

European science review

Nº 11–12 2018
November–December
Volume 1

European Sciences review

Scientific journal

№ 11–12 2018 (November–December) Volume 1

ISSN 2310-5577

Editor-in-chief

Lucas Koenig, Austria, Doctor of Economics

International editorial board

Abdulkasimov Ali, Uzbekistan, Doctor of Geography
Adieva Aynura Abduzhalalovna, Kyrgyzstan, Doctor of Economics
Arabaev Cholponkul Isaevich, Kyrgyzstan, Doctor of Law
Zagir V. Atayev, Russia, Ph.D. of Geographical Sciences
Akhmedova Raziya Abdullayevna, Russia, Doctor of Philology
Balabiev Kairat Rahimovich, Kazakhstan, Doctor of Law
Barlybaeva Saule Hatiyatovna, Kazakhstan, Doctor of History
Bejanidze Irina Zurabovna, Georgia, Doctor of Chemistry
Bestugin Alexander Roaldovich, Russia, Doctor of Engineering Sciences
Boselin S.R. Prabhu, India, Doctor of Engineering Sciences
Bondarenko Natalia Grigorievna, Russia, Doctor of Philosophy
Bogolib Tatiana Maksimovna, Ukraine, Doctor of Economics
Bulatbaeva Aysel Abdimazhitovna, Kazakhstan, Doctor of Education
Chiladze George Bidzinovich, Georgia, Doctor of Economics, Doctor of Law
Dalibor M. Elezović, Serbia, Doctor of History
Gurov Valeriy Nikolaevich, Russia, Doctor of Education
Hajiyev Mahammad Shahbaz oglu, Azerbaijan, Doctor of Philosophy
Ibragimova Liliya Ahmatyanovna, Russia, Doctor of Education
Blahun Ivan Semenovich, Ukraine, Doctor of Economics
Ivannikov Ivan Andreevich, Russia, Doctor of Law
Jansarayeva Rima, Kazakhstan, Doctor of Law
Khubaev Georgy Nikolaevich, Russia, Doctor of Economics
Khurtsidze Tamila Shalvovna, Georgia, Doctor of Law
Khoutyz Zaur, Russia, Doctor of Economics
Khoutyz Irina, Russia, Doctor of Philology
Korz Marina Vladimirovna, Russia, Doctor of Economics

Kocherbaeva Aynura Anatolevna, Kyrgyzstan, Doctor of Economics
Kushaliyev Kaisar Zhalitovich, Kazakhstan, Doctor of Veterinary Medicine
Lekerova Gulsim, Kazakhstan, Doctor of Psychology
Melnichuk Marina Vladimirovna, Russia, Doctor of Economics
Meymanov Bakyt Kattoevich, Kyrgyzstan, Doctor of Economics
Moldabek Kulakhmet, Kazakhstan, Doctor of Education
Morozova Natalay Ivanovna, Russia, Doctor of Economics
Moskvin Victor Anatolevich, Russia, Doctor of Psychology
Nagiye Polad Yusif, Azerbaijan, Ph.D. of Agricultural Sciences
Naletova Natalia Yurevna, Russia, Doctor of Education
Novikov Alexei, Russia, Doctor of Education
Salaev Sanatbek Komiljanovich, Uzbekistan, Doctor of Economics
Shadiev Rizamat Davranovich, Uzbekistan, Doctor of Education
Shahhutova Zarema Zorievna, Russia, Ph.D. of Education
Soltanova Nazilya Bagir, Azerbaijan, Doctor of Philosophy (Ph.D. of History)
Spasennikov Boris Aristarkhovich, Russia, Doctor of Law
Spasennikov Boris Aristarkhovich, Russia, Doctor of Medicine
Suleymanov Suleyman Fayzullaevich, Uzbekistan, Ph.D. of Medicine
Suleymanova Rima, Russia, Doctor of History
Tashpulatov Salih Shukurovich, Uzbekistan, Doctor of Engineering Sciences
Tereschenko-Kaidan Liliya Vladimirovna, Ukraine, Doctor of Philosophy
Tersvadze Mzia Giglaevna, Georgia, Doctor of Philology
Vijaykumar Muley, India, Doctor of Biological Sciences
Yurova Kseniya Igorevna, Russia, Ph.D. of History
Zhaplova Tatiana Mikhaylovna, Russia, Doctor of Philology
Zhdanovich Alexey Igorevich, Ukraine, Doctor of Medicine

Proofreading

Kristin Theissen

Cover design

Andreas Vogel

Additional design

Stephan Friedman

Editorial office

Premier Publishing s.r.o. Praha 8 – Karlín, Lyčkovo nám. 508/7, PSČ 18600

E-mail:

pub@ppublishing.org

Homepage

ppublishing.org

European Journal of Arts is an international, German/English/Russian language, peer-reviewed journal. It is published bimonthly with circulation of 1000 copies.

The decisive criterion for accepting a manuscript for publication is scientific quality. All research articles published in this journal have undergone a rigorous peer review. Based on initial screening by the editors, each paper is anonymized and reviewed by at least two anonymous referees. Recommending the articles for publishing, the reviewers confirm that in their opinion the submitted article contains important or new scientific results.

Premier Publishing s.r.o. is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Instructions for authors

Full instructions for manuscript preparation and submission can be found through the Premier Publishing s.r.o. home page at:

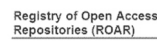
<http://www.ppublishing.org>.

Material disclaimer

The opinions expressed in the conference proceedings do not necessarily reflect those of the Premier Publishing s.r.o., the editor, the editorial board, or the organization to which the authors are affiliated.

Premier Publishing s.r.o. is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Included to the open access repositories:



The journal has the GIF impact factor 1.26 for 2017.

© Premier Publishing s.r.o.

All rights reserved; no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Publisher.

Typeset in Berling by Ziegler Buchdruckerei, Linz, Austria.

Printed by Premier Publishing s.r.o., Vienna, Austria on acid-free paper.

Section 1. Biotechnology

Tashmukhamedova Shokhista Sabirovna,
Kadirova Zukhra Abrarovna,
Madjidova Rano Khabibulla qizi,
Shovkatova Gulchekhra Abdullaevna,
National university of Uzbekistan of Mirzo Ulugbek
E-mail: zukhra_abrarovna7@mail.ru

RECEIVING DRY EXTRACT FROM THE PLANT OF *PHYSALIS ALKEKENG* AND DETERMINATION OF CONTENT OF FLAVONOIDS

Abstract: In order to select the optimal conditions for the extraction of flavonoids from the plant *Physalis alkekengi*, study was conducted to determine the extraction of the flavonoids. At the same time, the influence of some factors on the yield of flavonoids, in particular, the concentration of the extractant, the particle size of the raw material, the influence of the incubation time and the ratio of the raw material and the extractant were studied. The quantification of flavonoids in the raw materials of *Physalis alkekengi* was also conducted, study was conducted based on their ability to form a colored complex with an alcohol solution of aluminum chloride.

Keywords: dry extract, extractant, flavonoid, luteolin, concentration, incubation, raw materials.

Introduction

Now the majority of medicines applied in medical practice to treatment of many diseases have the synthetic nature and these medicines in most cases, have side effects. In this regard special attention is paid on herbs, which in this plan are more perspective are flavonoids contained in plants, in particular their extracts. It is known from literary data, many flavonoids allocated from herbs have higher biological activity, reducing in an organism the level of enzymes at hepatitis and hypostases, also improve works of plant breath [1; 5; 6].

Considering the medico-biological importance of this class of connections, nowadays scientific research for the purpose of identification of species of flavonoids of plants are carried out. Proceeding from activity, availability and the practical importance of *Physalis alkekengi* L. is the most important representative of plants flavonoids.

Cape gooseberry ordinary, possesses anti-inflammatory, antiseptic, soothing, styptic, diuretic, bile-expelling action. Broth or water infusion of fruits accept at an urological disease, cystitis, hepatitis, bronchitis, the alternating fever, hypostases, ascites, rheumatism, gout, bruises. Fresh fruits and juice of a plant use at a dermatosis, respiratory diseases, gonorrhoea, dysentery, hypertension. Traditional medicine recommends broth of roots as antitussive, sedative [2; 3].

According to literary data it is known that fruits contain carbohydrates and related connections: sugar(28.38%), pectin (3.8%), organic acids(5.1%), and in seeds – fat oil(14.86%), ascorbic acid, tannins, macro – and minerals. Leaves contain carotenoids: alpha carotene, phytoanthin, lutein, β -carotene, and flavonoids, including, luteolin, 7- β -glucosideluteolin [3; 8].

Proceeding from the above, a research objective was development of optimum conditions of receiving extractive substances of the *Physalis alkekengi* having the highest biological activity.

Technique of quantitative determination of the sum of flavonoids About 1.0 g (exact hinge plate) of the *Physalis alkekengi* raw materials crushed and sifted through a sieve with a diameter of openings of 2.0 mm placed in a flask with a capacity of 250 ml, added 80%-ethyl alcohol in number of 100 ml and weighed. The flask was heated on the boiling water bath within 1 hour, periodically stirred up. The flask with contents was cooled, weighed and if necessary brought contents volume to a tag of 80% – ethyl alcohol. Extraction was filtered via the paper filter, rejected the first 10 ml of a filtrate (solution A). 3.0 ml of a filtrate placed in a measured flask with a capacity of 25 ml, added 5 ml of 3% ethanol solution of aluminum of chloride in 80% – ethyl alcohol. Then incubated within 10 minutes and added the divorced acetic acid (2 drops). The volume of solution brought to a tag 80% – ethyl alcohol and

left for 45 minutes (solution B). The optical density of the received solution measured on the spectrophotometer at the wavelength of 400 nanometers in a ditch with layer thickness 10 mm. As control solution for comparison used the solution consisting of 3.0 ml of initial extraction, 2 drops of the divorced acetic acid and brought 80% by ethyl alcohol to a tag in a measured flask with a capacity of 25 ml. The maintenance of the sum of flavonoids as a percentage (X) in terms of luteolin and absolutely dry raw materials was calculated on a formula:

$$X, \% = \frac{D \times 25 \times 100 \times 100}{549.41 \times m \times 3(100 - W)}; \text{ rAE}$$

D – the optical density of the studied solution;

549.41 – specific indicator of absorption of a complex of a luteolin from aluminum chloride at 400 nanometers;

m – the mass of raw materials in grams;

W – loss in weight when drying raw materials as a percentage.

Correctness of a technique determined determination of quantitative content the sums of flavonoids in terms of luteolin in the solutions received by means of addition of 0.25 ml, 0.50 ml, 0.75 ml of standard solution of a luteolin to the studied solution.

Experimental part

Collecting consisted of green leaves and flowers of *Physalis alkekengi*. Green leaves of the plant were collected during the autumn period of 2016–2017 in the Botanical garden of the National University of Uzbekistan named after Mirzo Ulugbek.

In purpose for determination of content of flavonoids were taken 30 g of leaves of a plant, crushed to the sizes of particles of 0.5 mm, have been placed in a flask with a capacity of 1.0 l and filled in extragent. Then incubated at the room temperature within 6–8 hours. After an incubation mix was extracted consistently ethanol (40–90%). For full extraction of flavonoids from a plant extract was heated at a temperature 80–90 °C and ethanol extract in the portions of an condensed on the rotor evaporator “Rotavapor R-210” to consistence of dense weight. In the received dry extracts defined the maintenance of flavonoids in terms of luteolin [4]. Dry extract represented non-hygroscopic powder of dark green color with a specific smell.

Discussion of results

In work for the choice of optimum conditions of extraction of flavonoids from a plant of *Physalis alkekengi* the research on definition of extraction of the sum of flavonoids has been conducted. At the same time influence of some factors on an exit of flavonoids, in particular, concentration of the extragent, the size of particles of raw materials, influence of time of an incubation and a ratio of raw materials and the extragent have been studied.

For establishment of completeness of extraction of flavonoids from a plant of *Physalis alkekengi* studied influence of concentration of the extragent. The obtained data are provided on (fig. 1).

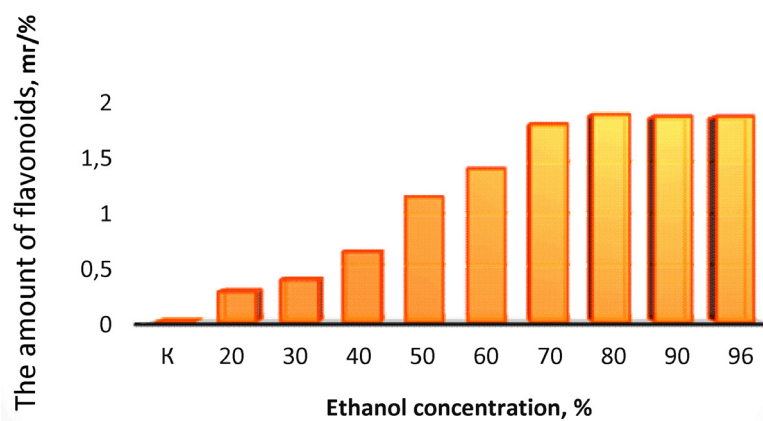


Figure 1. Influence of concentration of ethanol on efficiency of extraction of flavonoids

From (fig. 1) it is visible that at low concentration (20%, 30% and 40%) an exit of flavonoids made from 0.25 to 0.55 mg. Flavonoids were most fully taken by ethanol at concentration of 80%. At the same time concentration of a flavonoid I made 1.92 mg. Further increase in concentration of the extragent doesn't lead to increase in efficiency of extraction of flavonoids.

The influences of incubation time on efficiency of extraction of flavonoids within from 30 to 135 minutes (Fig. 2) also was studied in this work.

Apparently from (fig. 2) that within 105 minutes flavonoids are completely taken from vegetable raw materials. Further increase in time of an incubation wasn't increased by an exit of flavonoids.

At the following investigation phase we have studied influence of extent of crushing of raw materials, a ratio of raw materials and the extragent for an exit of flavonoids. The obtained data is presented in table 1. From the table it is visible that degree of powdering of a plant exerts a great influence on an exit of active agents, in particular flavo-

noids. At the choice of degree of an powdering of a plant used the raw materials particles passing through a sieve with a diameter of openings of 0.5; 1.0; 2.0; 3.0; 4.0 and 5.0 mm. From the obtained data it is visible that the most

maximum extraction of flavonoids from *Physalis alkekengi* is reached when crushing raw materials to the size of particles of 2.0 mm (quantity of flavonoids I made 1.93 mg) (Table No. 1).

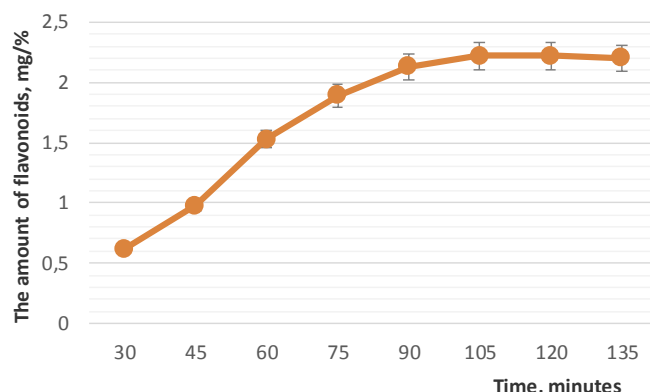


Figure 2. Influence of the incubation time on efficiency of flavonoids extraction

Also the ratio of raw materials and the extractant for an exit of flavonoids have been studied. The obtained data are provided in the (table No. 1). From the (table No. 1) it is visible that at a

ratio raw materials and extractant (1:100) quantity of flavonoids made 1.95 mg. Further increase of a ratio of raw materials and the extractant haven't affected an exit of flavonoids.

Table 1. – Influence of extent of crushing of raw materials, ratio of raw materials and the extractant for an exit of flavonoids

№	Ratio raw materials: extractant, g/ml	Exit of flavonoids, % mg	Reduction ratio of raw materials, mm	Exit of flavonoids, % mg
1	1:30	1.51	0.5	1.79
2	1:50	1.62	1.0	1.81
3	1:60	1.79	2.0	1.93
4	1:80	1.91	3.0	1.90
5	1:100	1.95	4.0	1.65
6	1:150	1.95	5.0	1.48
7	1:200	1.94	6.0	1.48

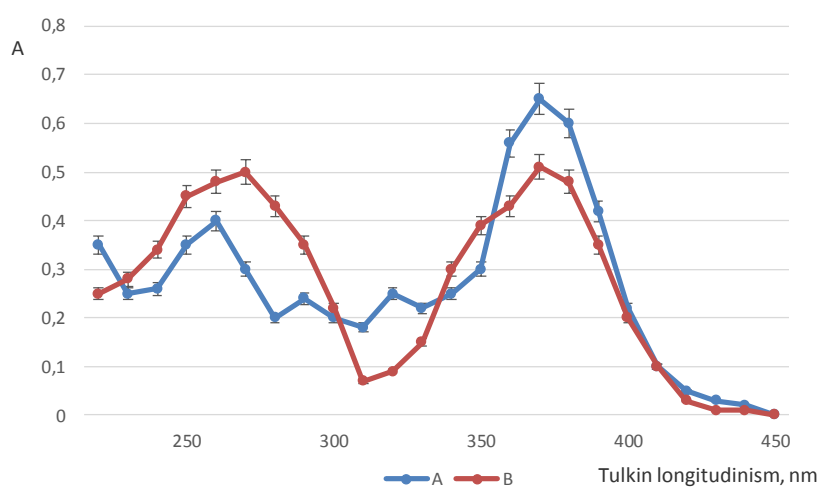


Figure 3. UV-ranges of solution of a standard sample of luteolin (A) and spirit extraction of *Physalis alkekengi* (B)

Further, researches for the quantitative definition of flavonoids in *Physalis alkekengi* raw materials are conducted and the research, based, on their ability to form the painted complex with a spirit of aluminum of chloride [7] is conducted. In terms of luteoline applied the UF-spectrophotometry method to calculation of the sum of flavonoids. Measured an optical density of the painted complex which is formed at interaction from 3% a chloride aluminum spirit at a wavelength of 400 nanometers. The similar maximum of absorption at a wavelength of 400 nanometers was noted for a complex of a luteolin with a spirit of aluminum of the chloride used by us in a technique as a standard sample (fig. 3). As monitoring used solution without reactant.

Thus, the method of receiving dry extract from a plant of *Physalis alkekengi* and the maintenance of flavonoids was developed.

Conclusions

Extraction methods biologically of the active materials of a simple *Physalis alkekengi* are analysed. Optimum conditions of extraction of flavonoids of the studied object are picked up. At the same time 80% – ethanol with particles of raw materials of 2.0 mm in size were optimum for an exit of flavonoids, and a ratio raw materials: extragent – made 1:100, and time of extraction made 105 minutes. Also, in work the technique of the quantitative determination of the sum of flavonoids in plant leaves in terms of luteolin is developed.

References:

1. Гордеева А. П. и др. Декоративные и лекарственные растения. Каталог Ботанического сада Белорусской государственной сельскохозяйственной академии / сост.: А. П. Гордеева [и др.]. – Горки: БГСХА, 2013. – 308 с.
2. Дейнека В. И., Сорокопудов В. Н., Дейнека Л. А., Третьяков М. Ю., Фесенко В. В. Исследование плодов *Physalis alkekengi* L. как источника ксантофиллов – Хим.-фарм. ж-л 2008. – 42, 2, – Р. 36–37.
3. Yang Y. K., Xie S. D., Xu W. X., Nian Y., Liu X. L., Peng X. R., Ding Z. T., Qiu M. H. Six new physalins from *Physalis alkekengi* var. *franchetii* and their cytotoxicity and antibacterial activity – *Fitoterapia*. 2016. – Jul., 112, – Р. 144–152.
4. Арзамасцев А. П., Садчикова Н. П., Харитонов Ю. Я. Валидация аналитических методов // *Фармация*. 2006. – № 4. – С. 8–12.
5. Куркина А. В. Флавоноиды фармакопейных растений: монография. – Самара: Офорт; ГБОУ ВПО Сам ГМУ Минздравсоцразвития России, 2012. – 290 с.
6. Лобанова А. А., Будаева В. В., Сакович Г. В. Исследование биологически активных флавоноидов в экстрактах из растительного сырья // *Химия раст. сырья*. 2004. – № 1. – С. 47–52.
7. Харитонов Ю. Я. Аналитическая химия (аналитика). – М., 2001. – 380 с.
8. Цыбанов К. Ц., Ажунова Т. А., Лубсандоржиева П. Б. Фармакологическая активность нового растительного средства «Фитокол» // *Биоразнообразие экосистем Внутренней Азии*. – Улан-Удэ, 2006. – Т. 2. – 121 с.

Section 2. Geography

*Kamalov Bakhodir Asamovich,
professor of the department of ecology
Namangan State University
E-mail: kamolov-1942@inbox.ru*

*Koriyev Mirzokhid Rustamjonovich,
PhD., student of the department of ecology
Namangan State University
E-mail: qoriyevmirzohid@mail.ru*

ORGANIZATION OF GARDENS WITHOUT IRRIGATION ON THE ADYRS OF THE NORTHEASTERN PART OF THE FERGANA VALLEY

Abstract: The article presents the results of experiments on the cultivation of orchards without irrigation on the adyrs of the northeast part of the Fergana Valley.

Keywords: plastic film mulching, adyr (hilly foothills) zone, horticulture, terrace.

The territory of the central lowland part of the Fergana Valley is framed with neotectonic adyrs (hilly foothills) uplifts almost from all sides. Their height above the surrounding territory reaches 200–300 m. In the 80 s of the twentieth century, a significant part of the heaps was mastered, mainly for growing cotton. Irrigation water was pumped, which required enormous energy consumption. Therefore, in the subsequent significantly reduced acreage. Currently, some of the developed territory is used for gardens and vineyards. In order to expand their area, starting from 2013, we conduct experiments on the cultivation of gardens on adyrs of the north-eastern part of Namangan region [1].

The climate is dry; the average annual precipitation is about 200 mm. Precipitation mainly falls in December-April. They in the experiments with vegetables, due to the relatively short period of their growing season, were sufficient. For garden crops, due to their high biomass, such natural moisture may be insufficient and terracing is usually used on the slopes. In terms of our experiences and they did not give the desired results. Therefore, we conducted experiments with terracing and mulching. The results of experiments for the years 2013–2017 gave positive results and formed the basis of this article.

Table 1. – The results of phenological observations are given



Experienced apricots planting 03.22.2013.
Photo from 20.08.2018



Experienced peaches planting 03.19.2014.
Photo from 08.20.2018

As is generally known, gardens and vineyards in a fertile age do not require much moisture. However, with the breakdown of gardens in arid conditions, the adoption and development of seedlings will not be realized without repeated watering. Therefore, for the beginning, experience was put on a small plot of 250 m² in size. During this growing season, corn and silage corn was grown on this plot. After the harvest, the land was left without plowing. In the spring of 2013, 10 apricot seedlings, 1 peach and 5 apple trees were planted in this area. Around the seedlings in a radius of 80 cm, the ground was covered with a thin polyethylene film, the border of which was surrounded by

a ditch 30–40 cm deep for collecting rainwater. Each bush was fertilized with 0.5 kg of ammophos, thrown evenly into the surrounding ditch. The plastic film was covered, as in experiments with vegetables, with a layer of soil approximately 5 cm thick.

During the growing season of 2013, according to data from the Namangan weather station located 15 km from the experimental site to the west, the atmospheric precipitation at approximately the same height above sea level with it was 13.8 mm in April, and 30.8 mm in May June 8.6 mm, July 1.6 mm, August 1.4 mm, September 2.0 mm and in October 7.1 mm, a total of 65.3 mm.

Table 1. – The results of the experience of organizing a garden without irrigation in 2013

Planting years	2013			2014		
	Apricot	Peach	Apple	Apricot	Peach	Apple
Type of seedlings	Apricot	Peach	Apple	Apricot	Peach	Apple
Date of planting	22.03	29.03	29.03			
Quantity of seedlings	10	1	5	10	1	4
Mulching date	22.03	29.03	29.03	16.03	16.03	16.03
Height of seedlings (cm)	80–100	50	60–80	100–120	70	90–100
Date the beginning of flowering	02.04	–	–	30.03	–	–
Date of mass flowering	05.04	–	–	05.04	–	–
Date of first leaves	02.04	05.04	5.04	06.04	05.04	07.04
Date of full leaf blooming	05.04	10.04	10.04	15.04	20.04	20.04
Leaf fall start date	07.10	29.10	05.11	01.10	10.10	01.11
End date of leaf fall	26.11	10.11	26.11	16.11	01.11	26.11
Seedling height at the end of the growing season (cm)	150–100	80	100–110	150–200	100	110–120
The number of dried seedlings	–	–	1	–	–	–

As can be seen from table 1, the seedlings in the first year were mainly taken. Of the 16 seedlings only 1 dried. The remaining 15 gave a growth of 30–40 cm. In this respect, the

experienced seedlings lagged behind the indicators of the control (irrigated) seedlings by 30–60 cm.

Table 2. – The results of the experience of organizing a garden without irrigation in 2014

Type of seedlings	Apricot	Peach	Quince	Cherry	Plum	Apple
Date of planting	19.03	19.03	19.03	19.03	19.03	19.03
Quantity of seedlings	5	10	5	5	5	15
Mulching date	26.03	26.03	26.03	26.03	26.03	26.03
Height of seedlings (cm)	70–100	90–100	80–100	50–100	100–110	80–100
Date the beginning of flowering	–	10.04	–	–	–	–
Date of mass flowering	–	13.04	–	–	–	–
Date of first leaves	15.04	08.04	10.04	05.04	13.04	10.04
Date of full leaf blooming	01.05	25.04	20.04	20.04	25.04	25.04
Yellowing date of leaves	10.09	10.10	25.10	10.09	12.10	25.10
Leaf fall start date	20.09	27.10	02.11	15.09	25.10	05.11
End date of leaf fall	01.10	15.11	17.11	01.11	12.11	20.11
Seedling height at the end of the growing season (cm)	90–120	100–130	100–130	80–130	110–120	90–120
The number of dried seedlings	2	–	1	2	3	–

This table shows phenological data for 2014 for the same seedlings. Before the beginning of the growing season of this year, they were cut off. In 2014, the growth of seedlings was 30–80 cm, and corresponded to the growth of seedlings in the irrigated field.

In 2014, apricot, quince, cherry and plum seedlings with 5 bushes, peach 10, apple trees 15 bushes were planted on a higher part of the hill in another plot. Apple trees and peaches

all started, and during the growing season they gave an increase of 10–30 cm. However, about half of the bushes of apricot, cherry and plum, 1 quince bush dried out. The rest gave the same growth as the apple and peach (Table 2.). In terms of growth and in this experience, experienced seedlings lagged behind irrigated ones. Note that, from the control irrigated saplings, dried ones accounted for 20%.

Table 3. – Phenological observations of experimental seedlings in 2016–2017

	Years	Seedlings 2013	Seedlings 2014 r.					
		Apricot	Apricot	Peach	Quince	Cherry	Plum	Apple
Quantity of seedlings	2016	9	3	8	2	4	3	15
	2017	9	3	8	2	4	3	15
Date the beginning of flowering	2016	26.02.	–	02.03.	15.03.	25.03.	–	–
	2017	21.03.	–	28.03.	04.04	14.04	–	05.04
Date of mass flowering	2016	01.03.	–	06.03.	18.03.	28.03.	–	–
	2017	25.03.	–	04.04	10.04.	20.04	–	10.04
Date of first leaves	2016	02.03.	05.03	08.03.	11.03.	02.03.	08.03	05.03
	2017	22.03.	22.03	02.04	06.04.	02.04.	25.03.	05.04.
Date of full leaf blooming	2016	16.03.	16.03	25.03.	28.03.	20.03.	25.03	25.03
	2017	05.04	05.04	10.04.	15.04.	12.04.	05.04.	14.04.
Beginning of fruit formation	2016	18.03.	–	28.03.	28.03.	15.03.	–	–
	2017	05.04.	–	10.04.	15.04.	28.04.	–	22.04.
Beginning of fruit ripening	2016	08.05.	–	09.06.	07.05.	05.10.	–	–
	2017	10.05.	–	30.06.	15.05.	10.10.	–	05.10.
Mass ripening of fruits	2016	15.05.	–	15.06.	09.05.	15.10.	–	–
	2017	20.05.	–	05.07.	25.05.	25.10.	–	25.10.
Yellowing date of leaves	2016	15.09.	15.09	05.10.	01.09.	25.10.	28.10.	28.10
	2017	20.09	20.09.	01.10.	10.09.	20.10.	20.10.	25.10.
Leaf fall start date	2016	24.09.	25.09	20.10.	10.09.	05.11.	07.11.	10.11.
	2017	01.10.	01.10.	15.10.	25.09.	10.11.	01.11.	10.11.
End date of leaf fall	2016	10.10.	15.10.	18.11.	20.10.	25.11.	28.11.	05.12
	2017	20.11	20.11.	28.11	25.10	10.12.	25.11.	10.12.
Seedling height at the end of the growing season (cm)	2016	100–120	70–90	100–110	80–100	90–110	60–70	80–100
	2017	140–150	100–110	140–150	110–130	110–120	90–100	120–130
The height of the bushes at the end of the growing season, cm	2016	140–150	100–120	150–170	110–130	120–140	90–100	120–140
	2017	220–250	160–190	180–220	120–150	160–200	120–150	170–220
The number of dried seedlings	2016	–	–	–	–	–	–	–
	2017	–	–	–	–	–	–	–

March 30, 2015 there was a sharp cooling down to -10°C with snow falling up to 20 cm thick. It damaged all the bushes in the test and control areas. Auxiliary irrigation was carried out on the control plots, which in 15–20 days led to the development of repeated shoots. In the experimental plots

where such watering was not carried out, the development of repeated shoots was observed only on 9 apricot bushes of planting in 2013, 3 apricot bushes, 8 peaches, 4 quinces, 2 cherries, 3 plums, 15 apple trees in 2014.

The results of phenological observations of experimental seedlings in 2016–2017 are given in (table 3).

Conclusion:

1. On the basis of the conducted experiments, it is possible to conclude that it is possible to organize gardening without irrigation in the arid conditions of the foothill regions of

the Fergana Valley with an annual precipitation of 100–200 mm, most of which falls in the winter-spring period.

2. The experiments were conducted by the authors, due to their limited capabilities, in small areas. Therefore, the developed technique needs to be tested at larger sites.

References:

1. Kamalov B. A., Abdurakhmanov S. T., Koriev M. R. Possibility of crop in arid conditions without irrigation // European applied sciences.– No. 10. 2015.– (November).– P. 13–17.

*Karakulov Nurbol Maidanovich,
The Tashkent State Pedagogical University named
after Nizami, Tashkent, Uzbekistan
E-mail: nkaraqulov@mail.ru*

*Nugmanova Arofat Abduxamitovna,
The Tashkent State Pedagogical University named
after Nizami, Tashkent, Uzbekistan*

*Bayqabilov Xusnuddin Mardanovich,
The National University of Uzbekistan named
after Mirzo Ulugbek, Tashkent, Uzbekistan*

*Abduraimova Xurshida Gurgunbayevna,
The Tashkent State Pedagogical University named
after Nizami, Tashkent, Uzbekistan*

THE METHODOLOGY OF ORGANIZING AND FULLFILING THE COURSE WORK OF STUDENTS ON THE SUBJECT OF “NATURAL GEOGRAPHY OF CONTINENTS AND OCEANES”

Abstract: This article describes the methodology of organizing and completing the course work on the subject of “Natural geography of continents and oceanes”. There is also a guideline instructions about how to write a course work.

Keywords: course work, generalization, academic development, the subject, concept, theoretical importance, practical significance, research, paragraphs.

The course is written on the basis of deep study of theoretical foundations of science, the study of specific practical materials, analysis and generalization.

Course work is one of the forms of students' independent work. It is based on the student level and capabilities of academic development [3].

The subject of the course is the independent research work of the student, the students of 3–4 courses of the educational direction 5110500 – Geography teaching method. Geography Teaching Methods Students are required to complete 3 course studies in the curriculum for 4 years of study. Course work is based on the curriculum of the subject “Geography of the Continents and Oceans” in the 3rd year (6 semester), “Geography Teaching Methods” in the 4th year (7 semester), “Economic and Social Geography of World Countries” 4th year (semester 7), [4].

The aim of the course is to write the course subjects in natural geography subjects in the Continents and Oceans:

- Strengthen the theoretical material presented by students and to educate them to practice and enlighten them scientifically;
- develop students' ability to solve problems and solve them;
- To teach students independent use and analysis of literature, practical, internet, statistical and other materials in scientific and practical activities.

- It is desirable for the subject of the course to continue as a graduate qualification work on the 4th year. Therefore, the research supervisor should advise the researcher in choosing a topic that is relevant to the current SES compliance and response that can continue as a graduation qualification in a graduate course.

The main objective of the course is to teach the students to elaborate scientifically-practical issues of their chosen topic and to develop recommendations for their solution.

Successful student performance by the student is largely dependent on the creative development and selection of the topic. An important factor in the successful completion of the course is the choice of a suitable subject depending on the student's own interests and abilities. Therefore, at this stage the student should be sensitive and responsible in choosing the subject. The student should take the course course topic independently from the list of course topics created and approved by the teachers of the department, taking into account their academic and practical interest. The scholars need to have academic guidance in selecting subject matter. At the same time, students should choose their topic from the Bank of approved topics.

The head of the course prepares the course assignment on the chosen subject and submits the assignment to the student upon approval of the head of the department.

Course work structure usually consists of the introduction, main part, summary, list of references and, if necessary,

applications. All of its parts are interconnected and should serve the purpose of course work [4].

It is also desirable to clearly define the concept of research, an expanded course work plan that identifies its main ideas, and the scope and sources of issues to be explored. The volume of the course work must be within the range of 35–50 pages in the manual text.

Course work is divided into separate parts (chapters and chapters) according to the plan. The names of these parts should be summarized in their own terms and capitalized in symmetry with the capital letters. The bet must be numbered with the Arabic numerals in the upper right corner.

Course work should include the following component parts:

title sheet; table of contents; introduction; the main part that combines the most important issues of course work; conclusion; the list of publications used; applications.

All illustrations in the course (graphs, drawings, diagrams, etc.) should have their own name and this title should be written at the top or bottom.

All formulas must be numbered with Arabic numerals. The formula number is displayed in the bracket on the right side of the page.

The contents of the content are shared with all the pages of the course (entry, chapters, paragraphs, entry, references).

Introduction part size is 2–4 pages. It is based on the relevance and relevance of the chosen topic, the purpose, objectives, theoretical and methodological foundations of the research.

In the introduction to the course, the following topics should be covered.

Theme: Priority; level of knowledge; the purpose of the research; functions; object; subject; methods; methodological bases; theoretical importance; practical significance.

The main part (chapters and paragraphs) should account for about 80–85% of the overall volume of the course. It may consist of 3–4 chapters (chapters) and at least paragraphs 5–6.

In the main part the main theoretical and methodological issues of the topic are considered, the results of the analysis of statistical (statistical) data are studied, the directions and norms of development of the studied processes are studied, the factors influencing them are studied and the studied processes recommendations for improvement.

The final part of the course consists of two to three pages, with the main conclusions and recommendations of the student's research. The list of references is a list of resources used during writing the course work [4].

Applications include tables, graphs, duplicates, diagrams, which can make reading more difficult.

Course work should be written in fluent literary language without grammatical errors, sentence and phrase clearly, interconnected and complementary to each other. The statistical data presented here should not only serve as illustrations, but also should serve for scientific analysis, conclusions and proof. Images, diagrams, card schemes, and other illusory sources of research should definitely be analyzed. The author is responsible for the accuracy and authenticity of all the facts and information contained in the course. Therefore, the student must regularly submit and review the information he / she has collected at least twice a month.

One of the most important requirements to the course work is the independent research by the student. This course will not be evaluated or recommended unless the student completes the course work independently, that is, the current job or the Internet.

One of the most important conditions for the quality of the course work is the in-depth study of available literature on the chosen topic. It should examine all the major works that are relevant to the issues under consideration (such as official information, scientific papers, textbooks, scientific papers, magazines, scientific conferences, statistical information).

During the study of the literature, the main focus should first be focused on parts (chapters, chapters) that are directly linked to the course or article of the book. Students will also be able to access foreign literature and receive course information from them.

The general guidance of the course is carried out by the scientific supervisor.

The main tasks of the scientist are:

- to help with choosing subject matter;
- to give the task to the course;
- help students develop course work structure and plan;
- assisting in the selection of basic and supplementary literature, reference books on the topic;
- identification of the object and scope of research, object activity, data collection and analysis methods, together with the data.
- the scientific supervisor must develop student initiatives in various ways and help them to carry out independent research.
- consultations on the issues of writing the course work by the scientific supervisor are carried out in a timely manner by the supervisor and approved by the department.
- the supervisor oversees the execution of the course work;
- the Scientific Leader checks the course work provided to him, he/she expresses his / her own opinion and advises in what direction to change and fill up the job;

– completed course work is handed over to the academic director within the prescribed time limit.

– the supervisor checks course work and in his written review he / she expresses his / her consent to the defense and signs the review.

– In the case of a scientific director suggesting that the course work can not be defended, this issue will be resolved in the presence of the head of the department and the author of the curriculum. The minutes of the meeting of the department are presented to the assistant to the rector of the university on academic and scientific work [4].

Students carry out the course work under the supervision of the supervisor (teacher) appointed by the department. After a positive assessment of the course leader, the supervisor must submit the work to the chair for review at the appointed time. All the course works are reviewed with the permission of the head of the department. Positive reviews must be protected by a special commission.

If the course work is not at the level required, it will be returned to the student for processing.

Course work is defended. The department confirms the composition of the commission for the defense of the course work. At the same time, the student will inform the commission about the purpose, tasks, content of the course, as well as its recommendations and recommendations within 10–15 minutes. After that, the student will answer the questions of the subject of the course and the questions of commission members connected with it. The guardian shall be registered in the registry and signed by the commission members. The cost of the course is determined by a 100-point system based on a review of academic staff and student responses. If a student is evaluated 86–100 points, he / she will be assessed 5 (excellent), 71–85 points 4 (good), 55–70 points 3 (satisfactory) and no less than 55 points 2 (unsatisfactory).

Students who fail to fulfill the course-work in time and defend the course in time will be the academician debtor. If the student fails to complete the course-work during the re-defending the paper, appropriate measures are taken and students are advised to leave education programme.

References:

1. O'zbekiston Respublikasining "Ta'lim to'g'risida"gi Qonuni, 29.08.1997.
2. O'zbekiston Respublikasining "Kadrlar tayyorash milliy dasturi" // Barkamol avlod – O'zbekiston taraqqiyotining poydevori.– T.: Sharq, 1997.
3. Талабалар мустақил ишини ташкил этиш ва назорат қилиш бўйича Йўриқнома.– Т.: 2009.
4. Safarova N. I., Karakulov N. M. "Materiklar va okeanlar tabiiy geografiyasi" fanidan kurs ishlarini yozish bo'yicha uslubiy ko'rsatma.– T.:2018.
5. Soatov A., Abdulqosimov A., Mirakmalov M. Materik va okeanlar tabiiy geografiyasi.– T.: O'qituvchi, 2017.
6. Yo'ldoshev J. G', Usmonov S. Ilg'or pedagogik texnologiyalar.– T.: O'qituvchi, 2004.
7. Притула Т. Ю., Ерёмин В. А., Спрялин А. Н. Физическая география материков и океанов. Учебное пособие.– М.: Владос ИМПЭ им. А. С. Грибоедова, 2003.

*Hoshimov Azamat Naziraliyevich,
researcher, The Faculty of Natural Sciences
Kokand State Pedagogical Institute, Uzbekistan
E-mail: gayrat17@mail.ru*

*Isakov Valijan Yunosovich,
Head of the Department of Geography, professor,
Kokand State Pedagogical Institute, Uzbekistan
E-mail: isakov47@inbox.ru*

GEO-ECOLOGICAL CONDITION OF THE CONE REMOVAL OF THE SOKH RIVER AND ITS CHANGES AS A RESULT OF THE HUMAN FACTOR

Abstract: The article describes the impact of irrigation and melioration on the hydrogeological and ecological conditions of the cone of Sokh River. Underground water bed saturation and mineralization changes, seasonal and multi-year cycles, dynamics are described. The relation between the rhythmic changes in the underground waters with the water level of the Sokh River and its fluctuations is shown in the article.

Keywords: Underground water, artesian basin, irrigation and amelioration measures, hydro geologic and ecologic conditions, bedding level and melioration, rhythm, mode, effluent, water consumption.

An institutional and legal framework for the use and protection of land and water resources has been created in the Republic of Uzbekistan. These are Law on nature protection, Law on state land cadastre, Law on farming, Law on subsoil, Land code and other laws. Within the framework of the Action Plan for the further development of Uzbekistan in 2017–2021, the goals of improving the reclamation of lands, the development of irrigation and land reclamation facilities and ensuring their safe and stable operation for the rational use of land and water resources.

Implementation of the set tasks requires a thorough scientific foundation, comprehensive study of its geo-ecological, hydrogeological, soil-reclamation conditions in each particular region, a comprehensive analysis and ways of rational utilization of resources.

It is known that the conical spatial expansion of the Sokh River differs for its classic symmetrical structure. Its central and lower edges and wings are fully formed. Specifically, the hydrogeological zones of the mountain rivers are common. Sokh cone spread has a special place in the study of the mountain rivers spreads, the research work, and the use of the spatial areas in the national economy.

The following three hydrogeological zones are allocated within the cone spread areas [2; 4]: 1. The zone where surface water leakages to underground and underground water forms; 2. The zone of freshwater flows to the surface; 3. Mineralized water distribution or secondary sedimentation zone.

The main part of the cone spread consists of thick gray layers and forms the first hydrogeological zone. The underground water is formed by Sokh River and its branches, as well as irrigation canals, and partly atmospheric precipitation.

The underground water of this zone is close to surface water, according to the mineralization and chemical composition. Mineralization of underground water is 0.3–0.4 g/l and river water is 0.2 g/l. According to the chemical composition it includes hydrocarbonate, magnesium-calcium.

The commissioning of the Great Fergana Canal (January, 1940) had a great impact on the depth of the settlement of underground water. The bottom was blocked by the flow of water flowing from the upper canal, which is much deeper than the surface of the water. As a result, the surface water levels have risen from 6–10 m to 2–3 m in most of the sand and stone areas. There has also been a dramatic change in the water regime. The level of underground water has been raised in canal when flows full in vegetation period and has been decreased when the water flow has been stopped during the winter months, the swamping of the soil was rising, but the mineralization of water remained unchanged. The saturation amplitude of the saturated water is 50–100 cm, the maximum is February, and the minimum is June-July.

V.A. Gaints [2] was in the second zone of the hydrogeological zone with the intensified flow of the watersheds and the weakest leakage zones. The first Great Fergana Canal boundary is 3–3.5 km wide. The upper boundary corresponds to the fine substances widespread. The third hydrogeological zone continues to the alluvial plains of the Syrdarya river, 3.5–4 km north of the Great Fergana Canal.

Fergana valley, filled with Mesozoic and Cenozoic deposits formed on the paleozoic basin, formed as a huge tectonic sediment, is a common artesian haze [5]. Particularly rich in water, such as chalk, paleogene, neogene and quaternary deposits. There is an interconnected hydraulic link between

them. Due to the size and quality of water resources in this basin, the cone splits the Sokh River.

The upper reaches of the Artezian basin are composed of quaternary beds, and in its geolithological section, complexes such as Sorgh, Tashkent, Mirzachel and Syrdarya are allotted. [1; 2].

Pressure groundwater from the Cone springs on the beds of the Tashkent complex and in the lower part of the thick gravel layers in the Mirzachel complex is the main source of water supply to the city of Kokand and its surroundings. In the XX century, especially in the second half of the century, comprehensive irrigation and melioration activities were carried out to manage the regime of the Sokh River basin and groundwater regime, to effectively utilize them, expand the area and improve the fertility. They, in turn, have had a strong influence on the natural hydrophorescence and ecological conditions of the area which have been formed for decades. Average consumption of underground water flows formed at the top of the cone spread was $27 \text{ m}^3/\text{sec}$, with $18 \text{ m}^3/\text{sec}$ partially returned to normal groundwater flow at outbreak zone. The groundwater flow of the reconstructed and reinforced canals of the irrigation system was $21.4 \text{ m}^3/\text{sec}$. Its average annual consumption dropped to $4 \text{ m}^3/\text{second}$ and the amount of water outflow dropped to $7 \text{ m}^3/\text{sec}$, while the amount of groundwater utilization increased by $7 \text{ m}^3/\text{s}$ [2].

Reinforcement of the irrigation system has reduced water saturation by 20–26 cm in 1964–1965. The amplitude of the phase fluctuations ranged from 5.5 to 8.4 m in the central part of the formation of surface and underground waters in these years and from 0.65 m to 1 m in the remote parts of the region. The average value of groundwater fluctuation between 1947 and 1964 was 3.14 m.

The wells located at the center part of the spread the relative debt vary from 10–15 l/sec to 50–60 l/sec. The level of water absorption of the periphery towards the wings and cones of the periphery decreases to 0.5–1 l/sec.

The layers of the Tashkent complex start at depths of 100–130 m and are 400–450 m thick. The volume of water consumption of wells in the complex varies from several liters to 150 liters per second, and the flow of wells springs spontaneously from 5–10 l/sec to 30 l/sec. The relative debt of the wells in the head of cone spread are 0.03–3.4 l/sec, and 2.5–5.6 l/sec in the center, 4.5–8.8 l/sec in leakage zone, and 1.0–2.5 l/sec on the periphery.

Mineralization of pressurized waters in Tashkent and Mirzachel water complexes is almost the same, with an average dry residual amount of 0.2–0.3 g/l. At the top of Mirzachel complex water in the northern direction the dry residue rises to 0.5–0.8 g/l and does not change in deep layers. Min-

eralization type is hydrocarbonate, magnesium calcium rich in sulphates.

At present, the level of subsurface water is 60–100 m at the head of the soil and rocks beginning part of the cone layer, 50–60 m in the middle and 6–10 m in the marginal part. The unsaturated zone in this region have a filtration coefficient of 80–100 m/day, and water supply is 0.25–0.30.

Here, the undergroundwater regime has a stable rhythm in the long run: from summer to autumn it rises and falls from winter to summer. This rhythmic state of the maximal and minimal line represents the phase dynamics of the hydrogeological order of Sokh river. Due to the fact that the groundwater level is deep at the bottom of the surface, there is no direct hydraulic connection between them and the surface waters of the river. The maximum amount observed in July-August in river water is only 2–2.5 months (November-December) after groundwater [3].

Formation of the seasonal and long-term flow of the groundwater on irrigated fields of the cone spruce ponds depends on the balance between the water level of the Sokh River, infiltration of irrigation water, evaporation and transpiration volumes.

The maximum exposure level in the natural pitch of the cone periphery is observed in March and the lowest level of decline in November-December. However, the natural rhythmic status of the above-mentioned waters is affected by irrigation water during irrigated lands: during the year, the surface rises twice. The first seasonal rise is due to the spring salt washing, in March and the second, in the period July to September, due to summer vegetation irrigation.

The water level of the irrigated land was between 1–1.8 m depth during the 1935–1965 period. The mean annual minimum and maximum values of the line varied between 0.87–1.08 m in the amplitude. The mineralization level of the water ranged from 0.6 g/l to 16 g/l depending on the irrigation period. The fertilising effect of the irrigation water has increased over time. The newly-acquired land is characterized by high mineralization and low in old irrigated land.

In the 1980's, the total area of irrigated area of the Sokh River cone was 129063 hectares. Today, the value is about 150000 hectares. In today's environments with the type of collector-pond, the ground waters with a depth of 1.5–2.0 m are predominant in all areas of the study area. The area of this group has grown to 8500 hectares in the last 20 years, and the land area with a surface area of 2 m is significantly reduced. There is also a tendency to increase the mineralization of the waste water. Water mineralization with the reduction of land areas up to 1 g/l, the area of land with mineralization 1–3 and 3–5 g/l has increased.

The groundwaters of the Sokh River cone spread are highly valued by the quality. The importance of water for the

population as well as for irrigation purposes is unmatched and the capacity utilization is increasing. From 1911 to 1914, seven artesian wells were dug. Their number reached 34 at the beginning of the 1950s, and in 1962, there were 390 wells for water supply. Since then, the construction of the integrated water intake facilities for irrigation and water supply purposes has begun. In the 1960s, Shoimbek, the largest water intake facility, was constructed in the north-west of the slopes, 65 wells with a total output of 1.6 m³/sec, Ganiabad water intake facility in the south-west of the cone with 27 wells with 325 l/sec, the Tomosha Association has 29 wells for 290 l/sec. A total of 505 wells (453 phantoms) of wells with water are 5.2 m per second.

The number of wells used for the purposes of drinking and agricultural needs, irrigation and drainage in the Sokh River Cone Spread exceeds 2100, the total water volume is 18.2 m³/second. However, over the past few decades, the number of informal artesian wells has increased: they can be found in farms, neighborhoods, villages, and some businesses.

At present, the probable reserves of condensed groundwater are 3126000 m³/day, in practice their use makes up 45%.

Based on the aforementioned, it should be noted that over the last century, the transformation of human activity has changed dramatically. In particular, The Great Fergana Canal (1940) was put into operation. The type of collector-dump and the system of sinking canals (1936–1941, 1947–1948)

were constructed, in the 60s its specific length was increased to 60 degrees in some places. Sokh irrigation system was reconstructed, canals were reinforced. From 1992 to 1993, the Sokh reservoir began to collect river water. The number of wells for drinking, irrigation and drainage purposes has exceeded 2100. The amount of water withdrawn from them exceeded 18.2 m³/sec, which is expected to increase further in the future. In connection with the above, the water supply of irrigated areas has improved, new lands have been utilized, the land areas have been abandoned, and the water supply was dumped. Depth of water flow and its hydrochemical content have changed dramatically. At the same time, Kokand city and its affiliated industrial enterprises in the center of contaminated soil are a source of pollution of groundwater, and their disposal and waste contaminated not only in the 1980s and 1990s, but also groundwater (1–12). The above mentioned high quality of underground waters was mentioned above.

Unfortunately, because of the misuse of the upper part of the Sokh cone spill, the quality of underground wastewater was broken, and the waters turned into pollution. The water hardness of calcium and magnesium carbonates increases.

Thus, the creation of sustainable water supply for irrigated lands in the cone of the Sokh River, improvement of land reclamation, and raising agricultural production are connected with the solution of the existing problems of the existing hydrogeological and ecological conditions.

References:

1. Васильковский Н. П. К стратиграфии четвертичных отложений Ферганы. Материалы по геологии Средней Азии. Вып. 2. – Ташкент, 1935.
2. Гейнц В. А. Подземные воды четвертичных отложений Юго-западной Ферганы. – Ташкент: Фан, 1967.
3. Исаков В. Ю., Отабоев А. Х., Солиев Р. Э., Абдурахманов Г. А. К характеристике гидрогеологических условий Сохского месторождения подземных вод в Ферганской долине // Материалы V Международной конференции. Ресурсовоспроизводящие малоотходные и природоохранные технологии освоения недр. – Москва-Кызыл Кия, 18–22 сентября, 2006.
4. Легостаев В. М. Мелиорация засоленных земель. – Ташкент: Госиздат, 1959.
5. Ходжибаев Н. Н. Гидрогеолого-мелиоративное районирование. – Ташкент: Фан, 1975.

Section 3. Demography

*Tojievna Zulhumor Nazarovna,
DcS., associate professor,
National University of Uzbekistan named after
Mirza Ulugbek Faculty of Geography
E-mail: z_tadjieva@mail.ru
Sabirova Muazzam Shuhratbek qizi,
Saipov Ulugbek Muratovich,
researchers of the National University of Uzbekistan
named after Mirzo Ulugbek. (Tashkent, Uzbekistan)*

REPRODUCTION OF THE POPULATION IN THE REPUBLIC OF UZBEKISTAN AND ITS TERRITORIAL DIVISIONS

Abstract: The article discusses the features of birth rates of the population in the Republic of Uzbekistan. The main purpose of the article is to consider tendencies of birth rate of the population and analyses a complex of indicators of fertility and reproductive behavior. A comparative analysis of the population's reproductive behavior was carried out using the system of demographic coefficients. An assessment of births contribution of various sequences to indicators of total birth rate is carried out.

Keywords: fertility, reproductive behavior, total fertility rate, the order of birth.

Over the past 25 years, birth and death rates among the Uzbekistan population have led to a decrease in natural movement rates. Nevertheless, the population growth is rising every year due to the natural population growth. Because of the mechanical increase of the population, it has already become a negative factor for the country. Between the years 1950–1991, the population of Uzbekistan has been steadily developing, and from the 91st birth rate of babies has gradually dropped. Nowadays, it is mainly through the limitation of the number of children born in families to live in a culturally sound way, to seek a better life, and to create the necessary conditions for the present and future lives of children. In particular, the population of the republic was 723.4 thousand in 1991, and in 2017 it was 726.1 thousand, or 1.4 times more. The annual average birth rate was negative in 1991–1995, ie –1.3 percent, in 1995–2000, –4.90 percent, followed by 0.25 percent in 2000–2005 and 2.90 percent in 2005–2010 – changed to 2.50% in the year 2015. The total coefficient of births per thousand people was 34.5 in 1991, 22.8 in 2017 or the total birth rate in that period declined by 11.2%. This is due to the fact that the birth of the fifth, sixth, seventh, eighth, or even tenth births of children in families belonging to the former Soviet regime was rising. On the contrary, the proportion of births born first,

second and third is increasing steadily. For example, the share of children born in families who were third-born in total births in children was 18.8 per cent in 1989, whereas last year it was 19.2 per cent. The proportion of children born in the fifth and subsequent years in the family declined from 15.3 to 2.1 per cent in 1989–2015. Of the 5240.0 thousand families in the republic, 25.4% of the total number of children, 23.9% of families with one child, 25.6% of children with two children, and 16.5% – have 3 children.

The periodic decline in the overall birth rate among the population has specific features at the provincial level. In 1991, the overall birth rate of population in the provinces was 29.0–42.5%, and in 2017, it was 21.3–27.3%. The overall birth rate in Kashkadarya, Surkhandarya, Samarkand and Jizzakh provinces ranks first in the country in terms of birth rate over the years 1989–2017 above the national average. The difference between the largest and lowest birth rates [1; 3] was almost the same in 1989–2017. In the demographic transition, not only the employment of women in the country, but also the level of education, the dramatic change in the attitude towards the number of children born in the family began to emerge. For this reason, 14.3% of infants in recent years are women of 30–34 age group, 34.1% are women of 25–29 years, and

42.5% are women of 20–24 age group. Of these, 65.0 percent of firstborn babies belong to women aged 20–24. The share of the first child in the 40–44 age group is only 0.1%. In contrast to this age group, most third-born babies comprise 25–29 years (45.7%) and women aged 30–34 (34.4%). Naturally, as the age of women grows, the number of births is fourth, fifth, and even more. The majority of children born to 5 years of age or more in the family fall to women aged 30–39, accounting for only 4% of all births. In Uzbekistan, the overall birth rate decreased by 1.5 times in comparison with 1989, in urban areas – by 1.3 and in rural areas – by 1.9 times. At the same time, this ratio of births in total population dropped to 4.0 in 1989, having dropped to 2004, from 2005 to 2.4% in 2017. In the regions of the country, this indicator exceeded the national average by 1.0–1.3 times in the population of Surkhandarya, Kashkadarya, Jizzakh, Namangan, Andijan and Samarkand regions in 1996–2017.

There were no changes in the role and status of these regions during the transition period, but the number of children in a single reproductive age was lower. The cumulative birth rate in the rural population of the Republic is always relatively high, ie in 1989 the average fertility age was 5.4 children, and last year it was 2.6. In rural areas, a single reproductive age has a relatively high proportion of urban population, despite the rapid decline in birth rates. In the years under review, the population aggregate birth rate declined almost 2 times. For example, the urban population of the Republic of Karakalpakstan, Kashkadarya, Navoi, Namangan, Surkhandarya, Syrdarya and Ferghana regions and the city of Tashkent were 2.2–2.4, while in Bukhara, Jizzakh, Samarkand, Khorezm and Tashkent provinces it was smaller than the national average.

The coefficient of the population re-establishment was reduced to $R_b = 2.049$ in 1989 and 1.77 in 2017 to $R_b = 1.147$. Thus, by 2017, every 1.000 women in Samarkand region will receive 1204, Kashkadarya region – 1254, Khorezm region – 1135, Surkhandarya region – 1225, Jizzakh province – 1135, In Tashkent region 1061, in Fergana region, 1131 girls have been resettled, indicating that the population in these areas is still being rebuilt. On the contrary, the population of Bukhara, Navoi and the city of Tashkent (with a coefficient of 1027–1085) is re-established. In rural areas, every 1.000 women leave their place of residence in 2437 in 1991 and 1257 in 2015, suggesting that the effective population is rebuilding. This will lead to a rapid decline in the population population, which increases the demographic potential and capacity. In rural areas, especially in Jizzakh, Kashkadarya, Surkhandarya, Andijan and Samarkand regions, this coefficient of 1299–1387 provides a high level of population growth in these regions. The ratio of Brutto's coefficient to total and

the decline in the rural population suggests that urban areas are rapidly approaching demographics.

In the urban population of the Republic, this coefficient was approached closer together, and even less than $R_b < 1$ than in 2001. In 1989, the urban brutto's coefficient $R_b = 1.483$, in 1991 it was 1.527, $R_b = 0.969$ in 2005, 1.039 in 2017, ie again growing. This means that in the urban population of the republic there is a rebirth of ordinary population. At the same time, women in Bukhara, Surkhandarya, Kashkadarya, Syrdarya and Ferghana regions are very small. If the demographic situation in the urban areas continues to be similar, it is expected that soon the entire population will be rebuilt. However, the proportion of young people in the age structure of the population of the republic helps to increase the birth rate and decrease the number of population in the near future. From this point of view, the demographic potential of Uzbekistan can be considered high. Because of the high demographic potential, the population will continue to increase as a result of the age structure of the population. There is an absolute increase in birth rates, but there is no significant change in the gross and net.

The net ratios of the population represent the population of $R_n > 1.0$, which has been expanded to a size greater than 1.0. For example, in 1989, every 1.000 women left their 1867-year-old mate, and in 2017 this figure was 1092. In 2000–2006, the net population indices were smaller than < 1.0 , in other words, the decline of the population was observed in this territorial structure, ie 961 girls out of every 1.000 women in 2000, 916 in 2005, And in 2017, 976 had lived up to their mother's age. In these years, the nettoy factor $R_n < 1$ indicates that the girls born during those years will not be replaced. $R_n = 1169$ (2017) is the peak of population re-establishment in rural areas, and the overall population is high in re-establishing. However, the fact that these regions dropped to 1.8 times between 1989 and 2017 once again proves that the enlarged population has been completely transformed into a weakened species.

The decline in birth rates among the population is not significant due to the negative demographic factors (population sex, mortality rate, marriage, divorce rate). Today, there are no significant changes and differences in these demographic factors. The reason is that the sex composition of the population directly affecting birth is almost equal. The proportion of men and women in all age groups is proportionate. In addition, women aged 15–49 who include a childbearing age account for 27.6% of the total Uzbekistan population, more than half the total number of women, ie 55.4% (2017). It is estimated that the population of this age population in the country has grown by 169.6% in 1989–2017, and that 56% of the total population in the provinces is involved in the re-establishment of the population. In the period under

review, the growth rate of reproductive age population in Namangan, Surkhandarya, Khorezm and Kashkadarya regions was 188.8; 208.5; 198.8 and 205.2 percent, and the birth rate is high. In the case of a high birth rate, stable marriage relationships play an important role. Correlation between marriage and birth is therefore stronger than the spiral correlation coefficient, $R = 0.77$. The link between them has a strong, straight line link.

The results of the research once again show that the demographic process in Turkey has started not only the transition, but also the modernization process. For this process, the transition from traditional to modern type of population has become a turning point. This modern type of re-establishment of population in the current socio-economic and demographic development of the country is effective.

However, it is necessary to take into consideration the fact that this type of re-establishment of population after a certain period of time can create demographic danger in the country's socio-demographic situation.

Due to the decline in birth rates among the population, the decline in the number of young people, the low age of the elderly and the elderly, the working age population and the favorable demographic opportunities for the development of the country's economy. Consequently, the territorial characteristics of the current population of Uzbekistan show that «demographic opportunity doors» are now open. Therefore, it is crucial to set up and establish effective and efficient use of these demographic opportunities in the socioeconomic development of the republic and its regions, in the stabilization of the economy.

Section 4. Study of art

Muradzadeh Leyla Rauf,
doctoral candidate
Azerbaijan National Conservatory
E-mail: mouradzadeah@gmail.com

Aliyeva Ulkar Sabir,
doctor of sciences on art, professor
Azerbaijan National Conservatory
E-mail: ula-music@rambler.ru

USE OF “SEGHAH” MUGHAM ON FAIG NAGHIYEV’S “ASHIGAM” CHORAL MINIATURE

Abstract: The article gives a detailed analysis of modern Azerbaijani composer Faig Naghiyev’s “Aşiqam” (“I am in love”) a capella choir. The Mughams, used in the work -mainly the sequence of segah and its varieties, have been demonstrated by the help of musical note examples. Moreover, the harmony of used piece of Bayati (The prevalent poetry genre of Azerbaijani folklore) with music and its influence on the development of musical line is also mentioned.

Keywords: a capella choir, mugham, Faig Naghiyev, Azerbaijani folklore, bayati.

A significant part of outstanding composer Faiq Naghiyev’s creative career, representing some of the most important contributions to Azerbaijani music, is composed of choral works. He also explored the genre of requiem, having written “Khojaly haray” (*Khojaly cry*), a musical composition for a grand orchestra and mixed chorus.

In addition, musical works such as “Ana Torpag” (*Motherland*) cantata (words: Khalil Rza) for mezzo-soprano, narrators, mixed choir and grand orchestra dedicated to the memory of Great Patriotic War victims; “Layla” (*Berceuse*) (words: folk bayaties) for a capella Female Chorus, azanchi (muezzin) to the words of Hasan Merach; “Azadlig” (*Freedom*) and “Sumgayit” odes (words: Alakbar Salahzade) for chorus and symphonic orchestra; “Shamin nalesi” (*Candle cry*) and “Ashigam” (*I’m in love*) miniatures for mixed chorus a cappella and symphonic orchestra, as well as songs such as “Al uste kimin eli” (*Whose hand is on hand*) (words: Khalil Rza), “Nargizin mahnisi” (*Song of narcissus*) (words Mirvarid Dilbazi); “Khatirlyarsan meni” (*Will remember me*) (words: Mir Mehdi Seyidzadeh) for children’s choir; “Benovshayam” (*I’m a viola*), “Geder” (*Will leave*), and “Toy gunu” (*Wedding day*) cycle for mixed chorus a capella dedicated to Leman Atakishiyeva (words: folk bayaties); “O sary yarpag” (*That yellow leaf*) for tenor and mixed a capella chorus dedicated to Yusif Habibov (words: Balash Azeroglu); and finally the three-part Concert for mixed

chorus a cappella (words: A. Khagani) can be particularly noted.

The mixed chorus a cappella we will study in the article, is “Ashiqam” miniature written to folk bayaties in January 1979. The inspiration of Segah mugham is clearly visible in the miniature written in a simple 3-part, reprise form.

Generally, the lyrical base of the work is closer to the perception of Azerbaijani people, so the mugham is one of the most sung pieces in Azerbaijan. Even Iranian musician Ruhullah Al-Khaligi confirms, “Although “Segah” expression is found in ancient Iranian music books, most Iranian musicians attribute Segah mugham only to Azerbaijanis, because Segah mugham had become more and more popular among Azerbaijanis and Azerbaijani singers masterfully perform the mugham” [1].

This mugham is classified in five tones by M. Ismayilov, a well-known Azerbaijani musicologist who was a student of U. Hajibeyli, due to different phases it’s being played on:

- 1) B key-note in small octave (“Kharij segah”);
- 2) E key-note in the first octave (“Orta segah”);
- 3) A key-note in the first octave (“Mirza-Huseyn segah”);
- 4) D key-note in the first octave (“Yalkhin segah”);
- 5) G key-note in the first octave (“Hashim segah”) [2, 61].

In the “Ashiqam” miniature, composed by F. Naghiyev to folk bayati words, from the beginning of the first bars it is clear that the song belongs to Segah mugham with the 6th degree B note. Most of songs which are based on Segah the starting sen-

tence, as usual, is generated around 6th phase of maqam – key-note quint. Such an intonation circle reveals that it belongs to “Shikesteyi-Fars” part of Segah, whereas the complementary second sentence gets lower and is completed at key-note of maqam at cadence typical for Segah, which shows that it belongs to “Mayeyi-segah” [...].

Most of songs composed over Segah maqam are based mainly on the stated rule. The first sentence of the first part leads it to “Shikesteyi-Fars”, whereas the second, complementary sentence to the key-note phase and further, is completed [3, 27].

In this work we have studied, various types of Segah mugham, including Kharij Segah, Hashim segah, Yalkhin segah, as well as others. Furthermore, several types of structures that are required to accent choral music have been studied in this work: monodic or melodic, subsonic, polyphonic and homophonic-harmonic [4, 186].

The general character of the work, composed to the folk-bayati words, is lyric and amorous as can be seen from

its name. In some parts the elements reminding ashug music tunes it even more up to a positive mood.

Ashigam gule bakhdi, (*I'm in love, looked at flower*)
 Bulbullar gule bakhdi, (*Nightingales looked at flower*)
 Bir gozel gulumsedi, (*A beauty smiled*)
 Aghzindan gulab akhdi. (*Rose water flowed from her mouth*)
 Ashigam daghi gezem, (*I'm in love, walking in the mountains*)
 Sinemde sazi gezem, (*Walking with saz on my chest*)
 Metlebim yari gormek, (*Hope to see my beloved*)
 Ishim ne daghi gezem. (*Why else would I need mountains*)

The part that studied the stunning impressions of the era, when the first signs of love and instant meetings give such a great gladness and emotion, was described with specific artistic poetic expressionism by the composer. It may be thought that such a shifting and contrasting composition line is exactly related with its text. Here both volume and structure, and tonality-maqam changes is implied.

Sample № 1

Allegro ($\text{♩}=138$)

Sample № 2

In describing the structure of the work, we have defined as a simple 3-part, reprise formed of A+A₁+B+C+A symbols. A theme is given in the first bar – B key-note (i.e., on Shikesteyi-Fars part of Kharij Segah). Only soprano and alto are included in the section which are temporarily subdivided into two sounds – S(I + II) + A.

Most likely, the composer intended to use volume of sound and timbre tones of female voices. Female voices that continue the sentence in the form of a 3-voice chorus pedal are answered in the 6th bar by the tenors in the form of *divisi*. Onwards, the phrase end is shifted to mayeyi-segah at 7th bar – S (I+II)+A–T (I+II)–B (I+II). Meantime, the word “bakhti” (*looked*) is repeated by bassists in a *tertia* form, and thereby once again accents *segah*.

The first theme we defined as A₁, which starts from (figure 1), is repeated in a slightly modified form. The

middle section starts from the (figure 2). In the soprano part where *divisi* is visible the left note of (I) sopranos shows *Mukhalif* part. The theme of the sopranos at bar no. 19 is repeated by tenors at the next bar. However, the imitative polyphony does not last long. The next episode starts from (figure 3). Simultaneous sounds of C-natural in soprano section over exclamations of “hey” and C-dieze once again accents *segah* mode. This is still the Shikesteyi-Fars section.

Episode B begins from (figure 4). The syllables “Dzin-dzin” used in the composition reminds the sounds of *saz*, which plays an accompanying role. It should be noted that this small theme, which is sounded only by tenor and sub-groups, also appears in tones typical to *ashug* music due to parallel quarte it sounds throughout.

Sample № 3

33 *f*

S. Si - nəm - - - də da

A. çin çin çin çin çin çin çin

T.

B.

Sample № 4:

39 *mp* 40 41 42

S. çin çin çin çin çin çin çin çin

A. çin çin çin çin çin çin çin çin çin çin çin çin çin çin çin çin

T. çin çin çin çin çin çin çin çin çin çin çin çin çin çin çin

B. Hey mət - lə - bim ya - rı gör - mək mət - lə - bim ya - rı gör - mək.

While tenor and alto continue to sing under the structure, bassists join the rendition with a new theme on another rhythmic line which is on a shur mode. The F-sharp sound here is the most obvious element in the identification of mayeyi-shur cadence. Bassists complete the theme by keeping sound a "la" sound on the "hey" exclamation are responded to by the same sopranos with the words "Sinemde daghi gezem". Meanwhile, in the 33rd bar background melody of sub-section, sounds in the bardasht part of Shur mugham, and more clearly reflects the tones of mekan it belongs to.

It should be noted that, despite the composer refers to the theme of love with whimsical mood, the musical language is rich in moments and strokes which are far from primitive and, on the contrary, demonstrative of the complex polyphonic writing style.

Figure 5 is a small episode composed of 4 bars. Here, a fuller version is sounded due to versatile the version of the vocalized execution in the figure 4, as well as addition of the theme other than that of the tenor and alto.

From (figure 6), we see one more structure change. The main theme is also shifted in section, which we defined as C conditionally. Interestingly, the author has incorporated $6/8 + 2/8$ grouping within the $4/4$ dimension.

Let's also mention that Soprano, Alto, Tenor and Bassist parties individually have a different rhythmic shape.

Accompanying sopranos who act in the form of divisi (tertia) are joined, over the "dzin-dzin" syllable, by altos in another rhythmic form. The phases under these two voices show Hashim segah with a left chord. At the same time, an

interesting theme sounds in tenors over the syllable. Although the section plays the role of accompaniment, it can be regarded as melody with an individual theme.

Finally, in the bassists section, a new theme begins with "Metlebim yari gormek" (*Hope to see my beloved*) words which are followed by a short vocalizations of "hoy-hoy" and, at the same time, "dzin-dzin" syllables. "Hey" and "hoy-hoy" exclamations used in this piece, illustrates some kind of village life, imitating the shepherd's call of sheep and cattle.

Due to both used syllables and performance structure this short part reminds instrumental sound (more precisely stringed instrument played with mizrab). This section may also be called pre-repetition preparation.

Finally, reprise, and, at the same time, the culmination point of the work starts at (figure 9). It should be noted that this experience has been apparent in the works of many composers.

This part, we defined as A, is almost the same as the beginning, with the addition of a small coda. At figure 12, the composer gives, in an unexpected form and time, C-shape key-note to tenors and bassists in unison.

At the 76th bar, the sopranos and altos conclude the final bar with the same sound with entire chorus in unison by forming cadenza over the keynote tertia – in E keynote with the "hey" exclamation.

The works of, talented, hardworking composer, educator, and active public personality, Faig Naghiyev, are the objects of research of many scholars. He continues his creative endeavors and pursuits well into the present day.

References:

1. Ruhullah Xaliqi. "Nəzəri be musiqi", Tehran, 1313(1938), səh. 190. Ruhullah Khaligi. "Nazari be musiqi", – Tehran, 1313. 1938. – 190 p.
2. İsmayılov M. S. "Azərbaycan xalq musiqisinin janrları", – Bakı. İşıq-1984. səh. 61. M. S. İsmailov. "Genres of folk music of Azerbaijan", – Baku. Ishiq-1984. – 61 p.
3. İsmayılov M. S. "Azərbaycan xalq musiqisinin janrları", – Bakı. İşıq-1984. səh. 27. M. S. İsmailov. "Genres of folk music of Azerbaijan", – Baku. Ishiq –1984. – 27 p.
4. Ушкарев А. «Основы хорового письма». – М., 1982. – 186 с. А. Ushkarev "The Principles of Choral Writing". – М., 1982. – 186 p.

*Hayitov Jakhongir Shodmonovich,
The base doctorate of
history of Bukhara State University
E-mail: wolffar7@mail.ru*

SPREAD OF NEW TYPES OF CORPS IN TURKISTAN CONTINENT AT THE END OF THE 19th – AT THE BEGINNING OF THE 20th CENTURIES

Abstract: In this article the spread of new sorts of cereal crops in the Turkestan region during the late 19th – early 20th centuries is scientifically researched based on the analysis of primary sources.

Keywords: wheat, barley, rice, millet, hay, sesame, flax, white wheat, American millet, Canadian barley, maize, American maize, kubanka, Poltava type, Turkish red wheat, cereals trade.

The cultivation of cereals and cereals is a traditional agricultural tradition in Central Asia, with a large portion of the agricultural land allocated to agriculture as the most important source of the population's cereal crops. Therefore, the consumption of fresh food in the region's population is at the forefront.

Sources reported that wheat and other cereal crops occupy the majority of land funds during the 1880 s. According to Shakhnazarov in 1898: "10–15 years ago (1883–1888 – J.H.) occupied 3/1 of the sown areas of Turkestan, but now (1898 – J.H.) these lands cotton harvest" [18, 65].

Among the cereals, wheat plays a major role in the cultivation of these crops in artificial irrigated lands of the region, in mountainous and foothills. The sowing of wheat in cultivation and dumping, and the sowing of the mulberry depends largely on the amount of annual rainfall. In the region, until the colonies of the Russian Empire, the autumn and spring wheat "White wheat", "Red wheat", "Shashkirra", "Koramoqor", "Yellow magic" were grown, and although the best quality was the smallest "Yellow Butter" ("The word" red camel – J.H.) is of high quality wheat and White Wheat, and is highly rated in the market [20, 722; 9, 95]. Also, "Steppe wheat" is also grown, which is the type that consumes less water.

According to sources, 20 varieties of wheat are planted in the region. Turbat (white and black) Sairam (white and black) of wheat varieties; Yellow–red (2 varieties), Al–Biruk, Kokand (N1), Yellow magic (white, yellow, German varieties – J.H.); Ashxabod, white wheat (2 grade), [16, 41]. Due to the lack of water in the region, farmers tried to plant wheat varieties that were resistant to drought. According to calculations, the water turbans (spring – J.H.) Water saving; Varieties such as "Yellow Butter", "White Wheat", "Sayram" and "Ashgabat" are important, and Nari–Kizil and Kokand varieties use large quantities of water. The 19 and 20 varieties of "Red Wheat" are the top priority in water consumption.

Following the deposition of Russian rubble to the region, agricultural specialists learned about the yields and water saving rates of wheat, barley, rice, oats, tar, maize, linseed, sesame seeds and watermelons, – they were interested in vegetable

oil, as well as experimenting with selection of new varieties of varieties based on climatic conditions. Work has been done at experimental stations to increase the yield of irrigated and saline land areas. They also include the creation and testing of new varieties by combining local cereal crops. Thirdly, new varieties of cereal crops from Russia, Crimea, Caucasus and European regions have been brought to the local conditions.

In the experimental trials of wheat varieties, they have noticed how many grains of wheat, how much water is spent for each crop. The turbine varieties are from 11.9 grams to 23.4 grams, Sayram (18.4; 24.7); Nari – Red (18.9; 20.0); Kokand grade (14.9); Ola Birun (13.0) 4 Kokand Kairagach (16.9; 36.7); Arnautka (21.6; 28.9); Yellow magic (23.7; 24.9; 25.2); Ashgabat (33.5%); white wheat (18.9; 41.7); Red wheat (19.3, 28.0) grams weight. To grow a bush of wheat, 411 grams is consumed, and 713 grams of water are consumed. The lowest water consumption is Turbat (411 grams) and Arnautka varieties (428 g); the most popular consumption is the "Turkestan Collection", which tells about the demand for red wheat (713 g.) [16, 36–40].

Together with local varieties of wheat, clover was brought to Turkestan in tens of new varieties in the last quarter and beginning of the 19th century. At the end of the 19th century, the Kubanka wheat, which was successfully climbed in Turkestan, was highly valued in the market, yielded high yields and high yields of the local varieties in the villages and settlements inhabited by Russian immigrants. At the beginning of the 20th century, the Russian migration began to be popular (Kubanka) [16, 41]. "Arnautka" from South Russia (Ryazan, Samara – J.H) also sown in large areas, with its high yields, but also resistant to cereal diseases. It was also characterized by drought resistance, low water consumption, and hardness of grain (local varieties of grains – J. H.) [16, 38].

Together with the new wheat varieties such as Kubanka and Arnautka, Poltava, which is sown in autumn and spring in the country: the Kharkov wheat, which is also widely spread on the American continent, the wheat of high quality pasta, as well as Donbass, red wheat. These varieties were tested in

semi-arid areas, desert conditions, mountainous and mountain hills. Southern Russia wheat varieties have been successfully calcined, especially in the Poltava experimental test area [20, 730; 18, 67; 9, 95]. The varieties of these varieties have also been focused on the selection of new varieties of local wheat varieties.

The “Red Wheat of Turkey” is of high fertility, and in the early 20th century, a farmer from the US Montana, Ben Marshe, cultivated this type of wheat in his farm, with 1200 bushels of 20 acres (272 pood agronomic Filippov, 354 ½ poods–J.H.) field Seeding of winter varieties ranged from 35 to 50 bundles per acre, from 20 acres to 159 to 227 poods (Filippov calculated from 206 ½ to 294 ½ pounds). The yield of Turkey’s “Red Wheat” varieties was high with a hardness of 50 per cent to the local wheat grain. Four species of cereals: wheat, barley, corn, oats, Tashkent, Yalangochinsk steppe and Ashgabat experimental stations were operating in the United States for stubble farming. A second grain crop is counted. Early in the barley, white, red, and black barley varieties were cultivated in the region and climbed to the 19th century with new varieties of Himalayan and East. The autumn and spring barley cultivated and the barley season was shorter than the wheat. The Himalayas barley is a resistant, fertile, protected bird, with no homogeneous crust (so-called “coffee barley” – J. H.) because of its colored coffee.

In the region during the colonial period of the Russian Empire, the purpose of climate change, with the introduction of new varieties of barley, was of great importance as the kind of human and animal feed. When creating new varieties of barley, “amateur farmers” and workers at experimental stations were very busy. With the service of the landowner Malkin (Tashkent – J.H.), barley varieties “Shevale”, “Golden Bard”, “Naked barley” climbed in the 19th century in the region. Various varieties of barley varieties were produced by local varieties of pollen [18, 68; 20, 719].

All the work in the water, which is hard work with cereal crops, is a hand-made rice cake, and farmers have the experience of rice cultivation and rice cultivation in favorable areas. The region is rich in rice production, along with India, Iran (Fors), and three rice varieties of rice “White Rice”, “Barley Rice” and “Red Rice”. The “Red Rice” is of the highest quality, followed by “White Rice” in the second place. Although the quality of barley rice is a bit low, yields are high, with an average of 60 to 120 fodder per hectare. (“White rice” from 34 to 56 spikes – J. H.). Rice fields ranging from 25.21% to 16% of the total area of land sown to the Russian colony. In Tashkent (70.087 desyatina, mainly in Angren and Toytepa districts – J.H.) in the Samarkand region (41.91/9 desyatina) in Kokand of the Fergana valley, in the upper stream of the Sokh River, along the Andizhan, Zarafshan River and Khiva Khanate, Rice is planted to collect seeds of wheat and barley crops for harvesting after harvesting. Shared sowing was 16 per cent in the experienced dehkan farm, sometimes at 13

per cent. The rice is split into small pieces (40–50 sq. Ft. Sajin – J.H.), 1 desyatina is sprouted 7–8 pud seeds, the seeds sprout 8–10 days, and all children, even children, have to work in the water. As you know, rice requires a large amount of water. That’s why it tried to climber the rice’s relatively low demand. Instead of the “wet rice” in Turkistan, the issue of bringing the Chinese gang, which was initially wildly populated in the mountains in South China, was tidalized in the tropical climate. The local rice water consumption was cultivated in Italy by 3/1 and less than 2/1 less water, with the so-called “China rice” cultivating 5000 cubic meters of land. The General Assembly governor, Mr. Fon Kaufman, personally inquired about the “dry rice” issue, and in 1878 he demanded that his team be tested at the Samarkand experimental plantations. The general-governor asked how much less the “rice rice” than “wet rice” and, second, about the quality and productivity of these new varieties” [3, 8]. Since the 1980s, the local population gradually began growing new varieties of rice to save water. However, traditional rice varieties (especially red and white rice – J.H.) were of high quality, with the population to paint their market value.

The new Persian version from the Persian (Persian) state was widely spread during the period of study, but with high yields, it could not withstand the quality of Kokand, as well as the “Karakiltrik”, which will be delivered in Osh.

One of the cereals and cereals grown in Turkistan is the White Oat (corn), which feeds for domestic animals (cattle, horses, etc.), which is fed for the flour and livestock.

It is an important plant to increase the yield of the soil, such as cornseeds, in the cultivation of the amount of salt in the soil, and the sowing of other crops. The important thing is that the corn yield is higher than other cereal crops, and 150–180 desyatina from 1 desyatina irrigated [18, 71].

New varieties of corn were climbed at the Tashkent experimental station at the end of the 19th century. Originally from “Korol Philip”; Varieties such as “Nanerottiollo” and “Sekler” were tested and their vegetation period was determined. Subsequently, the American varieties such as “Chikvantino”, “Kutaisi hybrid” began to be grown [20, 721; 9, 95]. The “Menna Oatmeal” has not been for a long time since the Central Asians entered the culture of cultivation, and Malkin’s “White Oat” was a good result. The “Horse teeth” (“Constricted zub” – J.H.) was also created in the type of white corn, “wrote Shakhnazarov [18, 72]. The “white head” oats varieties were 77 days, and the varieties ripen for about three months. Trying to create varieties of corn that give sugar. The motto was merged with “Corol Philipp” and got a new breed. Sugar can be obtained from “Motto”, “Chikvintano” and “Sekler” at the experimental station. At the end of the 19th and early 20th centuries thousands of desyatinous regions of the Turkestan region were given the “Belyi zub” (“White teeth”, “Minnesota № 1” and “Minnesota № 2”

(the shortest vegetation period was 64 days, J.H.) “Gordost Severa”, “Laming”, “Kaliko”, “Rosen” and “North–West” were tested. “Two species of Minnezota” will be planted April 26, and will be harvested on 29 June. In mountainous areas such as “Mogar”, “Bor”, “Kunak”, where the Kyrgyz live, These crops are not particularly interesting for the displaced populations in the Russian settlements, but these crops are widely spread in grazing lands and stubble fields [20, 724–730].

The cultivated cereal crops are widely spread in the region, which were cultivated as the second crop after the harvesting of wheat and barley, which were cultivated in the end of May and early June of this year, such as “Red millet” and “White millet”. Due to the limited capacity of cultivation in cultivated lands (rainy season will be at the end of May and early June – J.H) no attention was paid to the introduction of new varieties of tar. However, the stubble, which requires less water, was attempts to introduce suitable varieties of tarrant for farming [19, 142.].

The juice of the cereal crops sown in agriculture has also been spread, and its new fertile species has been imported by Russian farmers who have been relocated to the country. Agronom and “amateur farmer”, Malkin climbed “Canadian Canadian” in Chimkent, Syrdarya Region. The varieties of this new crop spread throughout the provincial governorships and began to produce yields to the farmers’ satisfaction [18, 69].

In each source, each desyatine contains a variety of “Swedish”, “Australian” 43 poode, “Shatilov” 40 poods, “Namerchan”, 33 pounds yielding 50 pounds, and “Ganna” barley “experience. These varieties are climatized in experimental trials in Tashkent, Chimkent trains [20, 724–725].

In the late 19th and early 20th centuries, new varieties of cereals and cereals were successfully climbed in the Turkestan region. Due to the limited use of land funded by artificial irrigation, the colonial administration has a low watercourse crop for cultivation in the steppe areas where a large reserve fund has been established (mowing areas in mountainous and foothills areas – J.H) and stubble farming the main focus of climate varieties. In this regard, systematic selection works were carried out in the “Agriculture Brotherhood” Association, Tashkent, Chimkent, Samarkand, Ashgabat and test sites in dozens of areas.

During the Russian colonization of the Russian Empire during the years of the colonization of wheat “Kubanka”, “Poltava”, “Donbass”, “Kharkov”, barley barley “Banana Arpasi”, “Shevale”, “Bolden–Melon”, “Yale barley” barley varieties such as “Chikvintano”, “Kutaisi hybrid”, “Kaliko”, “Rosen”, “Minnezotto”, “American”, and “Canadian oats”. High yields of varieties of cereal crops (“Kubanka”, “Minnezotto”, “Canadian oat) were distributed throughout the country to peasant farms.

References:

1. Библиография (1908 год в сельско хозяйственном отношении // Туркестанский сборник.– Том 491.– С. 73–74.
2. Валерикан Правдив. Роль русской колонизации // Туркестанский сборник.– Том. 436.– С. 129–130.
3. Возделывание риса в Туркестанском крае // Туркестанский сборник.– Том. 433.– С. 4–9.
4. В сухом земледелии // Туркестанский сборник.– Том 536.– С. 113–124.
5. Как следует удобрят различная растения // Туркестанский сборник.– Том 564.– С. 189–191.
6. Корреспонденции (Ст. Голодная степь Средне Азиатской жел.дороги) // Туркестанский сборник.– Том 501.– С. 175–176.
7. Кондрашов С. Пшеница или хлопок // Туркестанский сборник.– Том 501.– С. 164–167.
8. К вопросу о колонизации Туркестанского края // Туркестанский сборник.– Том 445.– С. 98–100.
9. Кузикулов И. Қ. XIX аср охири XX аср бошларида Фарғона водийси аҳолисининг миллий таомлари таркибидаги ўзгаришлар ҳақида / “Фарғона водийси тарихи янги тадқиқотларда” мавзуидаги IV Республика илмий-назарий конференция материаллари. Фарғона-2017.– Б. 94–97.
10. Ланский А. К статье богарное хлебопашество (в ноябрьской книжке Туркестанского сельского хозяйство) // Туркестанский сборник.– Том 500.– С. 30–32.
11. Хлопчатник // Туркестанский сборник.– Том 441.– С. 3–5.
12. Логофет Д. Н. Хлебная торговля и запасы Восточной Бухары // Туркестанский сборник.– Том 417.– С. 105–107.
13. О хлебом вопросе // Туркестанский сборник.– Том 437.– С. 137–139.
14. О производстве хлебов в Туркестан // Туркестанский сборник.– Том 500.– С. 84–86.
15. Розов А. На пути // Туркестанский сборник.– Том 451.– С. 36–43.
16. Итоги сельского хозяйства за 1908 г. По Ташкентскому уезду // Туркестанский сборник.– Том 492.– С. 38–39.
17. Шахназаров А. Очерк сельского хозяйства Туркестанского края.– Санкт-Петербург, 1898.– 152 с.
18. Тимаев К. Сельско-хозяйственное образование в Туркестан // Туркестанский сборник.– Том 542.– С. 141–144.
19. Т.С.Х. Виды на урожай в Туркестанском крае // Туркестанский сборник.– Том 422.– С. 24–25.
20. Растения для сухового земледелия // Туркестанский сборник.– Том 536.– С. 719–730.

*Hakimov Abdumukhtor Abduxalimovich,
The base doctorate of history
of Andijan State University
E-mail: wolffar7@mail.ru*

MIGRATION PROCESSES IN THE BRONZE AGE IN SOUTHERN CENTRAL ASIA AND URBAN CULTURE

Abstract: This article explores the ancient history of Central Asia on the basis of numerous archeological findings. The author points out the migration processes, cultural relations, and the role of urban culture in the ancient civilizations of the East.

Keywords: Central Asia, ancient history, ancient civilizations, urbanization processes, migratory processes, Bactria, Margiana, tribes in the north, Andronov culture, urban.

Central Asia is located at the center of the Eurasian continent, and the natural conditions of these lands are the main reason for the uneven and distinctive historical development of Bronze Age in different parts of the region. Moreover, it has a significant impact on ethnic and cultural relations. In the southern regions of Central Asia, during this period, the Ancient East was a region of extreme farming and civilization, while northern regions were part of Eurasia's largest cultural heritage area, which mainly grew in animal husbandry. The whole area of Central Asian was a center of permanent intertribal relationships and migration that caused cultural interactions and interference in diverse cultural traditions.

The cultivated farming culture is originally spread to South Turkmenistan, South Uzbekistan, and northern Afghanistan. There are several historical and cultural sites that are unique to these regions. The rapid development of cultures that have been constantly cultivated for many thousands of years is observed in the northern plains of Kopetdog in southern Turkmenistan. Historical cultivated farming culture which are literally basic of ancient cultures, develop in the territories of Margiana and Bactria. At the southernmost edge of Turkmenistan, a culture close to North Iran is developing. In the Bronze Age, in northeastern Afghanistan, the ancient tribe of Harappa, an ancient Hindu country, appears.

In the Central Asia, the Dasht tribes were mainly located in the South Aral Sea, the Ferghana valley and the foothills of Central Asia. The Dasht region is surrounded by the present-day northern Tajik territories and the tribes of different cultures are located in Zarafshan Valley, which occupies the central regions of Central Asia.

The collapse of the southern Turkmenistan and the South Uzbekistan society has led to the collapse of the Bronze Age. There are many expectations of the researchers (military-political situation, migration, natural-geographical situation, etc.) about the crisis and dislocation of major destinations in these regions. It should be noted that the similar crisis occurs not only in the southern part of Central Asia, but also in

many centers in Iran – Gissar, Shohtepa, Trangtepa, Shahri Sokhta, as well as Mundigak in southern Afghanistan and the largest centers of ancient Hindu civilization in Harappa and Mohinjo-doroda.

For many years, there were opinions that the reason for these vacancies was the emergence of the Oriental people who brought the desert culture from the north to the farming zones. However, according to recent studies, these centers have been dissolved before the orientalism, and the vacancies are gradual. The long-term drought, shortage of water, and the weakening of the land for a long time will lead to socio-economic downturn. As a result, life in large centers is stopped, and their inhabitants move to new places. This is precisely the case with Iran's plain and ancient India. The crisis surrounding such bigger regions also changes the political situation in the Middle East. That is, if some civilizational centers are empty, new cultural centers are formed in large oasis.

These new centers will appear in the Central Asian region of Margilan and Bactria. The genesis of these cultures is associated with many migratory processes by researchers. For example, according to V.M. Masson idea, the appearance of the initial sites in the Murgob basin is connected with the expansion of the developed culture in the Kopetdag Prefecture. The researcher noted that the Kalleli complex was unique to the Oltintepa archaeological complex, and the scientist did not deny the consequences of the emergence of populations in Margiana and Bactria, who were rapidly intertwined with the local population from northwestern Iran. I. Masimov and A. Askarov also dubbed V. Masson's Kopetop Mountain Plains after Margai while supporting the idea of migration processes in Bactria.

I. Sariyarii acknowledged that the tribes of South Turkmenistan initiated the development of the Murgabian Basin, and recognized that the archeological culture of Elam and Margiana was associated with the culture of that era.

P. Amene believes that the nomadic people of the Elam population have been formed by specific communities and

have played an important role in trade relations with the regions. Therefore, the researcher suggests that the groups of bands closest to nomadic craftsmen in Bactria and Margiana may have originated. The fortified castles or fortresses belonged to that same class.

According to V. Alyoshkin, the poplar culture of Central Asia will then spread to the plains of Margiana and Kopetdag. B. N. Udemurodov predicts the origin of the Margians of the Bronze Age.

Analyzing the opinions of the researchers, the assumption that urban populations are located in the foothills of Kopetdag, Margara, is relatively reliable. Reducing the number of locations in one area and re-emerging in another region, the very similarity in the material culture (except for the castle architecture) testifies to this. It is difficult to explain the appearance of the castles created in their unique architectural style with genetic or migration processes. V. S. Saryanidi connects them with the influence of architectural traditions in Mesopotamia and Iran. According to V. Masson, the square castles in Margiana and Bactria appeared under the influence of the Harappa architecture. A. Frankfort compares them with Mundigak in the South of Afghanistan.

As a result of the comparative analysis of many researchers' thoughts, it is possible to conclude that the architectural laws of Bactria and Margiana or the culture of the city have been developed locally and are a product of local civilizations. It is also worth mentioning that in this process, the cultural traditions emerged in other areas have a certain influence and have been developed on a new basis developed by the local population.

Undoubtedly, the tribes of southern Turkmenistan have been involved in the formation of cultural complexes in Bactria and Margiana. But it is important to note that just before BC. In the second quarter of the 2nd millennium, it is doubtful that the development of such an area is connected with the migratory population living in the same region. In addition, Kopetdog continued its life on the plains and continued at a number of locations in the Vatican City VI (2nd half of the 2nd millennium BC).

In the 1800–1600 BC, the major centers of north-eastern Iran were also liberated. For thousands of years tribes living in this region have developed in close contact with the population in southern Central Asia. Bactrian and Margilian culture

and similarities in the material culture of North-Eastern Iran are observed in stone products in metallurgy, in various jewelry and in worship.

Ceramic cooking technologies in the southern part of Central Asia have long tradition of glazed or light colored ceramics. It was during that period that the predominance of the gray vessels in North-East Iran (which was dependent on the special bottles) was predominant. Some of Bactria's and Margiana's monuments have been found in some of the bottles brought from Iranian cultural centers. Nevertheless, in the southern part of Central Asia, the traditions of local grape bottles continue. However, in South Turkmenistan it is possible to connect genesis of a number of non-advanced containers (with the presence of local technology) to the North-East Iran.

It should be noted that Sopollitepa has found a set of gray bats, which is the first phase of this culture. Moreover, it is likely that the tribes of the North-East Iran could have used the method of decorating or impregnating the surface of pottery in Central Asia. According to the results of the research, the northern tribes of Iran participated in the formation of cultural complexes in the southern part of Central Asia.

In the II millennium BC, tribes from the current political and climatic conditions of Central Asia were the scene of mass migrations. An example of this is the identification of traces of Harappa culture on the banks of the Amu-Darya, where some groups of tribes, from the East to the West. The Harappa settlements in these lands are formed not at the beginning of the advanced Harappa period, but at the end of this period, ie in the first quarter of the II millennium BC. The Kharappa tribes in Bactria were not only linked to economic relations but also were part of the migration processes that took place in many Central Asian states in the beginning of the II millennium BC.

In conclusion, it is evident from the findings of the study that in the II millennium BC, as in many regions of Central Asia, migratory processes and cultural exchanges of ancient tribes take place. This phenomenon was initially reflected in material culture, but also had a significant impact on socio-economic life. However, it should be noted that migration and cultural relations have a positive impact on the development of civilization, without the radical change in the traditions of the local people. The ancient population of Uzbekistan did not miss it.

References:

1. Amiet P. Jade des etchings Elam et Baktrine / Paris / 1998.– P. 190–214.
2. Frankfort H. R. Fortifications et societies en Asia centrally protohisrigue-De J6 Indus aux. Bal Paris. 1985.
3. Алёшкин В. А. К проблеме генетической связи южно-туркменистанских комплексов бронзы // КСИА 2000.– Вып 161.– С. 114–118.
4. Асқаров А. А. Сапаллитепа.– Ташкент: Фан, 1973.– С. 122–124.
5. Асқаров А. А. Древнеземледельческая культура эпохи бронзы Узбекистана.– Ташкент: Фан, 1977.

6. Бонград-Левен Г. М., Ильвин Г. Ф. Индия в древности. – М., 1985. – 110 с.
7. Масимов И. С. Изучение памятников эпохи бронзы низовий Мургаба // Советская археология. 1979. – № 1. – С. 70–71.
8. Массон В. М. Фортификация Средней Азии в бронзовом веке // Этнография и археология Ср Азии. – М., 1979. – С. 32–33.
9. Массон В. М. Процесс урбанизации в древней истории Средней Азии. Тез. докл. сессии. – Т., – Р. 36–37; Ўша муаллиф. Алтын-Депе // Тр. Южно-Туркменистанской комплексной археологической экспедиции. – Ашгабад, 1981. – Т. XVIII. – 91 с.
10. Массон В. М. Первые цивилизации. – Л., 1989. – С. 177–199.
11. Сарияниди В. И. Юго-Западное Азия: миграции, арии и зороастрийцы // ИБ МАИКЦА – Вып. – М., 1989. – 54 с.
12. Сарияниди В. И. Южная Туркмения и Маргиана в эпохи бронзы // ИБМАИКЦА – Вып. 7. – М., – 19 с.
13. Сарияниди В. И. Древние земледельцы Афганистана. – М.: Наука, 1978. – С. 34–50.
14. Удемуродов Б. Н. К вопросу о происхождении комплексов эпохи бронзы в Маргианы // Из Турк. ССР. Отд. общ. наук. 1988. – № 4.
15. Этнетические проблемы истории центральной Азии в древности (II тыс. до н. э.) – М., 2001.

Section 6. Information technology

*Khamdamov Utkir Rakhmatillaevich,
Ph D., docent of Department of Hardware and
Software of Control Systems in Telecommunication
Tashkent University of Information Technologies
named after Muhammad al-Khwarizmi, Republic of Uzbekistan
E-mail: utkir.hamdamov@mail.ru*

*Mukhiddinov Mukhriddin Nuriddin ugli,
senior researcher, Department of Hardware and
Software of Control Systems in Telecommunication
Tashkent University of Information Technologies
named after Muhammad al-Khwarizmi, Republic of Uzbekistan
E-mail: mmuhriddinm@gmail.com*

*Mukhamedaminov Aziz Odiljon ugli,
senior researcher, Department of Hardware and
Software of Control Systems in Telecommunication
Tashkent University of Information Technologies
named after Muhammad al-Khwarizmi, Republic of Uzbekistan
E-mail: azizusmonov1992@gmail.com*

*Djuraev Oybek Nuruddinovich,
senior researcher, Department of Hardware and
Software of Control Systems in Telecommunication
Tashkent University of Information Technologies
named after Muhammad al-Khwarizmi, Republic of Uzbekistan
E-mail: djuraev@bk.ru*

A NOVEL METHOD FOR EXTRACTING TEXT FROM NATURAL SCENE IMAGES AND TTS

Abstract: Extracting text character from natural scene images is a challenging difficulty due to variations in text form, font, dimension, orientation, alignment, and complicated environment. The text information available in images and video includes specific valuable data for content-based information indexing and retrieval, symbol translation and intelligent driving assistance. In natural scene text extraction, nearby character grouping and character stroke orientation methods are performed to examine for natural scene image regions of text strings. We proposed a novel system which is converting obtained a text and the extracted text data into audio. Firstly, we detect an object of interest region from natural scene images after that identify text area. Then, we extract text information and then text recognition method is applied. Finally, we translate text into audio by using TTS techniques in order to assist visually impaired.

Keywords: Text detection, text extraction, visually impaired, natural scene text extraction, text to speech.

Introduction

Extracting text from pictures or videos is an outstanding difficulty in numerous applications like image indexing, document processing, image understanding, video content summary,

video retrieval. In natural scene images, text attributes and lines usually appear in nearby signboards and hand-held objects and provide important awareness of the surrounding environment and objects. The natural scene images regularly endure from low

quality and low resolution, perspective distortion and complicated background [1]. The natural scene text is tough to identify, extract and recognize as it can seem with any gradient, angle, in any brightness, upon any surface and may be partly blocked. Many methods for text detection from natural scene images have been introduced recently. To extract text information by cameras from the natural scene, automatic and efficient scene text detection and recognition techniques are required. The main enrichment of this paper is combined with the proposed two recognition designs. Firstly, a character descriptor is proposed to extract characteristic and discriminative highlights from character pieces. It combines several feature detectors (Harris-Corner, Maximal Stable Extremal Regions (MSER), and dense sampling) and Histogram of Oriented Gradients (HOG) descriptors [5]. Secondly, to produce a binary classifier for each character class in text retrieval; we propose an original stroke configuration from the character frame and outline to design character structure. The proposed technique merges scene text detection and scene text recognition methods.

Related work

Modern optical character recognition (OCR) methods can perform almost absolute recognition rate on printed text in scanned documents, but cannot correctly recognize text data straight from camera-captured natural scene images and videos. Lu et al. [3] represented the inner character structure by establishing a dictionary of basic pattern codes to achieve character and word retrieval without OCR on scanned documents. Coates et al. [5] extracted local features of character patches from an unsupervised learning technique associated with an alternative of K-means clustering and merged them by cascading sub-patch features. In [8], a complete performance

evaluation of natural scene text character recognition was carried out to produce a discriminative feature representation of natural scene text character structure. Weinman et al. [7] combined the Gabor-based appearance model, a language model related to simultaneity frequency and character case, similarity model, and lexicon design to perform scene character recognition. Neumann et al. [1] proposed a real-time scene text localization and recognition approach based on outer regions Smith et al. [2] built a similarity method of scene text characters based on SIFT, and maximized posterior probability of similarity constraints by integer programming.

Proposed method

Text detection and recognition utilized to detect text in complicated background natural scene images. In order to achieve the main goal it takes text image as an input image and then implementing preprocessing techniques on it to eliminate noise from an image by converting color image to gray image. In the following step, the binarization method is applied that helps to efficient and accurate text classification from an image which is input to OCR. In the preprocessing step, if some part of text information will lose them by thinning and scaling is performed by the connectivity algorithm. Then we obtain connected text character from an image. Then the text recognition is accomplished. The proposed method is divided into three stages. First and second stages are text detection, text recognition to the image and the third stage is text character recognition. The text detection uses to quickly extract text region in images with a very less false positive rate. To provide the recognition for the accurate result we proposed a method to test the text image is segmented, considering a different number of classes in the image each time.

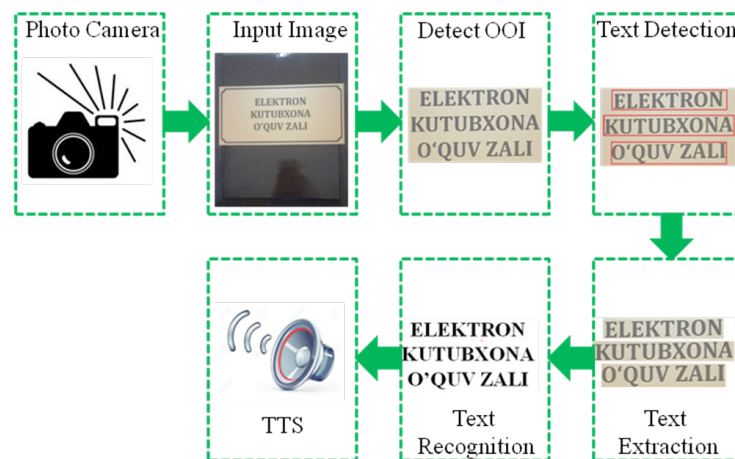


Figure 1. The flowchart of the proposed method

It is a demanding dilemma to automatically localize objects and text Region of Interest (ROI) from captured natural scene images with cluttered environments because the text

in natural scene images is most assuring surrounded by different surroundings outlier noise and text characters usually appear in different fonts and colors [11]. For the content ori-

entations, this thesis assumes that text lines in scene images keep in the region of vertical locations. Several techniques have been developed for localization of text area in natural scene images. We can arrange them into categories component based and operations based. To identify and extract text from complex backgrounds with multiple and variable text patterns, here introduce a text localization method that combines region-based layout analysis and horizontal-based text classifier preparation, which determine characteristic graphs based on stroke orientations and boundary arrangements. To generate representative and discriminative text emphasizes to decide text characters from environment outliers.

Object of Interest Detection:

The Object of Interest (OOI) detection steps searches to detect the existence of content in a camera captured natural scene images. Because of the various font, highlights, different cluttered background image, and demeaning accurate and instantaneous text detection in scene images is a still challenging task. The procedure utilizes a character descriptor to fragment text from an image. Initially, content is identified in multi-size images using an edge based system, morphological function and production summary of the image. These detected text regions are then verified using descriptor and wavelet features. The algorithm is powerful when a diversity in style, size of font and color. Vertical edges with a predefined pattern are applied to detect the edges, then arranging vertical boundaries into text area using a filtering process. The text data normally appears in text lines composed of several character features in similar sizes rather than single character, and text strings are usually in approximately horizontal alignment [12].

Text detection and extraction:

To detect and extract the text from camera captured natural scene images. Carefully extract the text from nearby object caught by the visually impaired from the complex conditions. Text finding is used to get text including image region then text classification to transform image-based knowledge into readable text. This step indicates to classify the characters as they are in the original input image. This is performed by multiplying resultant value with a binary transformed new image. The ultimate result is the white text in black background dependent on the new image. Text characters consist of strokes with constant or variable orientation as the basic structure. Here, we introduce a novel variety of stroke orientation, feature to describe the local structure of text attributes [13].

From the pixel-based analysis, stroke direction is vertical to the slope orientations at pixels of stroke borders. To model the text structure by stroke orientations, we propose a new operator to map a gradient feature of strokes to per pixel. It increases the local structure of a stroke edge into its neighborhood by a gradient of orientations.

Text recognition and TTS:

The speaker is to notify the user of extracted text codes in the type of speech or audio. Any kind of speaker can be applied for speech output. Text extraction is achieved by the modern OCR prior to a crop of beneficial words from the extracted text regions. A text area specifies the minimum rectangular part for the place of lettering within it, so the border of the text region links the edge borderline of the text quality. On the other hand, the current method produces better performance if the text section is first assigned proper margin areas and binaries to segment text characters from the environment. Thus each restricted text part is enlarged by enhancing the height and width by 10 pixels respectively. We test both open and closed basis solutions exist that have APIs that allocate the ending stage of translation to letter codes. The recognized text codes are recorded in script files. Then we develop the TTS to load the script files and perform the audio output of text data.

Conclusion and Future work

We have introduced a technique of natural scene text extraction from detected text areas, which is compatible with PC based and mobile applications also extracted text is converted into audio. This method reads the text information in the objects and informs visually impaired users about the extracted text information. It detects text region from natural scene image and extracts text information from the detected text regions. In image text detection, analysis of color decomposition and horizontal alignment is conducted to examine for image regions of text strings. This system can efficiently differentiate the object of interest from the complex background or other objects in the camera vision. Nearby character grouping is implemented to determine competitors of text patches prepared for text classification. An Adaboost training model is employed to surround the text in camera-based images. Text extraction is applied to produce word identification on the localized text regions and convert into the audio output for visually impaired users. To model text character structure for text retrieval design, we have designed a different stroke configuration map, feature representation, based on boundary and skeleton.

References:

1. Epshtein B., Ofek E., and Wexler Y. "Detecting text in natural scenes with stroke width transform", in Proc. CVPR, 2010.– P. 2963–2970.
2. Beaufort R. and Mancas-Thillou C. "A weighted finite-state framework for correcting errors in natural scene OCR", in Proc. 9th Int. Conf. Document Anal. Recognit., 2007.– P. 889–893.

3. Chen X., Yang J., Zhang J., and Waibel A. "Automatic detection and recognition of signs from natural scenes", *IEEE Trans. Image Process.*, – Vol. 13. – No. 1. 2004. – P. 87–99.
4. Coates et al., "Text detection and character recognition in scene images with unsupervised feature learning", in *Proc. ICDAR*, 2011. – P. 440–445.
5. Dalal N. and Triggs B. "Histograms of oriented gradients for human detection", in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, 2005. – P. 886–893.
6. Campos de T., Babu B., and Varma M. "Character recognition in natural images", *VISAPP*, 2009.
7. Smith R. "An overview of the tesseract OCR engine", in *Proc. Int. Conf. Document Anal. Recognit.* 2007. – P. 629–633.
8. Lucas S. M., Panaretos A., Sosa L., Tang A., Wong S., and Young R. "ICDAR2003 robust reading competitions", in *Proc. Int. Conf. Document.*
9. Zheng Q., Chen K., Zhou Y., Cong G., and Guan H. "Text localization and recognition in complex scenes using local features", in *Proc. 10th ACCV*, 2010. – P. 121–132.
10. Khamdamov Utkir. "Algorithms for parallel bitmap image processing based on the Haar wavelet", // *International Conference on Information Science and Communications Technologies (ICISCT)*, – Nov, 2017.
11. Hongchan Yoon, Baek-Hyun Kim, Mukhiddinov Mukhriddin, Jinsoo Cho. "Salient Region Extraction based on global contrast enhancement and saliency cut for image information recognition of the visually impaired" // *KSII Transac.on internet and infor. Systems* – Vol. 12. – No. 5. – May, 2018.
12. Utkir Khamdamov, Hakimjon Zaynidinov. "Parallel Algorithms for Bitmap Image Processing Based on Daubechies Wavelets", // *10th International Conference on Communication Software and Networks (ICCSN)*, 2018. – P. 537–541.

Section 7. Materials Science

*Narov Rustam Alixanovich,
candidate of technical sciences,
Tashkent Institute of Architecture and Construction,
Tashkent, Republic of Uzbekistan
E-mail: allanazar86@mail.ru,*

THE EFFECT OF AFR-3M AND MARA ADDITIVES ON TECHNOLOGICAL AND TECHNICAL PROPERTIES OF CONCRETE

Abstract: The article presents the results of a study of the effect of acetone-formaldehyde resin (AFR)-3M and methyl-acetone resin with ammonia (MARA) additives on technological and technical properties of concrete. It is stated that at expedient ratio of sand and crushed stone, the flowability factor of the standard slump increases by 2–2.5 times with the introduction of 0.15% of the binder weight of AFR –3M additive and by 2–4 times with the introduction of 0.10% of MARA additive. Concrete shrinkage without the additives develops faster by 32% and 38%, respectively. The introduced additives contribute to the change in the nature of porosity: the total volume of open pores is reduced by about 1.5 times and the average pore size by 5–6 times.

Keywords: workability, flowability, vibro-molding, impermeability to water, frost resistance, shrinkage, durability, plasticizing additives.

Introduction

As is well known, technological and technical properties of concrete mix, such as the workability, unmixing and water separation are determined by the amount of binder, water content, characteristics of aggregates and their ratio, the amount of plasticizing agent, the temperature and humidity of the environment, the method of transportation and the duration of holding the mix before laying, the nature and the mechanism of the plasticizing additive effect, the structure of the adsorption layer, the dispersion of the fillers, the concentration and adsorption activity of the aggregate.

One of the most important properties of concrete mix is the workability, characterized (in accordance with current regulatory requirements) by the flowability factor of the standard slump and rigidity. It should be noted that for vibro-compacted mixes with plasticizing additives, the assessment of workability by flowability factor does not correspond to the actual behavior of concrete mix under dynamic effect. Therefore, the workability of concrete mix with a plasticizing additive is more appropriate to be characterized by vibro-molding, which in practice can have a significant technical and economic effect.

Materials and research methods

At the first stage of the study, the issue of the effect of AFR-3M and MARA additives on the workability of concrete

mix is considered. As is well known, the additives demonstrate the most effective plasticizing effect at a certain sand-crushed stone ratio. Therefore, for a start, the design of concrete mix with rational sand-crushed stone ratio is determined [1; 2].

For example, for concrete mixes with flowability factor of 4–6 cm, consumption of cement 300–450 kg/m³, crushed stone of 10–20 mm fraction and sand of normal size with expedient ratio 0.33 of fine and coarse aggregate, the flowability factor of concrete mix increases by 2–2.5 times in proportion to the content of AFR-3M additive and by 2–4 times in proportion to MARA additive.

Studies have shown that AFR-3M and MARA additives have a positive effect on strain properties of concrete due to the self-stressing effect of the cement stone. Experiments on the effect of additives on long-term shrinkage deformations of concrete with cement consumption of 350 kg/m³ and water/cement ratio = 0.47 have been conducted at a temperature 20 + 5 °C and relative humidity 55–60% [3; 5].

It was stated that the most intense increase in shrinkage is observed for the first 40–50 days. The shrinkage of concrete without the additives develops faster than with the introduction of AFR-3M and MARA additives: in absolute values of concrete shrinkage strain by 32% less with the introduction of AFR-3M additive and by 28% less with MARA additive.

This is obviously due to the fact that the additives can reduce the amount of water by 15–18% and cement by 18–20%. As a result, reducing the amount of cement paste provides a significant reduction of the contraction phenomena.

Numerous laboratory studies have shown that due to the plasticizing and air-entraining effect, the water demand of concrete mix is considerably reduced and the porosity of micro- and macrostructure of concrete is improved.

The true porosity of concrete with addition of AFR-3M is the same, while with MARA additive it is slightly higher than the reference composition due to the air-entraining effect of the surfactant. The character of porosity with the introduction of additives varies considerably. Thus, the total volume of open pores is reduced by 1.5 times, and the average pore size by 5–6 times under more uniform distribution of pores in size [4] with the formation in concrete of conditionally closed pores of much smaller sizes, which contributes to improving the impermeability to water and frost resistance of concrete.

The indicators of impermeability to water in concrete with additives, depending on the type of surfactant and curing conditions, increase by 2–2.5 times. The main factor of curing and hardening of cement stone is the reduction of water content [6] in the binder due to the plasticizing effect of AFR-3M additives. An additional strengthening effect associated with specific features of the additive effect on the process of hydration and hardening during the early structure-formation of cement stone should be noted as well. A determinant factor in structure formation in the early period of hydration, and in density and strength of the cement stone in the process of long-term hardening is the velocity and content of forming calcium hydrosulfoaluminate.

Usually the re-crystallization process with a change in phase structure, the morphology of hydrated new formations causes destructive phenomena in the cement stone, which can lead to a decrease in strength and durability of concrete. In this regard, it can be assumed that the occurrence of this process at an early stage, when the cement stone is characterized by high plastic strains, has advantages over the process occurring in the subsequent periods in a more brittle cement stone.

The original feature of the effect of AFR-3M is to simultaneously increase the flowability of concrete with 0–6 cm slump and the strength of concrete in rational batch limits (0.1–0.15). The extreme nature of the change in strength properties is observed; the increase in strength at 0.15% will reach 20–25% of surfactant on the binder weight.

Introduction into concrete structure 0.15% of AFR-3M additive allows one to get uniform plastic concrete mix with 4–6 cm of initial slump at 15–17% reduce in water content. The overall increase in concrete strength with cement consumption of 270–430 kg/m³ is 35–38%.

The hardening effect of small dosages of AFR-3M additive is associated with the features of the formation of concrete microstructure, with decrease in contact porosity of the macrostructure, which indicates an increase in adhesion strength of the cement stone with the aggregate and is confirmed by 28–35% increase in tensile strength of the samples under bending.

At rational dosage of AFR-3M additive, the resulting increase in strength can save up to 17–20% of cement. Using the criterion of workability on standard slump for concrete mix with flowability of 2–3 cm, depending on the initial consumption of the binder, one can save 50–75 kg/m³ of cement at the introduction of MARA additive. Saving the binder for the same mixes in the evaluation of workability, equal to 10–15 seconds, can reach 50–100 kg/m³, or 18–22%.

Plasticizing air-entraining additives reduce the rate of increase in strength of concrete, which adversely affects the duration of monolithic concrete curing till the removal of form and the loading time of structures under maturing in normal conditions. The AFR-3M and MARA additives are free from these disadvantages. The most intensive increase in strength of concrete with additives is observed at the initial period of hardening up to 7 days. So, if the increase in strength of the reference concrete after 3 days of maturing in air and humid conditions at a temperature of 25–30 °C is 30%, the strength of concrete with MARA and AFR-3M additives reaches 70% [7]. Later on, the increase in concrete strength is stabilized and after 90 days of normal maturing it is 15–18% higher than that of the reference concrete. AFR-3M additives should be used to intensify the maturing of concrete and to reduce the modes of heat and moisture treatment of products. Using the AFR-3M additive as an example, the possibility of significant reduction of the duration of concrete heat treatment is shown on condition of optimizing concrete mixes with an additive based on vibro-molding, which corresponds to the workability of a conventional concrete mix based on characteristics of a standard slump.

Introduction of 0.15% of AFR-3M and 0.1% of MARA additives into concrete mix allows one to reduce water demand by 14–18% and 18–22%, respectively and to obtain a full-strength mix based on vibro-molding. This reduction in water demand provides an increase in strength of steamed concrete with AFR-3M and MARA additives from 30–35% to 38–40%, respectively. To obtain the handling strength of concrete with AFR-3M and MARA additives it is possible to reduce by 2–3 hours the duration of heat treatment at standard temperature or to reduce to 60–65 °C the temperature of isothermal heating at constant duration of steaming.

The use of solar energy in production of reinforced concrete is very effective in conditions of a dry hot climate in

summer period. An effective way to accelerate the maturing of concrete is proposed; it is simple and does not require capital investment on the installation of special helio-polygons. It can be used in ordinary polygons. The essence of this method is to use the heat accumulated by individual components of concrete mix and the heat taken by concrete at the hardening process in the open area, combined with plasticization of concrete mixes by AFR-3M and MARA additives and subsequent curing of the products under waterproof film. Freshly molded products are covered by a polymer film and kept in open area for 1 day. The proposed method for the intensification of concrete hardening involves the selection of concrete mixes with AFR-3M and MARA additives according to the criterion of vibro-molding, taking into account the temperature of the initial components of the mix. We should proceed from the fact that the required strength of concrete in the product after 1 day of curing in natural conditions of the hot period of year at a temperature of concrete mix 35~45 °C will be provided at the time of its laying into molds.

Frost resistance of concrete with the introduction of AFR-3M, MARA additives increases by 1.5–2 times. An increase in frost resistance of concrete with the additives is explained by the formation of closed pores, which play the role of reserve volumes, contributing to a further decrease in the crystallization pressure [6; 8] On the other hand, the air involved in concrete mix partially blocks the capillaries and,

by reducing the water content in general, the number of capillary pores decreases.

It should also be noted that to increase the frost resistance of concrete, it is very important to accelerate the binding of Ca(OH) with gypsum to hydrosulfoaluminate, and the duration of free lime transition to calcium silicate. As noted above, the AFR-3M and MARA additives accelerate the hydration, increase the period of calcium silicate formation and thereby contribute to the formation of strain structure of the cement stone.

The AFR-3M and MARA additives contribute to the implementation of a mechanism of influence on the macrostructure, which leads to a change in the kinetics of water saturation of concrete. Indeed, when obtaining concrete mix of the same flowability with 0.15% of additives and without the additive, an increase in water saturation of concrete samples is observed. Obviously, these features of the structuring of cement stone contribute to a significant increase in frost resistance of concrete with AFR-3M and MARA additives.

Conclusions

The introduction of AFR-3M and MARA additives into concrete mix has a positive effect on workability and strain properties of concrete. The proposed additives introduced into concrete mix increase the impermeability to water by 2–2.5 times and the frost resistance of concrete by 1.5–2 times. The introduction of 0.10–0.15% (of binder weight) of AFR-3M and MARA additives into concrete mix reduces the water demand by 15–18% and the consumption of cement by 18–20%.

References:

1. Bazhenov Yu. M. Technology of Concrete. Association of Higher Education. – M., 2002. – 500p.
2. Usov B. A. Methods for Selecting the Structure of Modified Concretes. Teaching aids. Moscow. INFRA – M. 2018. – 162 p.
3. Narov R. A. The Effect of the Fillers of AFR Plasticizing Agent on the Shrinkage of Concrete. Resource-saving technologies in railway transport, Proc. of the Republican Scientific and Technical Conference with the participation of foreign scientists, – Tashkent, – December 5–6, 2017. – P. 150–152.
4. Narov R. A. Rheological Properties of Concrete Mix with MARA Additive. Resource-saving technologies in railway transport, innovative technologies in construction. Proc. of the Republican Scientific and Technical Conference with the participation of foreign scientists. TASHIIT. – Tashkent. 2018.
5. Samigov N. A. Building Materials and Products. Teaching aids. – Tashkent: “Fan va tekhnologiya” 2015, – 404 p.
6. Narov R. A. The Effect of MARA Additive on Impermeability to Water and Frost Resistance. Scientific practical journal. Vestnik TashIIT 2/3, – Tashkent, 2017. – P. 9–10.
7. Dvorkin L. I. Testing of Concrete and Mortar. – M. 2014. – 170 p.
8. Narov R. A. Rational Mixes of Aggregates for Concrete. Scientific practical journal. “Architecture, Construction, Design” TASI 3/4, 2017. – P. 116–118.

Narov R. A.,
 candidate of technical sciences
 Tashkent Institute of Architecture and Construction
 E-mail: allanazar86@mail.ru

CONCRETE WITH FILLING AGENT AND ACETONE-FORMALDEHYDE RESIN ADDITIVE

Abstract: The relevance of the use of mineral fillers, such as gliege and electrothermophosphoric slag is discussed in the paper. It was established that mineral additives should be used in conjunction with acetone-formaldehyde resin (AFR) additives to prepare concrete mixtures with high workability at reduced cement consumption. It is proved that the use of mineral fillers increases the strength properties of concrete by reducing the water-cement ratio and by increasing the proportion of cement hydration products. It is established that the most promising direction of the use of the developed concrete is the structures with high rates in frost resistance and water impermeability.

Keywords: ACF – acetone-formaldehyde resin, electrothermophosphoric slag, adsorption, structure formation, water demand, mobility, coarse-dispersed fillers, water impermeability, frost resistance.

Introduction

One of the most important problems in concrete and reinforced concrete production is the problem of total economy of material, energy and labor resources while ensuring its high quality. Concrete technology currently has a wide range of tools to reduce resource intensity without compromising its technical properties. One of these tools is the use of active mineral fillers in concrete mixes in combination with effective plasticizing agent. There is a large amount of experimental and theoretical studies in this direction, and considerable practical experience has been gained in the use of fillers and additives such as gliege and electrothermophosphoric slag. As a result, significant economy of cement, increase in strength and durability, improvement of a number of other properties of concrete has been observed [1].

Complex application of AFR additive [2] and fillers from gliege and electrothermophosphorous slag provides significant economy in cement while improving technological, technical and operational properties of concrete. It was established that with rational dispersion of 0.15 m²/g of fillers and 0.15% of AFR additive, economy in cement in the mixed binder amounts to 28–35%. At the same time, the strength of the filled cement stone is comparable to the strength of ordinary Portland cement of the brand 400. Consider in more detail the effect of gliege and electrothermophosphoric slag fillers on concrete properties.

Concrete mix with mineral fillers and AFR additives in a wide range of workability have less water demand at sand-rubble ratio $r = 0.33$. Plasticizing effect of the combined use of AFR additive and coarse-dispersed fillers is manifested due to decrease in total surface of contact, depending on initial mobility of concrete mix. So, as one would expect, water demand of concrete mixes with mobility of concrete mixes equal to 2.6, 10 and 20 cm with slag (gliege) fillers in the amount of 25 and 50% at the consumption of binding agent 290, 370

and 450 kg/m³ decreases by 15–20 (10–15); 17–25 (11–16); 19–28 (17–20)%, respectively.

Water demand of concrete mix on the mixed binding agent substantially depends on the adsorption activity of the filler. For example, water demand of a mix with slag is 5–10% less than with gliege, which is explained by the greater activity of the latter. The influence of quantitative content of coarse-dispersed fillers on water demand is manifested depending on the flow rate of binding agent in concrete mix. So, at a binder consumption of 370 and 450 kg/m³, an increase in fillers content from 25 to 50% contributes to a reduction in water demand of concrete mix, regardless of initial workability. At a consumption rate of binding agent 290 kg/m³, water demand of concrete mix with 50% of filling agent is slightly higher than at 25%. This increase in water demand is explained by the fact that in a mix with such content of binding agent the proportion of sand (its wetting ability is significantly higher than that of gliege or slag) increases.

Contribution of coarse-dispersed fillers to the change in concrete strength is determined by the particle size, their adsorption activity with respect to water and AFR resins. Reduction in water demand of ordinary concrete mixes, provided they have the same workability, leads to an increase in concrete strength. As a result of structure-forming effect up to a certain limiting filler content and reduction in water demand due to decrease in total contact surface, the strength of concrete increases. The increase in concrete strength significantly depends on AFR additive [3]. Further increase in filler amount despite the reduction in water demand and in hardening effect of AFR additive leads to a decrease in concrete strength, due to diluting effect and the decrease in active clinker part of cement.

The above is confirmed by the example of a concrete mix of workability 2, 6, 10 and 20 cm, obtained with standard fill-

ers of Portland cement of brand 400 and coarse-dispersed fillers – gliège and slag.

Water content of concrete mix is favorably affected by relative increase in the strength of concrete with mineral filler. The greater the amount of water in initial composition of the mix, the higher the increase in strength. It. This can probably be explained by the fact that when the active clinker part of cement is replaced by mineral fillers, conditions are created for greater hydration of the binding agent and as a result less unresponded particles of the binder remain in the cement stone. On the other hand, the presence of a large amount of water in concrete provides favorable conditions for the hardening of the mixed binder in a moist environment. So, if the increase in the strength of concrete with gliège (slag) at the consumption of a binder of 290, 370 and 450 kg/m³ and sand-rubble ratio 0.5 and the mobility of concrete mix 2 cm is 15–35, respectively, then the increase in cast concrete is 35–43%. At an increase in fillers up to 50%, the strength of concrete with 0.15% of AFR obtained from concrete mixes with mobility of 2–20 cm and binder consumption of 290–450 kg/m³ reaches the values of reference concrete [4; 5].

Gliege Portland cement and slag Portland cement with electrothermophosphoric slag are most widely used for the construction of hydro-technical structures. Pozzolatic Portland cement with 30% of gliège in its mix hardens more slowly than ordinary Portland cement and at the age of 28 days it gains 80–85% of the brand strength. The same refers to Portland cement with slag. Therefore, for the concrete to be used in hydro-technical engineering the brand age is extended to 180 days. Thus, the long-term increase in strength is a characteristic feature of concrete with pozzolatic cement and slag Portland cement. The greater the value of concrete

strength increase the lower the strength of 28 day old concrete, and concrete with pozzolatic Portland cement at decrease in binder consumption has a higher strength for a longer time

The effect of plasticizing agents on the growth of concrete strength over time depends on the mechanism of surface-active substance effect on the processes of hydration and hardening. Additives like SDV and SNV do not accelerate the strength of concrete. It follows that reducing the duration of a set of brand strength for concrete with pozzolatic and slag Portland cement is an important task. In this sense, it is preferable to use the additives of plasticizing action which accelerate cement hardening in concrete. AFR refers to these additives. The use of coarse-dispersed gliège fillers and electrothermophosphoric slag in combination with AFR additives can contribute to the successful solution of this problem. The nature of change in strength of concrete with coarse-dispersed fillers and AFR additives is similar to cement stone. Portland cement with coarse-dispersed gliège and slag with 0.15% of AFR differs by accelerated structure-formation and short duration of strength increase.

The increase in the strength of concrete with coarse-dispersed fillers and AFR additives depends on the amount of gliège and slag, as well as on water content in concrete mix. Relative increase in the strength of concrete with 25% of filling agent is significantly higher than that of conventional pozzolatic cement. In addition, the increase in the strength of concrete with 25% of filling agent is significantly higher after 3 months of hardening, comparing with the same indicator of concrete of factory-manufactured pozzolatic cement. As one would expect, the higher the growth of the strength of concrete with fillers, the higher the water content in concrete mix; see (Table 1).

Table 1. – Calculation of the strength of concrete at hardening in wet conditions

Composition of the binder in concrete		Cone settlement, cm	Compressive strength, MPa, in months		
Brand of cement and its consumption, m ³	Type of a filler and its consumption, kg/m ³		1	3	6
Gliege Portland cement –320	-	2	17.2	22.4	27
Portland cement ordinary-240	Gliege –80	2	21.6	27.5	30.0
Portland cement ordinary –290	Gliege –100	2	19.5	31.8	32.4
Portland cement ordinary –240	Slag-80	2	20.2	29.3	31.7
Portland cement ordinary –290	Slag-80	2	18.6	31.2	32.2

Pozzolatic Portland cement with 25–27% of gliège, along with its use in hydro-technical engineering, is also recommended for the manufacture of products of ground parts of buildings and structures [5]. In this regard, it should be emphasized that the coarse-dispersed fillers in combination with AFR additives contribute in a greater extent to improving the weather resistance of concrete. Concrete with Portland

cement and mineral fillers is characterized by good weather resistance and monotonous increase in strength at hardening. So, if compare 12 months of age concrete on ordinary Portland cement to 1 month of age, it has 48–53% increase in strength; while concrete with Portland cement and 25% of gliège (slag) are characterized by 66–75 (57–64), 68–77 (58–65%) increase, respectively.

Thus, the enlargement of the filler particles and the use of AFR additives have a positive effect on the increase in concrete strength in both wet and natural atmospheric conditions; this expands the fields of application of concrete with fillers. For the production of precast concrete products, slag Portland cement is effective along with ordinary Portland cement, and pozzolatic one is recommended for products and structures, which are subject to increased requirements in water and frost resistance [6].

Under standard modes of heat-moisture treatment of products, the strength of steamed concrete depends on the type and amount of filler and consumption of mixed binder. At 25% filling of concrete with 0.15% of AFR additive after steaming it gains 85–93% of design strength. Increase in amount of fillers up to 40–45% results in 70–75% growth in the strength of filled concrete after steaming. Thus, concrete with coarse-dispersed fillers – gliege and slag in combination with AFR additive can be effectively used in manufacture of precast concrete products.

Conclusion

So, based on the above one may conclude that the use of coarse-dispersed fillers, such as gliege and electrothermo-

phosphoric slag in combination with AFR plasticizing additive has a positive effect on water demand of concrete mix and on strength gain of concrete, improves its technological and operational properties. The studies have shown that with 25% introduction of coarse-dispersed gliege or slag and 0.15% of AFR additive into concrete mix, there is a decrease in water demand of concrete mix with gliege down to 17–25%, with slag – 19–28% depending on the binder consumption.

The results obtained by experimental method have shown that concrete with 25% of filler (gliege or slag) and 0.15% of AFR additives after standard modes of heat-moisture treatment gained 85–90% of design strength.

A positive effect of coarse-dispersed fillers (gliege and slag) on strength characteristics of concrete has been revealed. Concrete with coarse-dispersed fillers on average increases the strength by 20% per month more than concrete with ordinary Portland cement.

It is stated that with optimal dispersion of used fillers – 0.15 m²/g and optimal filling – 25% of gliege and 50% of slag in combination with 0.15% of AFR additive the economy in cement in the mixed binder is respectively: 28–33% with gliege and 25–29% with slag.

References:

1. Usov B. A. Methods for Selecting Composition of Modified Concretes. Teaching aids. Moscow. INFRA–M. 2018. – 78 p.
2. Tokhirov M. K., Solomatov V. I. Recommendations for the Use of Acetone-Formaldehyde Resins as Additives. – Tashkent, 1993. – 315 p.
3. Narov R. A. Influence of Fillers and AFR Plasticizing Agent on the Shrinkage of Concrete. Resource-saving technologies in railway transport. Proc. of the Republican Scientific and Technical Conference with the participation of foreign scientists. – Tashkent. 2017. – P. 150–152.
4. Bazhenov Yu. M. Concrete Technology. Publishing Association of Higher Education. – M.: 2002. – 500 p.
5. Narov R. A. Rational Filler Mixture for Concrete. Scientific and practical journal “Architecture. Building. Design” – No. 3–4. – Tashkent, 2017. – P. 116–118.
6. Narov R. A. The Effect of the AFR Additive on Water Permeability and Frost Resistance of Concrete. Scientific and practical journal «Vestnik». TashIIT – No. 2–3. – Tashkent, 2017. – P. 9–10.

Section 8. Machinery construction

*Ermатов Ziyadulla Dosmatovich,
senior lecturer of technological machines and equipment department
Tashkent State Technical University
E-mail: ermatov-ziyadulla@rambler.ru*

*Dunyashin Nikolay Sergeevich,
head of technological machines and equipment department,
senior lecturer, candidate of engineering sciences
Tashkent State Technical University
E-mail: dunjashin-nikolajj@rambler.ru*

DEVELOPMENT OF ELECTRODES FOR SHIELDED METAL ARC WELDING BASED ON THE CLASSIFICATION OF THE COATING CHARGE COMPONENTS

Abstract: The article provides classification of the charging materials of electrodes for shielded metal arc welding that allows the initial analysis of the charging mixture of welding materials for further researches.

Keywords: electrode, shielded metal arc welding, classification, nanomaterial, minal, potassium fluorozirconate.

Welding is an important industry that produces more than half of the gross national product in industrialized countries. Today, the domestic market of welding materials has a high share of imported electrodes due to the need to transport raw materials to electrode factories, including importation of raw materials from neighboring countries and beyond, deterioration in product quality, shortage of traditional welding materials, and high prices. Basic ideas of electrode selection for shielded metal arc welding are determined by the following conditions [1–3]:

- absence of hot and cold cracks;
- absence of pores and slag inclusions or their minimal size and quantity per unit length of the weld, which are reasonable and permitted for specific products or operating conditions;
- special properties of the weld metal;
- package and level of mechanical properties of the weld metal in combination with the metal of the welding parts;
- adaptability properties of the electrodes, such as their versatility, suitability for use in specified climatic conditions;
- satisfactory sanitary and hygienic properties of the electrodes (welder safety and health).

These conditions are fulfilled by selection of the appropriate electrode rod and components of the electrode coating. Modern electrode coatings are complex multicomponent systems. Materials of electrode coatings have a variety of metallurgical and technological functions [2–4].

Production of electrode coating for shielded metal arc welding uses the raw materials, which can be conventionally divided into: mineral raw materials, ferroalloys, deoxidation metals, alloying metals and modification of the weld metal, organic materials and synthetic chemical materials.

The initial analysis of the charging materials in electrode coatings used for shielded metal arc welding is carried out according to the following classification:

- 1) Pure metals (iron powder, electrolytic copper powder, aluminum powder, molybdenum powder, nickel powder, titanium powder, manganese metal, tungsten metal);
- 2) Ferroalloys (ferroboron, ferrovanadium, ferromolybdenum, ferrochrome, ferroaluminium, ferrotitanium, ferrosilicon, ferromanganese);
- 3) Mineral raw materials (carbonates, titanium-containing materials, aluminum silicates, fluorine-containing raw materials, silicates, quartz materials, iron and manganese ores);
- 4) Synthetic chemicals (fluorine-containing materials, chlorine-containing materials, carbonates, oxides);
- 5) Organic materials (cellulose electrode, carboxymethyl cellulose, starch, dextrin, dextrinol, wood flour).

The minerals and raw materials used for production of welding electrodes can be divided according to their purpose into the following groups: slag-forming, gas-forming, alloying, stabilizing, deoxidizing, plasticizing and binding. The components of the charging mixture of mineral raw materials for

the production of welding materials are limited on the basis of phosphorus and sulfur content.

Addition of the ultra-disperse components in the composition of welding materials can be helpful to obtain electrode coatings with optimal structures, which provide a more efficient use of welding materials components. The optimum temperature during electrode manufactures using nanomaterial can adjust the water content and hydroxyl groups in the composition of welding materials that affect the porosity of the weld metal, the content of hydrogen in it and the strength performance characteristics of welded products.

One of the issues solved in this article is the introduction of small amounts of alloying elements into the components of welding materials, such as rare-earth elements, zirconium, etc. to improve the welding and technological characteristics of the weld. For this purpose, the distribution of these elements should be as uniform as possible throughout the entire welding electrode coating. Such a distribution in practice could not be achieved with the introduction of small additives of the necessary elements directly into the coating composition; therefore, the transition to the composition of the weld metal is also not uniform.

Introduction of alloying elements to the coating was carried out by the method of obtaining fused components – minerals that contain alloying elements among other elements. We used the purified components during the mineral melting, as well as oxides of rare-earth elements as a source of alloying elements. This method provides homogeneous products, their low reactivity to liquid glass and easy addition of small amounts of alloying elements.

The composition of the electrode coating is, by wt.%: marble: 52–60; quartz sand: 8–11; fluorspar: 17–21; upgraded kaolin: 3.8–5.4, soda: 1.5–1.9; electrode cellulose 0.8–1.6; potassium hexafluorozirconate (VI): 12.5–18.9; ferromanganese: 1.9–2.1; ferrosilicon: 3.2–3.8; ferrotitanium: 11.0–15.0.

The procedure that causes positive changes consists of refining the weld metal by sulfur and phosphorus, by creating harmless compounds with them: zirconium phosphorous and zirconium sulfurous, which deposits as molten slag.

Introduction to the composition of the electrode coating of less than 12.5 wt.% potassium hexafluorozirconate (VI) does not increase the impact hardness of the weld metal, since this amount is not enough to achieve the desired level of activity of the welding slag which causes purifying reaction. Increase in K₂ZrF₆ content above 18.9% sharply affects the welding and technological properties of the coating. Surface of electrode coating is flat, smooth, and has no defects. Coating strength was determined by applying impact force: electrodes were thrown from a certain height on the concrete surface with no chipping of coating detected. Therefore, manufactured welding electrodes have the required coating quality, uniform distribution of components and the absence of defects. It indicates the quality of the mineral raw materials used in the coating composition. Welding using these electrodes is performed with direct current of reverse polarity and alternating current. Productivity (for diameter of 4.0 mm) 10.5 g/Ah; 1.6 kg/h. Electrode consumption per 1 kg of weld metal is 1.8 kg.

References:

1. Моравецкий С. И. Отделимость шлаковой корки при дуговой сварке (обзор) Ч. 1. Механизм химического сцепления шлаковой корки с металлом шва // Автоматическая сварка. 2011.– № 1.– С. 32–37.
2. Моравецкий С. И. Отделимость шлаковой корки при дуговой сварке (Обзор). Ч. 2. Характер влияния основных факторов на отделимость шлаковой корки // Автоматическая сварка. 2011.– № 2.– С. 22–27.
3. Кузнецов М. А. Нанотехнологии и наноматериалы в сварочном производстве (Обзор) / М. А. Кузнецов, Е. А. Зернин // Сварочное производство. 2010.– № 12.– С. 23–26.
4. Марченко А. Е. Влияние технологических факторов изготовления электродов на содержание водорода в наплавленном металле // Автоматическая сварка. 2013.– № 8 – С. 14–25.

Section 9. Pedagogy

*Poghosyan Shushan,
Ph.D. in Information and Communication Technologies,
Department of Radioengineering and Communications
The National Polytechnic University of Armenia
E-mail: shushanpoghosyan@gmail.com*

LEARNING-ORIENTED AUGMENTED REALITY TECHNOLOGY

Abstract: Emerging technology applied in any aspect of our everyday life and education is no different. Augmented Reality (AR) with its four main subcategories can be implemented in different subject and discipline of formal education. The research discusses the potential benefits and utilization techniques of this advanced technology in the learning process.

Keywords: Augmented Reality (AR), Educational Technologies, AR in Education.

Introduction

It is a widely accepted truth that technological intervention in industries increases the productivity, efficiency and provides better results. Education and educated employees are the keys for each government to build well skilled and technologically advanced society which directly reflects the level of the social-economic situation of the region. Integration of cutting-edge technologies in learning environments are critical to increase the level of education and develop a modernized educational curriculum.

Introduction to Augmented Reality (AR)

R. Azuma proposed the most widely accepted definition of Augmented Reality (AR) [1]. According to Azuma, Augmented Reality (AR) is a variation of Virtual Reality (VR) technology. VR technologies require a VR headset to completely immerse a user inside a synthetic environment generated with the help of realistic images, sounds and other sensations that gives the user a feeling of being in a different environment than the actual one where the user cannot see the real world around him.

Unlike Virtual Reality, which creates an entirely artificial environment in Augmented Reality technology computer-generated digital information (i.e., virtual 3D objects, sound, image, etc.) is overlaid onto live direct or indirect physical real-world environment in real time, thus enhancing user's perception of reality. Therefore, AR supplements the actual reality, rather than completely replacing it. In AR the new reality appears to the user that the virtual and real objects coexisted in the same space. In contrast with VR technologies, in AR technologies, users are not required to have specially made

expensive headsets to experience the technology. AR can be experienced just with the help of smart devices as the camera is the primary sensor requires for AR experience.

For experiencing the AR, the user requires only a smart device which should contain a camera sensor, GPS sensor, compass, and accelerometer. For more realistic experience device should have a notable CPU, GPU, and RAM.

The types of Augmented Reality and their implementation in education

Education is an investment in human capital and, a pledge on a nation's sustainable growth and further development. Integration of new educational approaches and technologies into educational programs is one of the most responsible tasks for governments for shaping more effective and employable society. New technologies provide opportunities for creating a specific ecosystem enhancing learning process preparing a globally compatible workforce.

The integration of emerging technologies and advanced techniques such as AR into the curriculum is becoming a part of good and productive teaching. Several governments including USA, France, South Korea, China, etc. are heavily investing in AR educational technologies as foresee benefits of this technology and the efficiency on the educational domain [2].

The history of AR technology implementation in learning dates back to 1990s when Tom Caudell, a former Boeing engineer created first head-mounted display system with simulated AR features. The system used augmented computer-generated graphics that were implemented in the learning environment of the pilots helping create a realistic simulation of actual flight [3].

Currently, counting four main types of Augmented Reality technologies that can be utilized in education systems.

- Marker-based Augmented Reality;
- Marker-less Augmented Reality;
- Projection based Augmented Reality;
- Superimposition based Augmented Reality.

Marker-based Augmented Reality system:

In marker-based AR systems, a marker refers to what commonly known fiducial marker. Fiducial marker is a square image of consisting of black and white square, that are randomly generated by a computer system.

In AR applications, the fiducial marker can be any object that's placed in front of the camera which can recognize the marker and visualize AR features assimilated with the marker. Visualization can include later, image, text, sound, video and even 3D interactive objects that augmented on top of the selected marker. In AR, these markers can provide an interface between the physical world and the augmented content.

Markers allow the device to calculate the position and orientation of its camera for a correct imposition of the augmented content (Fig. 1).

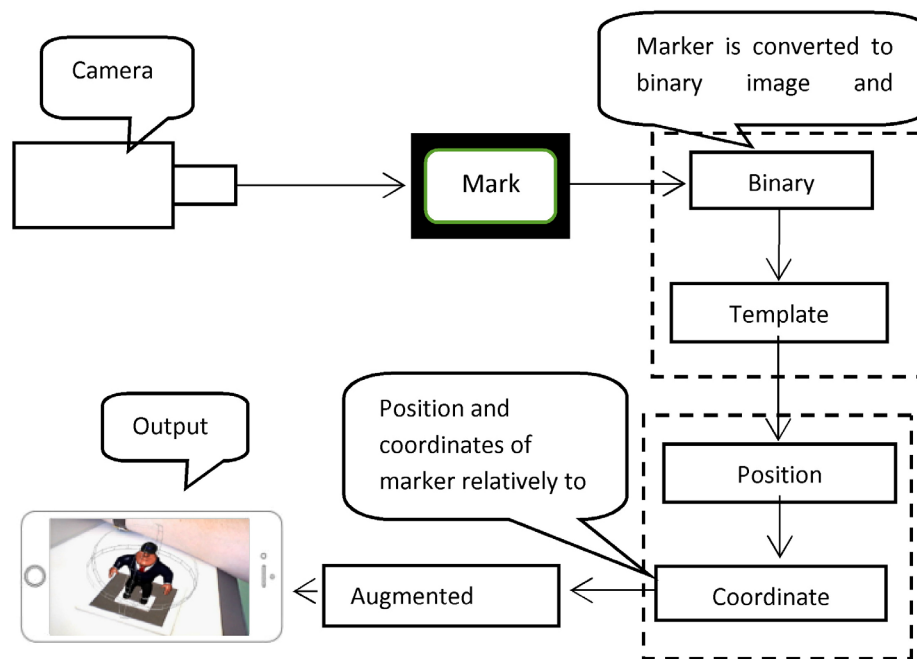


Figure 1. Marker Recognition in the marker-based AR technologies

This process is known as marker tracking. Marker tracking can be achieved with only a camera and no additional sensors such as a gyroscope are necessarily making the camera the primer sensor for experiencing marker-based AR.

Users can point the camera of their smart devices onto the designated marker to experience 3D augmented object that appears on top of the marker on the screen of their device [4]

Being a technology that is easy to develop and no need of specially designed external devices, marker-based Augmented Reality technology can find its unique implemented in a different level of formal education. Another advantage of marker-based AR technology is that it can be applied to already existing teaching materials, as pages on textbook can operate as a marker to build the supplemented data.

This technology can be implemented in all subjects where visualization can enhance students learning process including Biology, Physics, Chemistry, etc [5–7].

Marker-less Augmented Reality system:

In contrast with marker-based AR systems, marker-less AR systems do not require tracking for earlier designed specific marker or any pre-knowledge of a user's environment to overlay 3D content into a scene and hold it to a fixed point in space. Marker-less augmented reality technique allows the use of any physical environment to superimpose the generated data. In this technology, there is no predefined target or base for illustrating superimposed virtual objects [8].

As in marker-less AR technologies, the user's environment depends on the natural features of a surrounding rather than the fiducial identifying markers it can have a successfully implementations in science subjects, where the lab classes are necessary for more in-depth and comprehensive learning.

When used in smartphones and other smart devices, the marker-less AR system uses the inbuilt GPS feature of

the device to determine the location of interact available augmented reality resources. Some standard methods of

location-based AR involve mapping directions, finding nearby services, and other location-centric mobile apps [9].

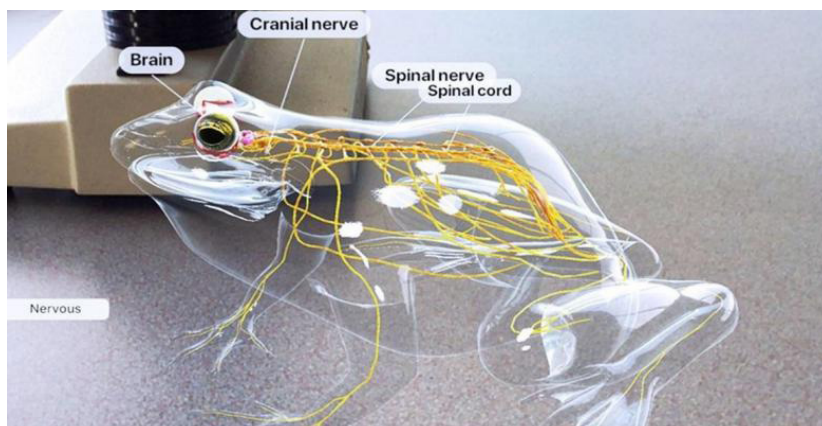


Figure 2. An example of marker-less AR in Biology Class

For a full-scale experience, the user requires to have a smart device that is equipped with at least camera sensor, GPS sensor, compass, and accelerometer.

With advantages mentioned above, marker-less AR technology can be implemented in such a learning environment, where students required to move from one place to another and the learning object does not have a fixed location.

Projection based Augmented Reality system:

Projection based Augmented Reality works by using projectors to project light on real-world surfaces. Projected light contains data, which can be anything ranging from colors and text to augmented 3D objects. Besides projecting light onto the surface, the projector also powered by human-surface interaction detecting sensor that senses the human interaction (i.e., touch) of that projected light. These unique projectors

usually equipped with an infrastructure-based sensor that position is tracked with the help of four Kinect sensors mounted on the ceiling at the mid-point of each room wall. Furthermore, these sensors are used to create a model of the environment and, thereby, also provide geometry awareness [10].

Using tablets or smartphones can reduce the cost of educational institutions for further implementation of AR technology in their educational curriculum. But the drawback of these devices is that they have to be held by one hand while the other hand is used for interactions on the screen. This way, the user has to lay down the tablet for interactions with his real environment or the tablet has to be fixed somewhere requiring users always to come back to see any augmented information on the tablet's screen. Projector-based AR, enables a group of users to see the same augmented information.



Figure 3. An example of Projection-based AR in Geography Class

Utilizing of Projection-based AR in education can drastically increase the interaction between students, keep them all concentrated towards the same topic of study. Instructors can have direct

control over the subject being taught. This method also help students to touch the surface of projected information allowing them to interact with superimposed details in the form of 3D objects.

This technology suggested to be applied in such studies, where students are required to learn new information through motion, which will activate the kinetically to develop physical and reaction skills.

Superimposition-based Augmented Reality system:

Superimposition based Augmented Reality is a technology where the features of the original object either partially or entirely replaced with newly augmented features that superimposed on the same item of the research.

Unlike marker-based AR technology, where augmented date appears on top of specially designed fiducial markers, in superimposition based AR, the technology recognizes the full object.

Object recognition is vital for this technology that application can replace the original view of the object with an augmented one.

The drawback of this technology is the requirement of the full object recognition. Depends on the scale and the color of the object as well as the environmental conditions of the object location, the identification of the object may be partial leading technology failure. Another disadvantage of this type of AR technology is the limitation of the free movement. When scanning the object from different angles camera of the device may not be able to detect all the features of the object and users may receive an unstable augmented image or even receive no augmented feedback.



Figure 4. An example of Superimposition-based AR in a History Field-trip

Further development of superimposition-based AR technologies can become an unrepeatable technology in history and natural science classes, where the learning process is combined with field-trips. With this technology students can attend field-trips to historic sites, battlefields and museums, discover features of historic buildings of the past, explore the outcomes of battle outcomes, see and interact with unique and scare exhibits presented in the museum.

Conclusion:

This research discusses four main subcategories of Augmented Reality technologies and methods of its successful implementation in different subject learning. AR implementation in the modern educational curriculum can be a game-changing by increasing the efficiency of the learning process allowing direct interaction with the content of the learning knowledge.

References:

1. Azuma R. A Survey of Augmented Reality. Presence 6. 1997.– P. 355–385.
2. Hovhannes Mayilyan, Shushan Poghosyan, Hakob Avetisyan. Educational augmented reality systems: benefits of implementation and government support, Proceedings of 4th International Conference of the Virtual and Augmented Reality in Education (VARE2018),– Vol. 1.– P. 23–28.
3. Caudell T. P. and Mizell D. W. Augmented reality: an application of heads-up display technology to manual manufacturing processes. Proceedings of the 25th Hawaii International Conference on System Sciences,– Vol. 2. 1992.– P. 659–669.– January 7–10,– Kauai (HI, USA).
4. Gayathri D., Om Kumar S., Sunitha Ram C. Marker Based Augmented Reality Application in Education: Teaching and Learning. International Journal for Research in Applied Science & Engineering Technology (IJRASET),– Vol. 4.– Issue 8. 2016.– P. 153–158.

5. Gillet A., Sanner M. F., Stoffler D., Goodsell D. S., Olson A. J. Augmented reality with tangible auto-fabricated models for molecular biology applications. Proceedings of the 10th IEEE Visualization conference, 2004.– P. 235–241.– October 10–15, Austin (Texas, USA).
6. Maier P., Klinker G. Augmented chemical reactions: An augmented reality tool to support chemistry teaching. Proceedings of the 2nd Experiment@ International Conference, 2013.– P. 164–165.– September 18–20.– Coimbra (Portugal).
7. Touel S., Mekkadem M., Kenoui M., and Benbelkacem S. Collocated learning experience within collaborative augmented environment (anatomy course), Proceedings of the 5th International Conference on Electrical Engineering-Boumerdes (ICEE-B), 2017.– P. 1–5.– October 29–31, Boumerdes (Algeria).
8. Koch R., Koeser K., Streckel B., Evers-Senne J. F. Marker-less image-based 3D tracking for real-time augmented reality applications. 7th international workshop on image analysis for multimedia interactive services, Montreux, Switzerland. 2005.
9. Platonov J., Heibel H., Meier P., Grollmann B. A mobile markerless AR system for maintenance and repair. IEEE/ACM International Symposium on Mixed and Augmented Reality, 2006.– P. 105–108.
10. Alexander C. Projection-Based Augmented Reality. Distributed Systems Seminar FS 2013.
11. Argotti Y., Davis L., Outters V., Rolland J. P. Dynamic superimposition of synthetic objects on rigid and simple-deformable real objects. Proceedings IEEE and ACM International Symposium on Augmented Reality 2001.– P. 5–10.

Section 10. Political science

*Lokhishvili Giorgi,
graduate student, the Faculty of Law
and International Relations
Georgian Technical University
E-mail: lokhishvili@ukr.net*

*Jijeishvili Ketii,
professor, the Faculty of Law and International Relations
Georgian Technical University*

THE RUSSO-AMERICAN INTERESTS IN THE 2008 WAR

Abstract: In our article, we tried to review the US – Russian interests in the 2008 Russo-Georgian war, and we developed our approaches and visions regarding these issues. The article discusses the policy of Moscow and Washington in relation to Georgia. The paper has thoroughly studied the interests and strategic goals of the two global players – the USA and Russia towards Georgia. The analysis of the chronology the 5 days of 2008 and the reasons for escalating this conflict are shown in detail. In this context, the involvement of both the US and Russia as the sides and the collision of their interests.

Keywords: Occupation, Russo-Georgian war, Global policy, Separatists, Tskhinvali region, Abkhazia, Caucasus region.

It's been 10 years since the tragic days of the Russo-Georgian war. Because of the five-day war, more than 100.000 Georgians became refugees, 1747 people were wounded, 170 Georgian soldiers, 14 police officers and 228 civilians were killed. After the war, Russian occupation forces occupied the Kodori Gorge and a large part of Shida Kartli. Within a few weeks of the war, Russia declared two regions of Georgia-Abkhazia and so-called South Ossetia as independent states. Unfortunately, the Russian occupation is still ongoing. There is a 400 meters-length occupation line from the main highway that is leading to the Western Georgia. There is a danger that Russians will shut down the West-East Central Highway of Georgia.

Is there a danger of the war repetition? How can we avoid the so-called possible conflict in the conditions of creeping occupation and continue the path of European integration? Considering the other dilemmas, analysis of hazards of tomorrow, forecasting and protective preventative measures in Georgia, we believe that the interests of two global players – the USA and Russia must be analyzed in detail. The reason is that in order to properly build the Georgian policy, it is important to understand the US-Russia relations dynamics and perspectives as well as its scientific analysis. In this article, we tried to consider the American and Russian interests in the Russo-Georgian War of 2008 with its subsequent develop-

ments in Georgia and to develop our approaches and visions regarding these issues.

In 2008, Georgia was the spotlight of international organizations and news agencies. According to the geopolitical concept of the Black Sea and the Caspian region, Georgia has the one of the distinctive strategic importance that has attracted the leading world countries throughout history. The control of the Caucasus region does not lose its significance in the global international politics. It is clear that the 2008 Russo-Georgian war was a clash of interests between Russia and the United States, which could be called the Geopolitical War in order to gain influence.

In the 2008 war, Russia wanted to “kill two birds with one stone.” The Russian aggression served two main purposes in relation to Georgia: the first and the main reason was to hinder the implementation of the American idea that intended to reduce the Russian gas monopoly in Europe – it now covers 40–45%. The USA aims to take control over the Caucasus and considers Georgia as a strategic state from the geographical location of the region and its political disagreements to Russia, “the enemy of my enemy is my friend”. Current and planned gas transportation routes go through Georgia. It is important to mention that in January 2009, Moscow officially stopped the supply of natural gas to the European countries during the coldest time of the

year, resulting in stopping of enterprises and state institutions and was the cause of death in many countries. Considering everything, the world has seen the Kremlin gas monopoly in Europe and that its gas does not only represent economic good for Russia but also political leverage.

The second goal contains NATO-Georgia relations. It was in 2007–2008 that high officials of the North Atlantic Treaty Organization announced that Georgia would definitely become a member of NATO and that Georgia was close to NATO standards. It is obvious that Russia perceived this statement as a threat because of Georgia's aspiration to the North Atlantic Organization. It is noteworthy that according to the WikiLeaks, in 2007 the former US Ambassador to Georgia John Tefft told Washington that "Russia was planning to take aggressive steps", whose main aim was to overthrow the pro-Western government and thus to change Georgia's North Atlantic Orientation. Official Moscow has numerous times made a statement that the expansion of the NATO's borders in the Post-Soviet countries represents a threat to Russia. The 2008 Russo-Georgian war is a clear example that Russia reckons Georgia as its own sphere of influence; it would not allow Georgia's membership in NATO. Since 2008, Russia has been consistently preparing for military aggression.

On March 13, 19 and 21, a closed parliamentary hearing was held in Dumas, where they discussed the independence of Abkhazia and so-called South Ossetia; The hearing also included the declaration of Russia's efforts for empowering their protection, especially considering Georgia's aspiration to NATO membership. NATO Bucharest summit was newsworthy at that time, which was scheduled for April 2–4. According to the NATO Summit Declaration, all members of the alliance agree unanimously that Georgia will become a NATO member. After the NATO summit, on April 20, the Russian military fighter shot down a Georgian unmanned aerial vehicle carrying a flight to Georgia's airspace. At the same time, the serious escalation of the situation (explosions, terrorist attacks) emerged in both conflict regions and the Georgian controlled territories. The Russian special services were behind all this, OSCE observers confirmed it on May 19. In May of the same year, Russia took part in the landing troops in Ochamchire. On June 1, Moscow agreed to restore the railway in Abkhazia without reconciling with the Georgian authorities. In July a massive military training of the Russian Federation's armed forces "Kavkaz-2008" was launched in the North Caucasus, it should be noted that the sub-division of the 58th Army participated in the exercises. This army has personally participated in a military operation in the Tskhinvali region. On August 2, Ossetia separatists opened intensive fire to Georgian villages, while six civilians and one police officer were wounded. The Georgian authorities tried to avoid any

type of provocation and to dodge further escalation of the conflict. On August 3, South Ossetia intensively started evacuation of people in the direction of North Ossetia. On August 6, the separatists resumed the bombing of Georgian villages by the mortars and the Georgian side opened fire in order to protect civilians. The crossfire continued during the whole night while two Georgian servicemen of Georgian peacekeepers were wounded. The Georgian side has repeatedly urged Russia's puppet regimes to a ceasefire. The official Tbilisi has repeatedly asked Moscow to calm the situation down in the separatist territories. On August 7, the separatists resumed bombing of Georgian villages, killing three Georgian military servicemen. Later, the Georgian peacekeepers' checkpoint was bombed, killing village civilians along with the military. In spite of the Georgian president's announcement on the television, when he admonished the separatists to stop the ceasefire, the situation did not change in the occupied Tskhinvali region. From the above-mentioned facts, Russia's interests are clearly visible. The aim of the Kremlin was to start the war with Georgia, with which it could destabilize the region, overthrow the Georgian government and change the country's North Atlantic course. The fact that during the UN, OSCE and other international state meetings Russia has always claimed to have been a security guarantee in the region, in fact, it used this mandate in consideration of its own interests and the 2008 war is the case when Russia's action contradicts the principles of international law. Russia was not able to adjust the gown of conciliator with which it is represented in the occupied territories under the auspices of the peace-maker.

Current events in the modern global world show that the interests of the superpowers in the 21st century are very big in the Caucasian and Caspian seas. The Caspian Sea is a major oil and gas reservoir while taking into consideration the current political map, the Caucasus region is the shortest and the alternate route of oil and gas transit routes for the European and global markets. America's interest has grown since Russia has created its own monopoly market in the form of the „Gazprom" throughout the European region, and with the help of these energy sources, it strengthens its own political influence. Nowadays Russia exports approximately 170–180 billion cubic meters of natural gas to the European market every year, thus earning more than 400 billion euros. Taking into account these facts, it is natural that EU member states are compelled to envisage Russia's interests in different directions as they are more dependent on Russia's natural gas. "Control the oil and you control the nations" – as the former US Secretary of State Henry Kissinger notes. Europe's cold winter of January 2009 is enough to confirm it. Furthermore, it is noteworthy that the attitude of Russian gas to European countries is different. For example, Bulgaria, Serbia and Moldova are 100% dependent

on Russian gas. The Baltic and Scandinavian countries except Norway are also 100% dependent on Russian gas. The share of Russian gas in many European countries, on average consists of 30–70%. The construction of the “Nord Stream 2” pipeline is in an active phase, through which Russia will export gas to Germany via the Baltic Sea. It is also worth mentioning that the construction of the „TurkStream” – Russo-Turkish gas pipeline, ended on November 19, 2018. The US political elite is well aware of the challenges, of the US image disturbance in case Europe becomes fully energy-driven by Russia. The ongoing scenario for the United States is unfavourable and its aim is to link Caspian oil and gas to Europe, thus reducing Russia’s energy expansion and retaining its political influence on European countries. Considering these facts, according to the world’s leading political scientists, the geopolitical interest of Russia-US is to control the Caucasus region and to gain absolute influence on the rich Caspian seaside countries. The control over the Caspian Sea means taking control over the energy resources and reaching the full market monopoly of the European market, which means gaining influence over the EU countries. From this perspective, Georgia represents one of the most important energy corridors in the Caucasus. Leading political scientists are unanimous and presume that the political influence on the Caucasus is one of the key controllers of the Eurasian continent. To strengthen this influence, America’s interests were to establish its influence in the region, to gain access to energy resources and prevent the possibilities of Russian imperial ambitions revival in the region. Georgia is a political and cultural centre of the Caucasus. Russia understands it as well as America and that is why Georgia has a very important place in the doctrine of both countries. It is clear that considering the current situation, without supervising Georgia, Russia will not be able not only to restore control over the South Caucasus but also to involve in the processes of this region as a serious political player. The control over Georgia allows Russia to cut the Caspian region – rich with the energy resources from the West, blocking Azerbaijan’s access to the Black Sea through Georgia, thus crushing the American Dream. With the control over Georgia, Russia is able to hinder the creation of the Europe-Asia corridor, transit routes between Central Asia and Europe through the Caucasus, as well as maintain the monopoly on the transportation of energy and other goods from central and eastern Asia to Europe. In addition, control of Georgia gives both states (America-Russia) chance to pursue their own policies all over the Caucasus and to be more active in the Middle East countries. Considering everything, the Russian state, with its neo-imperialist intentions, tried to stop the influence of American politics in the Caucasus that was aimed at liberating Georgia from Russia. This is where the Georgia-American political interests and

priorities coincide. Russia has occupied two regions of Georgia. Therefore, Georgia’s integration into the Euro Atlantic and especially transatlantic structures is the main goal of the country in order to escape the aggressive and invasive politics of Russia. That is why Georgia’s political vector is directed toward the United States.

The US interests include the promotion of European energy independence so the Southern Gas Corridor (SC) was created, which will enable European countries to use Caspian Gas Reserves. The volume of these above-mentioned gas reserves is noteworthy. Only Azerbaijanian gas reserves estimate at 4–5 trillion cubic meters, while Turkmenistan’s and Kazakhstan’s are 20–25 trillion cubic meters. The Southern Corridor’s strategic goal is to cover approximately 20% of the European gas demand by 2020. There are a number of planned projects (Nabucco, White Stream, TAP, ITGI, AGRI, recently announced SEEP and Trans-Anatolian pipeline) that comprise the concept of the South Corridor. For example, one route to Turkey (Nabucco, TAP, ITGI, SEEP pipeline) and the second route from Georgia to Europe via the Black Sea (White Stream subsea pipeline) and AGRI (Azerbaijan-Georgia-Romania connector). The South Corridor project is complex and has a high strategic value because the given projects are directed to promote to Europe’s energy independence from the Russian influence. It is true that Georgia is a small state, but its place is very high in geopolitical location. Many political analysts underlined the importance of this country, saying: “Georgia is a small country in the Caucasus region, which is located in a strategically important crossroads where one of the most important energy routes passes with which the Caspian Sea oil and gas will be connected to the European and global via the Mediterranean” (McFarlane, [3]). “The location of Georgia is a strategic key for transportation of Eurasian energy resources and makes it easier for the West to access the energy resources of Central Asia and Afghanistan”. (Cornell 2007).

The US has made large investments in the Caspian Sea region that gives an opportunity to reduce Russia’s impact on Caspian Sea resources. For example, the construction of the Baku-Tbilisi-Ceyhan pipeline, which started with direct lobbying of the US and has become the main phenomenon in the Georgian economy. The United States supports Georgia in many ways: development of free economy and growth of private sector, the US has supported Georgia to join the DCFTA in order to become a member of the Deep and Comprehensive Free Trade Area. The United States mobilized great financial and material resources on the development of favourable environmental and effective democratic political institutions for the democracy in Georgia. It should be emphasized that the US is interested in promoting democracy and stability in

Georgia because the afore-said represents a strategic value for the States. Georgia is a vital energy-transport corridor for oil and gas exports that can connect the Caspian Sea to Europe. Furthermore, the US partnership is quite profitable for Georgia. For example, as an energy coordinator, Georgia can get many good, even in terms of security. America is interested in supporting the security of Georgia, ensuring the stability of the state and preventing terrorist activities in order to maintain Caspian resources' safe transportation in international markets. Therefore, the US is a strong supporter of the sovereignty and territorial integrity as well as being unanimous in combating terrorism, defense development, democratization and economic protection mechanisms to strengthen the country's stability and prosperity. Moreover, the US aim is to implement its own strategic transportation processes in the East-West energy corridor.

Therefore, taking the above-said into consideration we can deduce that:

- Both the US and Russia have an economic interest in Georgia due to its strategic location. Azerbaijan, which shares borders with Russia and Iran, has a large gas and oil reserves and is considered as a reputable state for the West. Georgia can adopt transit function, which will increase its role in geopolitical terms. According to Svante E. Cornell, Director of the Swedish Institute for Security & Development Policy (ISDP), "Georgia is not the most strategic country, but it is the most critically important in the Caucasus";

- Georgian government should have been more adequate according to the policy analysis of the 43rd US President George W. Bush Jr. Despite the fact that George Bush Junior unequivocally demonstrated US support for Georgia – his visit to Georgia in 2005 showed the whole world that these two countries were close partners. After the end of the August war, the US allocated \$116.3 million for Georgia's rehabilitation and rebuilding; On January 9, 2009, two countries signed the U.S.– Georgia Charter, which reflected all the important actual directions in the framework, however, it was the decision taken during the Bucharest Summit that has greatly contributed to the August 2008 tragedy. Its doctrine was unambiguously unilateral. Because of this policy, two unfinished and unpopular war in Iraq and Afghanistan and unsuccessful colour revolutions in the Persian Gulf countries were left inadvertently. If we do not consider the failure of these revolutions, Georgia was almost considered as the only successful history. That is why it fought for Georgia to receive Membership Action Plan (MAP) in the 2008 NATO Bucharest summit, unlike the other important members of NATO. As a result, the summit made the decision that was a helpful agreement according to the book "A Little War That Shook the World" by Ronald D. Asmus. In his opinion, the US

and Europe made a mistake when they were not able to properly evaluate and prepare themselves for the fact that Moscow would have used this situation to its favour. The likelihood of Georgia receiving the MAP in December 2008 was small and was disproportional to the risk of the future Russian threat. The Georgian authorities did not make competent analysis and did not take steps to find alternative options regarding NATO. In particular, the issue could have been the adoption of a legislative act meaning that foreign military infrastructure would not have been deployed within the Georgian territory (like the membership model of France in NATO), which is of particular importance to Russia. It is noteworthy that the MAP itself does not provide security guarantees, so introducing it to the public, as the panacea was clearly an exaggeration;

- In our opinion, the 2008 war was inevitable, as Russia tried to intervene yet in 2004. At that time, the President of Georgia Mikheil Saakashvili made the decision to withdraw troops, so the Russian military force deployed in the Roki Tunnel was urged to go back. In 2008, the war could not have been avoided, though the government could have dragged on the situation. If this war occurred in the winter, the Russian aviation factor would have been less. In complex meteorological conditions, the aviation would not have been able to make such a big blow to Georgia;

- In the aftermath of the 2008 war, in contrast to the 43rd US President's Policy, the next President Barack Hussein Obama showed a very deliberate attitude (to say in a mild and constructive manner) towards Georgia's western policy and a sharp positive position towards Russia. During his visit to Moscow in 2010, Obama said that NATO would never accept a member, which was building its foreign policy on confrontation with Russia, as NATO's main task was to cooperate with Russia and it did not include confrontation. Even during the annexation of Crimea, when they started discussing the issue of Georgia's Membership Action Plan, Obama reaffirmed that neither Georgia nor Ukraine were not directed to NATO and correspondingly the agenda did not include handling the MAP to these two countries. In our opinion, from this point of view, it is paradoxical, though Obama saved Georgia from the crisis, as the Russian government said that granting the MAP to Georgia would have evoked sharp and specific measures in response. Moreover, if we analyze Western actions towards the events in Crimea, it is most likely that the West's actions would have been weak in response to the Russian provocations;

- Nowadays Russia's aggression in the Post-Soviet space is expressed in Ukraine and then in Georgia. The afore-said still remains the target of one of the most serious claims of Russia and is under the threat of hindering the real sovereignty, especially after the events of Ukraine and Syria. That is why Georgian diplomacy should be able to ensure future

reality to reassure that even in expected or unexpected turn of events Georgia will not face Russia in times of different conflicts. This will be possible if the US maintains the role of the order guarantor in the global policy as well as in Georgia and thus Russia's return to the international jurisdiction. EU's position towards Russia is also important to note. How can it

overcome political disintegration and achieve economic distancing from Russia? For this, it is necessary to continuously follow the trends of the main players in the modern political international order – the tendencies of US – Russian relations, and therefore be adequate in adjusting the modern Georgian political order.

References:

1. Asmus R. D. *A Little War That Shook the World: Georgia, Russia, and the Future of the West*, St. Martin's Press, Jan 19, 2010.– 272 p.
2. Bugajski J. *Georgian Lessons: Conflicting Russian and Western Interests in the Wider Europe*, A report of the CSIS new European Democracies Project and The Lavrentis Lavrentiadis Chair in Southeast European Studies, November 2010.– 126 p. URL: https://csis-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/102110_Bugajski_GeorgianLessons.WEB.pdf
3. Macfarlane S. Neil. *Colliding state-building projects and regional insecurity in post-soviet space: Georgia versus Russia in South Ossetia, Troubled Regions and Failing States: The clustering and contagion of armed conflicts*, Kristian Berg Harpviken Editor, *Comparative Social Research* – Vol. 27.– P. 103–127.
4. Khelashvili G., Macfarlane S. Neil. *The Evolution of US Policy towards the Southern Caucasus*, *Uluslararası İlişkiler*,– Vol. 7.– No 26. (Summer 2010).– P. 105–124.
5. Charap S. and Welt C. *A More Proactive U.S. Approach to the Georgia Conflicts*, Center for American Progress, 2011.– 80 p. URL: <https://www.americanprogress.org/issues/security/reports/2011/02/15/9108/a-more-proactive-u-s-approach-to-the-georgia-conflicts>
6. Ivanov A. G. *The policy of Russia in southern caucasus in the context of problems of international security, Historical and social educational ideas*. 2012.– No. 6 (16).– P. 35–39.
7. Rumer E. Sokolsky R., Stronski P. *U. S. Policy toward the south caucasus Take Three*, Carnegie endowment for international peace, 2017.– 44 p.

Section 11. Agricultural sciences

*Avakyan Elmira Rubenovna,
Dr. of biology leading researcher, FSBSI "ARRRI"
Dzhamirze Ruslan Ramazanovich,
Ph.D., in agriculture, senior scientist, FSBSI «ARRRI»
E-mail: dzhamirze01022010@yandex.ru*

PRODUCTIVITY OF PLANTS DIFFERENT BY TYPE OF C3–C4 PHOTOSYNTHESIS

Abstract: The review presents materials on the study of metabolic activity in the plant body of agricultural plants that differ in the type of (C3–C4) photosynthesis. The patterns of life processes (photosynthesis, respiration, mineral and water nutrition, as well as growth and development), their essence and interrelation with the surrounding world are briefly reviewed. Section on rice crop is particularly highlighted. Being a unique crop in nature, it grows during water flooding throughout the growing season, differs from C4 plants in the intensity of photosynthesis-photorespiration, remaining the most productive against the background of other cereals.

Keywords: plants productivity, C3–C4 plants, photosynthesis, rice.

Photosynthesis is the process of converting the light energy absorbed by a plant into the chemical energy of organic compounds. Photosynthetic activity is typical for all plants. The first classical studies on the study of photosynthesis were set by the English scientist D. Prystli on a mint plant [1]. Under the action of light, a plant, unlike animal organisms, releases oxygen and absorbs carbon dioxide. The organic mass of plants at the same time is formed not only due to CO₂, but also due to water. Of great importance for identifying the essence of photosynthesis was the discovery of the law of conservation and transformation of energy, experimentally confirmed by the largest physiologist K. A. Timiryazev [2].

By type of photosynthesis, plants are divided into C3 and C4. In the book of foreign authors, the mechanisms of photosynthetic assimilation of CO₂, the organization of the chloroplast photochemical apparatus, as well as the factors determining the plant's primary productivity are considered [3]. The primary products of photosynthesis are C4-dicarboxylic acids.

In chloroplasts of green plants, absorption of solar energy results in synthesis from CO₂ and H₂O, C₆H₁₂O₆ – the reverse of oxidation. Saint-Györd-Krebs first showed that some organic dicarboxylic acids – succinic (succinate), fumaric (fumarate), oxaloacetic (oxalate) catalytically increase tissue respiration, in particular the oxidation of pyruvic acid; Malonic acid almost completely depresses respiration of most tissues [4]. From this it follows that the mentioned dicarboxylic acids play a catalytic role in the oxidative processes occurring in the tissues. The mechanism of this process was discovered by

Krebs. He showed that pyruvic acid in tissues condenses with oxalic acid to form citric acid and release CO₂. Oxaloacetate is re-formed by the oxidation of citric acid. The entire mechanism of the citrate cycle was discovered after the detection of CoA in tissues and the identification of its role. That is, it was found that the citrate cycle is the main biochemical process in all tissues.

Fixation of CO₂, as shown by Calvin, occurs during carboxylation of Ribuloso-1,5-diphosphate. The formed product with 6-carbon atoms reacts with water, splitting into two molecules of glycerol-3-phosphate, which can turn into glucose in the glycolysis reaction.

The C4 pathway of photosynthesis is that the first product in the fixation of CO₂ is 4-carbon organic acids – malic and aspartic. This type of photosynthesis predominates in tropical plants and some species from temperate latitudes [1]. These include maize, sorghum, sugarcane, millet, and many malicious weeds – rounded cyperus, jungle rice, barnyard grass, amaranth, bristle пкфыы, etc. All of these plants are highly productive, carrying out photosynthesis with significant temperature increases and in dry conditions. The leaves of C4 plants are characterized by the presence of two different types of photosynthetic cells, which are arranged in concentric circles: the lining cells radially arranged around the conductive bundles and the main mesophyll. The C4 cycle can be divided into two stages: carboxylation, which occurs in mesophyll cells, and decarboxylation and carbohydrate synthesis in cells of the sheath of conducting bundles. Common to all

C4 plants is the decarboxylation of FEP with the participation of FEP carboxylase with the formation of oxaloacetic acid (OAA), which is reduced to malic acid or is aminated to form aspartic acid. FEP carboxylase more efficiently captures CO₂ than RDF carboxylase and CO₂ accumulates in the cells of the sheath more. On the one hand, it creates the best conditions for the work of RDF-carboxylase, and on the other hand, it suppresses photorespiration.

Plants with the type of C3 photosynthesis significantly differ in many indicators (physiological, biochemical, biophysical) from the type of plants with C4 photosynthesis (table). The C3 pathway of photosynthesis is the recovery pentose phosphate cycle of CO₂ fixation (the C3 pathway, or Calvin path, discovered by American scientists E. Benson

and M. Calvin in 1950 is universal and works in almost all autotrophic organisms) [4]. In this cycle, the fixation of CO₂ is carried out on a five-carbon compound ribulose-biphosphate (RuBPh) in the presence of the enzyme RuB carboxylase. The first stable product is two molecules of 3-carbon compound 3-phosphoglyceric acid (3PHC), reduced by adenosine triphosphate (ATP) and nicotinamide dinucleophosphate (NADP) to carbon sugars from which glucose is formed. Substrate at the same time can be O₂ along with CO₂. In the interaction of the RuBPh with O₂, the glycolate or C2 pathway, photorespiration, is realized. Most land plants have a C3 photosynthesis pathway: peas, beans, horse beans, spindle, cabbage, beets, pumpkin, sunflower, etc. [5].

Table. Differences between plants with C4 and C3 cycles of photosynthesis

№	Characteristics	C3-plants	C4-plants
1	Optimal temperature for photosynthesis	15–25 °C	30–45 °C
2	CO ₂ – compensation point (the concentration of CO ₂ at which photosynthesis balances photorespiration)	30–100 ppm	0–5 ppm
3	Carboxylation product	Phosphoglyceric acid	Oxalic acid
4	CO ₂ Acceptor	Ribulosebiphosphate	Phosphoenolpyruvate
5	Photorespiration	Intensive	Weak or absent
6	O ₂ effect (0–50%)	Inhibition	Absent
7	Green plastids	One type	One or two types
8	Leaf ribs	Bundle sheath is poorly developed, low concentration of chloroplasts	Bundle sheath is well developed, high concentration of chloroplasts
9	Efficiency of photosynthesis	Low	High
10	Maximum speed of photosynthesis	From low to high	High
11	Productivity	From low to high	High
12	Impact of high temperature	Reduces total absorption of CO ₂	Increases total absorption of CO ₂

Of all the diversity of crops with the C3-type of photosynthesis, particular attention should be paid to rice. Photosynthesis in rice occurs in a specialized tissue – chlorenchyma (chlorophyll-carrying parenchyma), concentrated mainly in the leaf plates and vaginas [6]. Photosynthetic tissues are also located in the internodes of the straw, in the spikelet and floral scales. Chlorenchyma has a different density in different forms of rice. It is least compact in indica varieties. Their cells are large, loosely located. The number of chloroplasts per unit leaf area is less than that of forms with more dense chlorenchyma. Traditional japonica varieties have a more compact chlorenchyma. The most dense chlorophyll-carrying parenchyma in modern semi-dwarf varieties. Its cells are small, densely arranged, there are almost no intercellular spaces. The number of chloroplasts per unit leaf area is greater than that of traditional varieties. The described differences in the structure of

chlorenchyma are due to the reduced level of endogenous gibberellins in short stem varieties [7]. Under any growing conditions (level of mineral nutrition, resistance to stress factors, growth and development of individual vegetation phases), varieties with a new type of plant have photosynthesis that is superior to respiration. From a certain index of leaf plate, difference between photosynthesis and photorespiration reaches its maximum value. All this is explained by the straightening of the leaves of rice varieties of a new type and the specificity of the location in the leaf cover of sowing [6; 8]. Суходольное возделывание снижает интенсивность фотосинтеза. Rice plants absorb carbon dioxide not only from the air, but from irrigation water and soil through the roots. About 65% of carbon assimilated by the plant during the period of tillering is spent on the formation of a straw, ~ 30% is lost during respiration, and ~ 5% enters the emerging panicle; after flower-

ing, 50% for respiration, 10% for maintaining straw, and 40% for dry matter of grains. The enrichment of the atmosphere around rice plants with carbon dioxide under experimental conditions leads to an increase in the productivity of the latter. A rice leaf has a lower photosynthetic capacity and a higher compensation point for photosynthesis than leaves of C4 plants. In rice, unlike the latter, photorespiration reaches significant values. Despite the huge variety of cultivation technologies, rice remains the most productive cereal on the

planet. Moreover, growing in the most regulated by human conditions, rice from all grain crops has the greatest prospects for increasing its productivity.

In conclusion, it should be noted that attempts by modern biotechnologists using marker breeding to construct a rice leaf structure with a low level of photorespiration and increased photosynthesis activity are aimed at developing a fundamentally new type of rice plant to maximize the yield potential of this crop [9].

References:

1. Kefeli V.I., Sidorenko O.D. Plants physiology with bases of microbiology.– M.: VO Agropromizdat. 1991.– 334 p.
2. Kretovich V.L. Bases of plants biochemistry.– M.: Vysshaya shkola. 1971.– P. 6–395.
3. Edwards J., Walker D. Photosynthesis of C3–C4 plants: mechanisms and regulation. Translation – M.: Mir, 1986.– 590 p.
4. Shtraub F.B. Biochemistry. Ed. Academy of Sciences of Hungary. Budapest. 1965.– P. 192–199.
5. Galstone A., Davis P., Seter R. Life of a green plant.– M.: Mir. 1983.– P. 283–291.
6. Aleshin E. P., Aleshin N. E. Rice.– M. 1993.– 504 p.
7. Avalyan E. R. Physiological and biochemical aspects of rice growth and development,– Krasnodar. 2017.– 165 p.
8. Dzhmirze R. R. Study of quantitative traits of rice plants of various morphotypes for use in breeding high-yielding varieties: Dissertation ... Ph.D. in agriculture: 06.01.05. ARRR,– Krasnodar, 2009.– 132 p.
9. Goncharova J.K. Genetic bases of increasing rice productivity: Dissertation ... Dr. of biology: 06.01.05. KubSAU,– Krasnodar, 2014.– 417 p.

Khamidov Muxamadxan,
doctor of agriculture scientific, professor
Tashkent institute of irrigation and
agricultural mechanization engineers

Jurayev Umid,
doctor of Ph D,

Kadirov Zayniddin,
assistant,

Saksonov Umidjon,
student,

Bukhara branch of Tashkent institute
of irrigation and agricultural mechanization engineers
E-mail: buhtimi@mail.ru

REDUCTION OF MINERALIZATION OF COLLECTOR-DRAINAGE WATER BY THE BIOLOGICAL METHOD AND USE OF THEM IN THE IRRIGATED AGRICULTURE

Abstract: This article presents the results of the research work on the use of different methods of irrigation to economize irrigation water. Particular attention is related on the decrease of the salinity of drainage water in the Bukhara region using biological method by growing water plants *Lemna minor*.

Keywords: *Lemna minor*, biological method, mineralization, drain-drainage, algae, water scarcity, irrigation, dry residue, chlorine ion, salt regime, productivity, and cotton.

The lack of water resources is increasing in all countries of Central Asia, including the Republic of Uzbekistan [1]. Currently, 54–55 billion m³ of water resources are consumed in the Republic of Uzbekistan, of which 92% are used in irrigated agriculture.

The average annual discharge of irrigated lands in the Bukhara region is 4.2–4.6 billion m³ of which almost 50% (1.9–2.3 billion.m³) is carried to the collector-drainage network [2]. Mineralization of collector-drainage water ranges from 2 g/l to 15 g/l. In the period of water shortage, their direct re-use in irrigated agriculture can increase soil salinization, which will adversely affect the growth and development of plants and reduce the resulting yield to 30–80%.

Objective: to develop scientifically based technologies for the effective use of collector-drainage water in the Bukhara region. In this case, the desalting of saline waters is carried out mainly due to biological methods. Namely, algae with a special tendency to the absorption of salts contained in water. First of all, this plant *Lemna* is small (*Lemna minor*). This plant has an amazing salt tolerance and a need for salts in water. Salt for this plant is the staple food.

Research methodology

Research methods are based on the recommendations of the Uzbek Scientific Research Institute of Cotton-growing “Methods of conducting field experiments” (UzNIIKh, 2007) and the German Research Center for Agricultural Technology Leibniz.

To realize the idea, a pool was dug along the Yulduz collector at the research site, where drainage water was discharged and where the growing of *Lemna minor* algae was supposed to provide the desired effect of desalinization of moisture.

Studies on the establishment of the effect of cotton irrigation with biological purified water from the basin were carried out according to the recommendations of the Bukhara branch of the Cotton Research Institute. Norms of mineral fertilizers are taken N250, P175, K100 kg/ha [3].

The experiments were conducted in one tier, in 5 variants and in 3 replications. The mineralization of the Yulduz collector water used for irrigating cotton was by the amount of dense residue, 3.9 g/l, Cl–0.374 g/l, SO₄–1.348 g/l, HCO₃–0.476 g/l, Ca–0.228 g/l, Na–0.367 g/l and Mg–0.412 g/l. When growing *Lemna minor* in the reservoir capacity at the collector, by the end of the growing season the mineralization decreased, the amount of dry residue was 2.8 g/l, the Cl content of the ion was 0.291 g/l, and SO₄–1.084 g/l, HCO₃–0.246 g/l and Ca–0.174 g/l, Na–0.311 g/l, Mg–0.284 g/l. In order to establish the effect of irrigation on the salt regime from a meter-thick layer of soil (0–30, 30–70, 70–100 cm), after each irrigation and irrigation of each variant, soil samples were taken, and at the beginning and at the end of the growing season, it was determined Cl content; Cl; HCO₃; SO₄; and the amount of dry residue.

Results of experience and their discussion

The growth and development of cotton, yield, time for opening of the bolls and its quality is mainly determined by the irrigation time, quantity, irrigation pattern, duration of irrigation, irrigation and irrigation rates.

For a number of years on the experimental fields, cotton irrigation was carried out on the basis of the adopted scheme for the Bukhara region. At the same time, the duration and norms of irrigation according to options were determined depending on the level of soil moisture. In all cases, the calculated layers for determining the irrigation rate were in the period before flowering 0–70 cm, in subsequent period's 0–100 cm [4]. The irrigation rate of cotton is determined by the formula Academic Kostyakov.

$$m = 100 \cdot h \cdot \gamma \cdot (\beta_{\max} - \beta_{\text{per}}) + \mu \cdot P \quad m^3 / \text{ha}$$

here: β_{\max} – the maximum soil moisture,%; β_{per} – The personal moisture in the soil,%; γ by weight of dry soil; – volume mass of the soil to be moistened, g/cm³; h – depth of the layer to be moistened, m; P – precipitation during the autumn-winter period, m³/ha; μ – coefficient of use of precipitation.

The amount of water supplied to each field was measured by the “Chipoletti” watersheds established at the entrance to the temporary irrigator of the experimental field.



Figure 1. Irrigation of cotton with biologically treated drainage water

We have analyzed the accumulation of salts in the soil during the growing season. Before sowing seeds during the experiment, the salt composition was analyzed in the laboratory.

Analysis of the results of the arable layer (0–30 cm) showed that if the amount of Cl was 0.009%, HCO₃ was 0.029%, SO₄ was 0.049%, then the dense residue in the soil was 0.153%. In the soil layer of 0–100 cm, the amount of these salts, respec-

On the experimental fields, the smallest irrigation rate was observed in option 1 (irrigation with river water). In this variant, according to the scheme 1–3–1.5 irrigations were carried out, the irrigation rate was 4595 m³/ha. In the experimental field in option – 5 there was the largest irrigation rate (irrigation with drainage water). In this variant, relative to 1 experimental field, 284 m³/ha more water resources were consumed, the irrigation rate was equal to 4879 m³/ha. In variant 2 of the studies, that is, when cotton was irrigated with river water mixed with biologically purified drainage water, the irrigation rate was 4640 m³/ha. If in the 3-variant research (irrigation of cotton with the addition of drainage water to the river water), the irrigation rate was 4730 m³/ha, in the 4-variant with irrigation scheme 1–3–1, the irrigation rate in relation to the 3-variant was 85 m³/ha less, with a total water supply of 4655 m³/ha.

During the years of research, the cotton variety “Bukhara-6” to maintain pre-irrigated soil moisture of 70–75–65% of HB, irrigation was carried out according to the scheme 1–3–1. The average rate of each irrigation was 688–1216 m³/ha, the irrigation rate was 4595–4879 m³/ha, and the duration of irrigation was 14–22 hours, the time between irrigation was 16–22 days (Fig. 1).

tively, was: Cl-0.012%, HCO₃–0.033%, and SO₄–0.048% and the amount of dense residue – 0.128%. At the end of the growing season, it can be stated that the values of all salts in the soil have increased, with the exception of only HCO₃, which has decreased in comparison with the initial position. If we analyze the change in the amount of chlorine (Cl), then when irrigating with river water in variant 1 in the topsoil (0–30 cm), the

amount of chlorine was 0.014%, then in the subsoil (30–70 cm) relative to the initial result, the amount of chlorine increased by 0.003%, and it was equal to 0.014%, in the layer of 0–100 cm at the end of the growing season was 0.015%. In variant 2 of studies, i.e., with river water irrigation mixed with biologically purified drainage water in the topsoil (0–30 cm), the amount of chlorine was 0.015%, and in the 0–100 cm layer, this amount became 0.015%. Or, compared with the 1-variant, the amount of chlorine increased by 0.001–0.002%. In the 3 variant of the experiments, by the end of the growing season, the amount of chlorine became equal to 0.018% in the topsoil, 0.016% in the separable layer, and 0.017% in the 0–100 cm layer. In the 5th variant, when watering cotton only with drainage water, the greatest amount of salts was observed in the soil. In this variant, in the topsoil the amount of chlorine was 0.034%, and in the separable layer 0.031%, in the 0–100 cm layer, 0.031%.

When studying the effect of irrigation water quality on the amount of dense soil residue, if at the beginning of the growth period on the arable layer is equal to 0.153%, in the subsoil layer by 0.136%, and in the 0–100 cm layer it is equal to 0.128%, then at the end of the growth period, 1-variant, the amount of dense residue in the topsoil relative to the growth phase increased to 0.079%, and amounted to 0.232%. And in the subsurface layer, this value is equal to 0.193%. In the 2 variant of experiments in the topsoil, the amount of dense residue is 0.241% ha, and in the 0–100 cm layer it is equal to 0.178%. In the 3-variant, i.e., with irrigation with the addition of drainage water to the river water, the dense soil residue in the arable layer relative to the initially obtained results increased to 0.091% and amounted to 0.244%, in the 0–100 cm layer it is 0.196%. When cotton was irrigated with biologically purified drainage water in the 4th variant, the amount of dense residue in the arable layer was 0.243%, and in the separable layer was 0.210%, in the 0–100 cm layer, the amount of dense residue

was 0.185%. In the 5th variant of the experiments, i.e., with cotton irrigation with drainage water, the amount of dense residue in the arable layer at the end of the growing season was 0.283%, in the separable layer 0.236%, and in the 0–100 cm layer increased to 0.244%.

According to the collection and repetition, the indicators of raw cotton harvest in case of irrigation with river water in variant 1 amounted to 41.8 centners per hectare. In variant 2, with irrigation by river water with mixed biologically purified drainage water, the yield was 40.1 c/ha, and in variant 3, i.e. under irrigation with the addition of drainage water to the river water, the yield of cotton relative to the 1- and 2-variants decreased by 4.6–6.5 c/ha, amounted to 34.1 c/ha. In the 4th variant, with irrigation with biologically purified drainage water, respectively, the yield was 32.3 c/ha, yields were increased by 4.2 c/ha relative to the 5th option (irrigation with drainage water). In the 5th variant of our research, i.e. under irrigation with drainage water, cotton yield was 28.1 c/ha.

Conclusion:

1. In the conditions of water shortage, irrigation of agricultural crops causes great difficulties, in particular, to achieve a tolerable, and sufficiently justified yield requires additional labor costs.

2. In order to mitigate the shortage of water resources, prevent the deterioration of the ameliorative state and find additional sources to increase the water supply of irrigated lands in the Bukhara region, a technology has been developed for biological treatment of collector-drainage water from plants harmful to plants, in particular for cotton, salts. *Lemna minor* is able to effectively neutralize toxic salts in drainage waters up to 22–28%. The use of collector-drainage waters, purified by biological methods, for irrigation of cotton of the variety “Bukhara-6” yielded a yield increase of 4.2 c/ha than for irrigation of cotton only with drainage water.

References:

1. Karimov I. A. World financial and economic crisis, ways and measures to overcome it in the conditions of Uzbekistan, – Tashkent, 2009.
2. The Ministry of Agriculture and Water Resources of the Republic of Uzbekistan. Recommendations on crop irrigation, – T. 2006. – P. 3–4.
3. Mirzazhanov K., Avliyakov A., Bezborodov G., Akhmedov Z. and others. Recommendation on the use of water-saving agricultural technologies in the cotton complex. – T. 2008. – P. 15–16.
4. Khamidov M. Scientific basis for improving the water use of irrigated lands of the Khorezm oasis. Abstract dock diss. – Tashkent, 1993. – P. 14–21, 34–37.
5. Landolt E. The family of Lemnaceae – a monographic study, 1 // Veröff. Geobot. Inst. ETH (Stift. Rübel), 1986. – No. 71. – 481 p.
6. Omar M. S., Aziz M. A. The effect soil moisture depletion on Wheat. – Production. Egyptj Soils 1983. 23, – No. 1. – P. 1–17.
7. Gubanov I. A., Kiseleva K. V., Novikov V. S., Tikhomirov V. N., Lemna minor L. – Small duckweed // Illustrated determinant of plants in Central Russia. In 3 volumes. – M.: T-in scientific. ed. KMK, Inst. Tech. research, 2002. – T. 1.

*Ruzmetov Rasul,
Urganch state University,
Ph.D student, the Faculty of Natural sciences
E-mail: Tupmik@mail.ru*

*Azatova Gulasal,
Urganch state University,
Student, the Faculty of Natural sciences
E-mail: Gulasal1404@gmail.com.*

*Atajonova Mukhayyo,
Urganch state University,
Student, the Faculty of Natural sciences*

PROGNOSIS OF THE DISTRIBUTION OF PESTS AND INSECTS IN THE AGRICULTURAL PLANTS

Annotation: This article deals with the issue of preventing the distribution of pests and insects. Moreover, some opinions on the use of information technologies to fight against pests are given.

Key words: pest, insect, humidity, measurements, agriculture.

Introduction. This article deals with the development and implementation of improved methods for predicting pests and insects. At the same time, the technology of automatic collection and processing of the necessary data for the implementation of classical monitoring and forecasting methods are offered. The biosphere contains several insects that affect human life and its labor efficiency. They can be positive (pollinators, destroyers of pests, etc.) and negative (damage to crops, loss of crops, etc.). The economic damage caused by insect pests can be estimated with billions of dollars. Protection of cultural herbs from insect pests is one of the actual issues of plant growing. Currently, a set of complementary methods and measures are used to tackle with this problem. These methods include a combination of technics that can meet agronomic, biological, chemical, and other fighting methods, and involves scientifically-based rotate planting, natural predators that can handle harmful organisms and measurements to save natural cleanness, and provide quality of crops. It is important to plan and monitor the development of pest insects in the proper implementation of these studies. At present, in Uzbekistan there appears a need to development of monitoring system using modern information technology in order to prevent the development of the harmful pests' development, distribution and damage. Until now, there are no accepted methods and techniques for the monitoring of pests and diseases [2]. Therefore, issues related to the prediction of the distribution of pests and insects in agricultural crops are very relevant.

Analysis of available literature. A number of scientific and practical studies on the development and spread of pests in agricultural crops have been developed and a number of

recommendations have been developed [2–7]. However, in these publications, information on the development of computer systems related to the forecasting of pests and insects in agricultural crops is not sufficiently detailed. It should be noted that the initial data on the distribution of pests and insects in agricultural crops are provided, and the problem of identifying unknown parameters of the prognosis model is sufficiently covered in existing scientific literature. Therefore, this report focuses on the use of modern information technologies in the collection of data needed to build a projection model.

The object and subject of the research. Owing to the fact that fighting methods are used in order to control the pests in Uzbekistan, it is necessary to precisely predict their appearance. Khorezm region is located in the northern part of Uzbekistan and its climatic conditions are affected by the existence of water-related crops. Similarly, climatic parameters in the region vary widely in smaller areas as well as rapid monitoring of the environment.

Materials and Methods. The issue of forecasting the development and spread of pests in agricultural crops is a matter of constructing the dynamics of development of the pathologic process. Therefore, we will briefly dwell on the conditions of emergence and development of the disease. The analysis of existing literature shows that the spiderbug begins to appear when the average daily temperature exceeds 7.3 degrees Celsius. When the relative humidity is 55–60%, and the temperature is + 26–33 degrees, the optimal condition is created for them. Increasing dust particles in the atmosphere creates favorable conditions for the growth of the pest. When the temperature drops in summer, rainfall

and dew drops, the number of spiderbug goes down [2]. Plant louse develops in wet areas (40–60% of air humidity). Reduced relative humidity can lead to a decrease in plant lice [3]. Depending on the sum of the useful temperature over 11 degrees Celsius, the cotton pests and duration of their development phases may be prolonged or shortened [2–5]. When the sum of useful temperatures in Uzbekistan is about 550 degrees and gives one element. Of this, 50 degrees for egg development, 300 degrees for larvae development, 200 degrees for bark development, and the other for the development of growing butterflies are used. If this index reaches 305 degrees Celsius, the pest can be easily overwhelmed and the next beetle will be able to grow in bulk. The fungus in plants is caused by the long-term droplet water supply in the body of the anthracnose, dandruff, mildew. If the drops of water in the body of the plant survive for 12 to 18 hours, these diseases begin to develop in the grape [4]. The information needed to forecast pests and diseases common in the Khorezm region has been studied. In the forecast of the distribution of pests insects, basically, the concentration of useful fertilizers and moisture is a major factor [4]. Based on this information, the scientists of the Urgench State University studied the possibility of sending SMS messages to the farmers' mobile phones, informing about forecasting the pests and insects and the areas where their susceptibility is high, moreover they created a device in the laboratory. Similar technologies have been created in foreign countries. For example, in Spain, the United States, Australia, the Republic of China, and Australia, the methods of remote sensing and forecasting of pests have been investigated. In Australia, methods for predicting the development of apple caterpillar based on climate parameters have been studied [8]. In Spain, methods for catching beetles with special handles and monitoring them automatically from the distance by means of micro cameras are distributed [7]. In the United States, a range of studies have been conducted to send information to the internet sites and to identify the distribution of insects and diseases based on collected data. In the Republic of China, remote monitoring of environmental pollution by GSM has been studied. According to the collected data, the information about the increase in the number of the cotton worms in connection with the speed and direction of the wind is shown. In addition, data on the increase in habitual damage caused by an increase in the concentration of carbon dioxide in the atmospheric air is presented [5, 6]. The data we have made about the pest infestation is stored in the memory device we are installing in the fields where GPS coordinates are obtained. At the place where the insect reproduction conditions are detected, the message will be automatically sent to the phone numbers in the memory of the device, with the

data on the need to fight it and the name of the disease. Additionally, for each device set on a central computer, an automatic file is opened in one EXSEL program, and the data is written to the same columns in each case. At the same time, the average daily temperatures measured every two hours on the central computer are also recorded. You can change the time of data transfer to the central computer by using a computer. This data can be directly sorted into the GIS program and can be mapped and analyzed in the region on an environmental monitoring site every day and at the risk of spreading insects. The device was installed on the 3 cotton fields at 0.5 meters above the ground. The direct installation was done so that the sun did not fall.

The general scheme of the proposed system is that GSM sim 900/300 module can simultaneously transfer data to Uzbekistan's any location. It can be used on any device with 300 and 900 marks. AtMega 32, with microcontrollers with 64 and more memory can be used. This device connects GSM with the sensors and transmits the received data to the remote sensors. The device also has the capability of transmitting data independently.

The results of the study. The soil temperature is measured using the sensor DS18B20. It measures in a diapason at -55°C to $+125^{\circ}\text{C}$ at a rate of 0.5%. The air humidity and temperature are measured using the DHT11 sensor. The humidity is measured at 0.3%, the temperature is done with 0.2 degrees Celsius. The detection sensor of the drop of water on the plant surface is made manually. For this purpose, a glass plate of 10 x 15 cm is taken and 10 rounds parallel to the 0.5 mm copper cord are used at a distance of 1 mm (3 repetitions). The first of the wires is a minus, the second is plus and the third is the same as the minus one. Parallel connected wires are connected to microcontroller. Microcontroller starts measuring time with the appearance of drops of water between the wires. When water drops, the measurement will stop and send data to the central computer. In each case, we can see how many drops of water in the plant body are stored on the central computer. If there is a risk of disease, the phone number you send will be sent to you with a warning message. The analogue of the device is in China, Spain, America, Russia, India and other countries, which makes it easy to use and economically easy. The total cost of this is 300 dollars.

Analysis of experimental data. In our experiments we have seen that the temperature is not the same as in the three fields we are studying. The results are shown in picture 1. The temperature was almost equal in the first and third points when studied in April. On the second decade, the average difference was 3–4 degrees Celsius. It was later observed that the temperature at the second point was lower after the formation of the plant cover. The average daily temperature was 10 degrees

Celsius in the first ten days of July, compared to the second and third decades. It can be caused by irrigation of fields in the surrounding area and the distance of irrigation canals.

Atmospheric air temperature in the dry desert zone can be degraded by continuous evaporation on the surface of the plant body and can range from 15 degrees Celsius even in the Sun. The constant water evaporation from the plant body, in turn, leads to increased air humidity.

In our experiments (see picture 2), the air humidity of the studied fields has changed dramatically during the daytime, without great distinction during the day. Air pollution in the third field was the highest and lowest in comparison to the learned ones. In the first field, air humidity did not change in large diapasons. In the second and third fields, air humidity increased to 50% over a period of 10 to 15 days in July. Air pollution exceeded 50% in August in the first field.

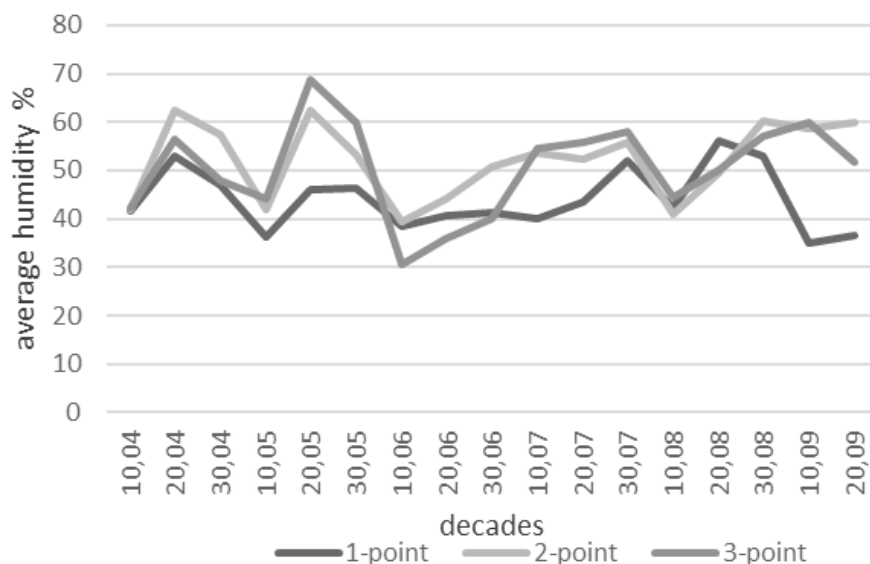


Figure 1. The change of average in the experiments fields on decades

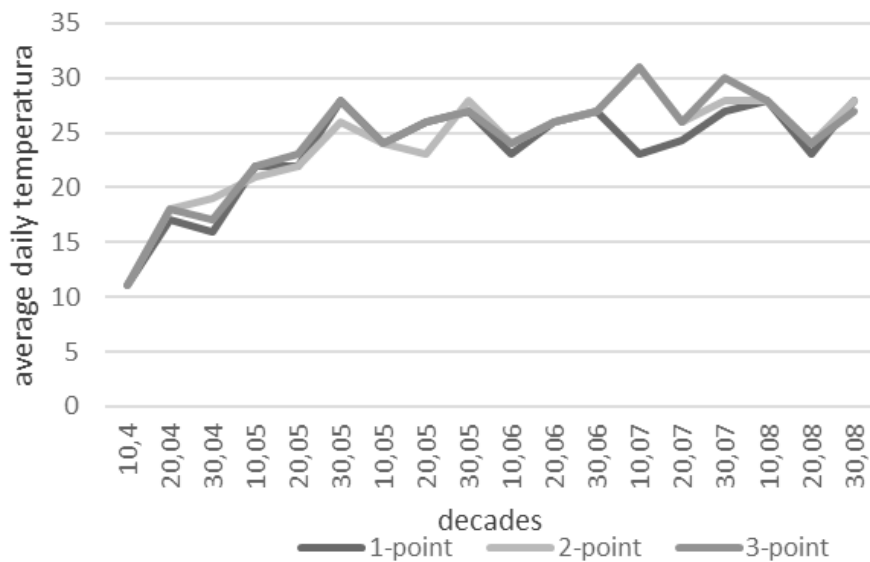


Figure 2. Average daily temperatura change in experimental fields

Conclusions and Recommendations. In general, devices that have been developed in order to prevent pests are determined at low cost. Furthermore, without the presence of human beings, the information will reach those concerned. This prevents the massive reproduction of insects. The device

to be installed on each farm creates the possibility of pre-determining the spread of agricultural pests and diseases. This device can be used to connect sensors that detect carbon dioxide gases in atmospheric air.

References:

1. Alimammedov S. N., Hodjaev Sh. T. Cotton pests and fight against them Tashkent: Mehnat, 1991.– 188 p.
2. Muhamadaliyev Sh.S., Sulaymanov B. A., Rashidov M. I. Propagation of development and distribution of harmful organisms of crops. Tashkent: O'qituvchi, 2002. 143 p.
3. Yakhyaev X. K., Abdullaeva X. Z. Information technologies in agrarian sector development.– Andijan: “Andijan Publishing House”, 2016.
4. URL: <http://agroflora.ru/monitoring-i-prognoz-boleznej-rastenij/> (data as of 12.07.2017).
5. Zapevalova S. B., Tropina S. M., Larchenko K. I. i dr. Методические указания по прогнозу развития и размножения основных вредителей хлопчатника и других сельскохозяйственных культур. Tashkent, 1982.– 62 p.
6. Hamraev AS, Azimov JA, Sharofutdinov Sh.A. et al. Agroentomological cartography. Tashkent: Fan, 1995.– 95 p.
7. Hodjaev Sh. T. Entomology, basics of agricultural crop protection and agrototoxicology. Tashkent, 2010.– 355 p.
8. Otoniel Lópezand etc. Monitoring Pest Insect Traps by Low-Power Image // Journal of Sensor Technologies.– 2012.– Issue 12,– P. 15801–15819.
9. Chengbai, Y. Remote sensing, GPSand GIS. texnologies for Agricultural insect pest detection. Science. Press, Beijing. 2005 PP. 402–432.

Section 12. Technical sciences

*Khasanov A. S.,
deputy director of science head of STC SPC
of production of rare metals and solid
alloys doctor of technical sciences, professor
Berdiyarov Bakhrriddin Tilovkabulovich,
senior teacher of department of Metallurgy,
Tashkent state technical university
E-mail: mr.berdiyarov@mail.ru*

RESEARCH OF EDUCATION AND PREVENTION OF FERRITE AND SILICATES OF ZINC WHEN ROASTING SULPHIDIC ZINC CONCENTRATES IN FURNACES OF THE BOILING LAYER

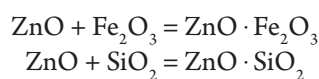
Abstract: In the article considered causes and conditions of formation ferrites and silicates zinc from roasting sulfide zinc concentrates on the furnace “Boiling Layer”, also in the article directed measure for decreasing formation ferrites and silicates on the process roasting. Thermodynamic impacts additional components to charge for decreasing formation components to charge for decreasing formation ferrites and silicates zinc also directed in this article.

Keywords: ferrite, cake, to make silicate, zinc, autogen, pyrite, roasting.

Now in the world about 10 million t of zinc a year are produced. Its main quantity is made in the classical hydrometallurgical way with use of furnaces of the boiling layer for the translation of non-soluble sulfides in soluble oxides [1]. This process has such advantages as:

- 1) specific capacity of the furnace of the boiling layer of “BL” is 3–4 times higher, than in multihearth furnaces, and 1.5–2.0 times above, than when roasting in suspension;
- 2) content in a candle end of sulphidic sulfur when roasting in “BL” furnaces is 0.2–0.3% instead of 0.2–0.5% when roasting in suspension and 0.3–1.0% in multihearth furnaces;
- 3) preliminary drying of a concentrate is not required, power supply of the “BL” furnace not only a damp concentrate, but also a concentrate pulp is possible;
- 4) process of roasting in “BL” furnaces easily gives in to automation;
- 5) considerably bigger between-repairs period and simplicity of repair.

However, also essential shortcomings are peculiar to process of roasting of a concentrate in “BL” furnaces, namely – rather low extraction of zinc in solution at the subsequent leaching of a candle end. The analysis of this phenomenon showed that education in the course of roasting of ferrite and silicates of zinc on the following reactions is the main reason for low extent of transition of metal to solution:



High-temperature roasting (t, 960–990 °C) promotes formation of these connections. These connections are very poorly dissolved in solutions of sulfuric acid and substantially pass into cake [2].

When performing research work it was established that at temperatures of oxidizing roasting of 900–950 °C on separate grains of sulphidic minerals temperature rises higher than 1200 °C that leads to fusion of these grains. As a result of fusion of mineral grains difficult connections similar to metallurgical slags (ferrite and silicates of zinc) are formed. In this regard to processes of formation of ferrite and silicates of zinc at oxidizing roasting, in some degree it is possible to apply regularities of formation of metallurgical slags [3].

According to the molecular theory of education and the structure of liquid slags – strong oxides force out weaker which remain in fusion in a free state from chemical compounds. “Force” of acid or main oxide can be measured by the thermodynamic potential of formation of connections from oxides in fusion [4].

Than more size of thermodynamic potential (its negative value), carried to 1 mole acid oxide, especially the basis is “strong” and the more so its connection with acid oxide is strong.

In silicate fusions the strongest main oxides are – oxides of alkaline and alkaline-earth Na_2O metals, K_2O , CaO , MgO

and BaO; weaker main oxides are oxides of heavy metals: FeO, MnO, PbO, Cu₂O, NiO and the weakest – amphoteric: ZnO, Fe₂O₃, Al₂O₃. The strongest acid in SiO₂ slags.

Thus, “strong” main oxides and “strong” acid oxides form most thermodynamic strong connections, than “weak” main oxides with “strong” acid oxides [1; 2]. Proceeding from it, it is possible to assume that introduction to furnace charge of roasting of “strong” main oxides will lead to decrease in formation of ferrite and silicates of zinc.

For experimental confirmation of this assumption laboratory researches of roasting of a sulphidic zinc concentrate

with introduction to furnace charge of additional additives were carried out.

The sulphidic zinc concentrate and the furnace charge prepared for roasting in the furnace of the boiling layer “BL” at the AMMC Zinc plant served as objects of pilot studies.

Now at zinc plant concentrates are processed imported and local zinc. For carrying out researches about 2 kg of a sulphidic zinc concentrate and furnace charge were selected.

The chemical and phase analysis of the selected tests were executed in chemical laboratory of the AMMC Zinc plant. Results of the analysis are given in (tab. 1).

Table 1. – The chemical composition of the selected tests on the main components

Tests	Contents,%					
	Zn	Fe	S	SiO ₂	Pb	Cu
Test No. 1 Zn, Concentrate of “Hondiza”	38–50	5–8	29–31	till 4	4–4.6	2.2–2.3
Test No. 2 Zn, Concentrate of “Zyryanovsk”	50–53	4–7	28–31	1.5–2.0		
Test No. 3 Zn, Concentrate of “Glubochenko”	38–39	16–18	29–32	10–14		
Test No. 4 Zn, Concentrate of “Predgorniy”	45–46	8–9	29–31	1.5–3.0		
Test No. 5 Zn, Concentrate of “Ust-Talovka”	38–43	8–14	29–32	3.5–4		

At Zinc plant these concentrates unite, average and prepare furnace charge according to production requirements. Pilot studies were conducted both with separate concentrates, and with the furnace charge prepared for roasting in the “BL” furnace on Zinc plant AMMC.

For a research and studying of the reasons allowing to reduce formation of ferrite and silicates of zinc in the course of roasting entered additional additives into furnace charge – chemical clean reactants are oxides of alkaline and alkaline-earth metals (CaO, BaO, Na₂O, K₂O).

Additional additives were entered into furnace charge of roasting in three ways:

1) the sulphidic zinc concentrate and additional additives carefully mixed up in dry before formation of homogeneous mass, further furnace charge was exposed to roasting;

2) for the purpose of ensuring good contact of components of furnace charge and the entered additional additives the furnace charge prepared on the first way was moistened with water and from it granules (pellets) with a diameter of 4–6 mm prepared. The prepared pellets dried and exposed to roasting;

3) for ensuring full contact of components of furnace charge with the entered additives prepared water suspension of the added component and mixed with a zinc concentrate. The formed pulp was pounded in a porcelain mortar and was exposed to drying. The dried-up furnace charge was crushed and exposed to roasting.

Roasting in the stationary mode was carried out in the muffle furnace which is previously heated to 950 °C within

120 minutes. From the tests of furnace charge prepared in various ways hinge plates which filled up in fireclay crucibles of rectangular section, layer of 5–7 mm thick were selected. Then crucibles placed in the work area of the furnace. Through an opening by means of a quartz tube blew air into the furnace. By means of the same tube hashing of furnace charge with frequency of 15 minutes was carried out.

After the expiration of the set roasting time, the crucible with a candle end was taken out from muffle furnaces, cooled and weighed. The phase structure of a candle end was defined in the Zinc plant AMMC chemical laboratory.

Roasting in the dynamic mode carried out on installation laboratory the furnace of the boiling layer of “LPKS” which consists of the laboratory mine SNOL 1.6/11-IZ furnace, a coil from corrosion-proof became for heating of air, model of the “BL” furnace executed from a quartz tube with a diameter of 60 mm, the brand air compressor UK – 2M (fig. 1).

For establishment of necessary pressure of the air blown into furnace volume for the purpose of creation of the boiling layer before roasting made single experiments. Further the furnace was heated to the set temperature and in furnace volume through loading tubes filled up with certain portions of a hinge plate of furnace charge prepared in various ways. Time of stay of one hinge plate in the furnace was 1.5–2.0 minutes. The candle end from the volume of the furnace was unloaded from an output tube and gathered in a porcelain crucible.

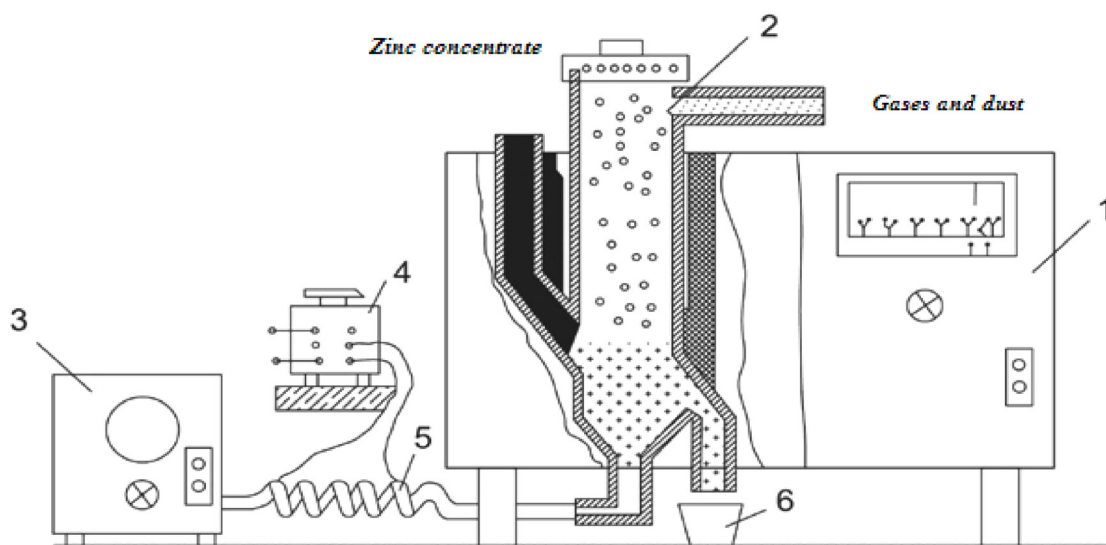


Figure 1. LPKS installation: SNOL 1.6/11-IZ 1 – mine furnace; 2 – model of the “BL” furnace; 3 – air UK-2M compressor; 4 – LATR-2M autotransformer; 5 – a heating tube from stainless steel; 6 – a cup for reception of a candle end

When roasting zinc concentrates in “BL” furnaces interaction of components (ZnO , Fe_2O_3 , SiO_2) a concentrate with oxides of the alkaline and alkaline-earth metals entered into roasting furnace charge can proceed according to two schemes:

1) oxide of iron and oxide of silicon reacts along with oxide of zinc and with the oxides entered as additional additives

$$\text{ZnO} + (m+n)\text{Fe}_2\text{O}_3 + n\text{MeO} = m\text{ZnO} \cdot \text{Fe}_2\text{O}_3 + n\text{MeO} \cdot \text{Fe}_2\text{O}_3 + (1-m)\text{ZnO} + (1-n)\text{MeO} \quad (1)$$

2) in the beginning ferrite and silicates of zinc which interact with in addition entered additives are formed

$$\text{ZnO} + (m+n)\text{SiO}_2 + n\text{MeO} = m\text{ZnO} \cdot \text{SiO}_2 + n\text{MeO} \cdot \text{SiO}_2 + (1-m)\text{ZnO} + (1-n)\text{MeO} \quad (2)$$

Regardless of according to what scheme interaction of components of furnace charge with in addition entered additives (oxides of alkaline and alkaline-earth metals) will proceed, the amount of oxide of the zinc which is not connected in the form of ferrite, obviously, will depend on the speed of formation of ferrite and the entered metal oxide. The more there will be a speed of an make of ferrite of the entered metal, the less zinc will ferritization. If process goes on a formulas (3, 4), then zinc oxide replacement from ferrite by other oxide will depend on the relative strength of the last.



Regardless of according to what scheme interaction of components of furnace charge with in addition entered additives (oxides of alkaline and alkaline-earth metals) will proceed, the amount of oxide of the zinc which is not connected in the form of ferrite, obviously, will depend on the speed of formation of ferrite and the entered metal oxide. The more there will be a speed of an make of ferrite of the entered metal, the less zinc will ferritization. If process goes on a formulas (3, 4), then zinc oxide replacement from ferrite by other oxide will depend on the relative strength of the last.

The possibility of course of this or that chemical reaction and also its direction, as we know, determinate by the sign of change of size of free energy. The absence given on warmth of education and thermal capacities of ferrite, oxides of metallic does not allow to count a value of the maximum work

of reaction therefore the issue of the direction of reaction of formation of ferrite of zinc had to be resolved by practical consideration.

Formation of ferrite and silicates of zinc when roasting a zinc concentrate was studied depending on a ratio of sulfide of zinc and the entered oxides of alkaline and alkaline-earth metals. At the same time temperature and duration of process was supported by a constant about 950°C , process duration – 2 hours.

Regardless of a way of preparation of furnace charge for roasting as additional additives chemically clean Na_2O , K_2O , CaO the following percentage from the mass of furnace charge, were entered into%: 0.5; 1.0; 2.0; 3.0; 4.0; 5.0; 7.0.

Results of experiments on studying formation of ferrite and silicates when roasting in the static mode showed that additive in furnace charge even of a small amount of oxides of alkaline and alkaline-earth metals causes noticeable reduction of ferrite and silicate of zinc in a candle end (fig. 2 of line 2, 4). The best indicators on decrease in content of ferrite and silicates of zinc in a candle end are received when roasting the furnace charge prepared on the third way. It can be explained with the fact that at a wet way of a charge preparing there is almost full enswathe oxides of alkaline and alkaline-earth metals of particles of a zinc concentrate. Results of roasting of the furnace charge prepared on the third way are given in (tab. 2).

When roasting furnace charge in the dynamic mode on the laboratory LPKS installation decrease in content of ferrite and silicates of zinc was not observed (fig. 2 of line 1, 3), it can be explained with the fact that it when

roasting in the boiling layer is not reached full contact between particles of a concentrate and oxides of alkaline and alkaline-earth metals.

According to the results received experimentally it is visible that additive of oxides of alkaline and alkaline-earth metals leads to decrease in formation of ferrite by 1.5–1.7 times.

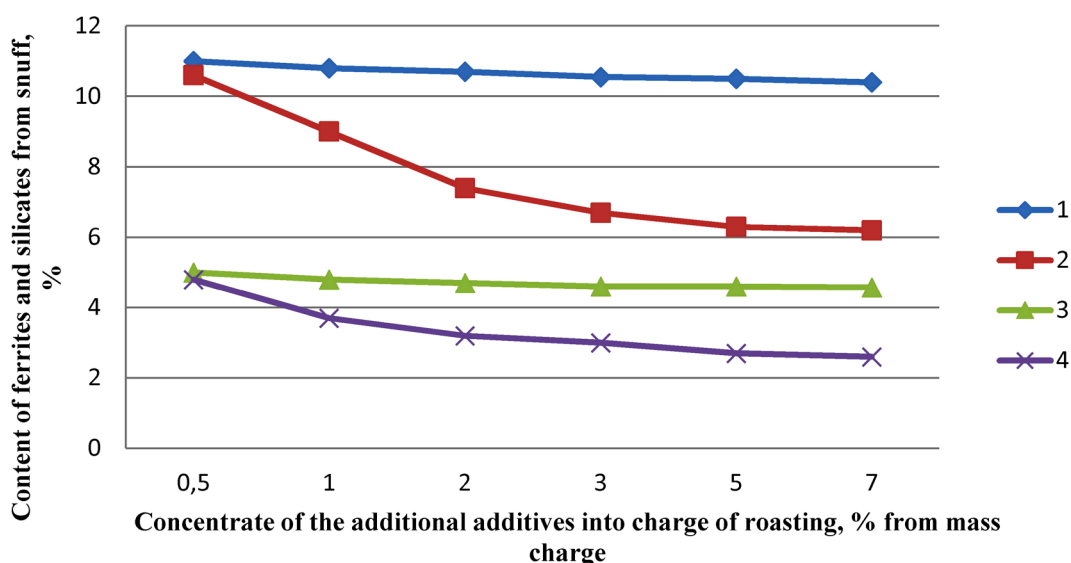


Figure 2. Influence of the additional additives entered into furnace charge of roasting on formation ferrite and a silicate at the static and dynamic modes of roasting: 1 content of ferrite in a candle end when roasting on the LPKS installation; The 2nd content of ferrite in a candle end when roasting in the laboratory muffle furnace; 3 content of silicates in a candle end when roasting on the LPKS installation; 4 content of silicates in a candle end when roasting in the laboratory muffle furnace

Table 2. – Results of roasting of the zinc furnace charge prepared on the third way

O Experience	The name of additives	Concentration of additives in% of the mass of furnace charge	Phase structure candle end (relatively)					
			Zn _{total}	ZnSO ₄	ZnO	ZnO · SiO ₂	ZnS	ZnSO ₄ · Fe ₂ O ₃
1	2	3	4	5	6	7	8	9
1	Without addition		56.6	0.24	38.14	6.75	0.32	11.5
	CaO	0.5	56.45	0.23	38.08	7.28	0.33	10.53
	Na ₂ O		56.50	0.20	37.88	7.07	0.27	11.08
	K ₂ O		56.47	0.23	37.66	7.19	0.31	11.10
2	CaO	1.0	56.43	0.34	39.24	7.37	0.29	9.19
	Na ₂ O		56.58	0.29	38.70	7.21	0.51	9.87
	K ₂ O		56.54	0.24	38.65	7.55	0.22	9.88
3	CaO	2.0	55.87	0.19	39.12	7.26	0.23	9.07
	Na ₂ O		56.21	0.42	39.02	7.18	0.48	9.1
	K ₂ O		55.94	0.47	38.68	7.23	0.50	9.06
4	CaO	3.0	56.84	0.19	40.53	6.65	0.57	8.90
	Na ₂ O		56.52	0.23	40.11	6.79	0.38	9.01
	K ₂ O		55.90	0.39	40.21	6.10	0.31	8.89
5	CaO	5.0	56.88	0.14	42.33	6.72	0.52	7.17
	Na ₂ O		56.03	0.28	40.41	6.46	0.32	8.56
	K ₂ O		56.48	0.21	41.87	5.97	0.41	8.02

1	2	3	4	5	6	7	8	9
6	CaO	7.0	56.11	0.15	43.30	5.30	0.36	7.00
	Na ₂ O		56.58	0.23	42.75	5.50	0.32	7.78
	K ₂ O		56.34	0.19	43.34	5.36	0.34	7.11

On the basis of the conducted researches on studying of influence of various additives in furnace charge of roasting and a way of a charge making on the content of ferrite and silicates of zinc in a candle end it is possible to draw the following conclusions:

– introduction to furnace charge of roasting of «strong» main oxides, such as CaO, Na₂O, K₂O, due to formation of strong thermodynamic connections with «strong» acid oxides (SiO₂) leads to decrease in formation of ferrite and silicates of zinc;

– the optimum quantity of the entered additional component (CaO, Na₂O, K₂O) at which reaches minimum content of ferrite and silicates of zinc in a candle end, 7% of the mass of furnace charge are, at the same time decrease in ferrite and silicates of zinc by 1.5–1.7 times is observed;

– an optimum way of preparation of furnace charge of roasting is mixing of water suspension of the entered additional additives with a zinc concentrate (a wet charge making) that provides almost full enswathe with oxides of alkaline and alkaline-earth metals of particles of a zinc concentrate.

References:

1. Lakernik M. M., Pakhomov G. N. Metallurgiya of zinc and cadmium.– M.: Metallurgy, 1988.– 240 p.
2. Shivrin G. N. Metallurgy of lead and zinc.– M.: Metallurgy, 1998.– 190 p.
3. Volsk A. N., Sergiyevskaya E. M. Theory of metallurgical processes.– M.: Metallurgy, 1986.– 344 p.
4. Yesin O. A., Geld P. V. Physical chemistry of pyrometallurgical processes.– M.: Metallurgy, 1982.– 478 p.

*Matkarimov Sokhibjon Turdaliyevich,
Tashkent state technical university,
Tashkent, Uzbekistan
E-mail: sohibtm@gmail.com*

EXTRACTION IRON AND ITS COMPOUNDS FROM STEEL-SMELTING SLAGS SC "UZBEKSTEEL" BY USING GRAVITATION METHODS

Abstract: The problems of extraction iron and its oxidized compounds from steel smelting slags are considered in the article. It is shown that there is noticeable amount of the iron, which concentration comparable to poor iron ores of Uzbekistan, after allocation of magnetic components in dump slags. Various methods are investigated for their allocation, and gravitational enrichment on a concentration table is recognized as the most optimum technology.

Keywords: slag, oxide components, extraction iron, ecological problems, steel smelting slag, extraction, magnetic components, gravitational extract.

For years of independence the Republic of Uzbekistan has turned into dynamically developing state which is moving ahead on the way of technological progress.

Problems of rational use of natural resources and environmental protection are under constant attention of the leadership of the Republic of Uzbekistan [1].

The basic concepts of waste-free and low-waste technology are so far formulated; the main objectives and the directions of their development are planned. Features are revealed and the main directions of development waste-free and low-waste technologies of mining and metallurgical productions which consist in development of essentially new directions, nonconventional ways and improvement of the existing production technologies, for reduction at all his stages of harmful emissions of complexity of use of raw materials and full use of the formed waste are planned. It directly concerns also the only enterprise of ferrous metallurgy in the Republic, SC "Uzbeksteel".

The main source of raw materials for production of steel and various alloys on the basis of iron in SC "Uzbeksteel", is secondary ferriferous scrap and waste. The raw materials arriving on SC "Uzbeksteel" after primary preparation are processed according to the pyrometallurgical scheme, fusion in metallurgical furnaces. Melting of ferriferous raw materials on SC "Uzbeksteel" is made in two types of furnaces:

- the martin furnace using carbonaceous fuel;
- the arc steel-smelting furnace working at electric energy.

When melting ferriferous raw materials in both types of furnaces, at the expense of the proceeding physical and chemical changes steel-smelting slags are formed. The maintenance of Fe_{total} in the formed slags makes the considerable size (50–70%), and pure iron of 10–12%. Now on Uzbeksteel these slags for extraction of ferriferous components and pure iron are exposed to crushing, crushing and magnetic separation.

After processing slags contain 15–25% of the sum of Fe_2O_3 and FeO and also 2–4% of Fe_{met} . These slags aren't processed and stored now in special dumps while when melting steel in the martin and arc steel-smelting furnace as oxidizers apply Fe_2O_3 , FeO , iron ore, scale, agglomerate, iron ore briquettes and other materials abroad, for currency. At the same time the plant incurs substantial damages on the organization and operation of slag dumps.

Today reserves of slags make 1–1,5 million tons, the annual gain makes 60–80 thousand tons [2].

When carrying out approximate calculations it is possible to see that the quantity of Fe_2O_3 which is contained in the saved-up steel-smelting slags is 100–150 thousand tons, and the amount of pure iron is 20–40 thousand tons. As a result of extraction of iron and its connections from steel-smelting slag the volume of the oxidizer delivered from abroad will be reduced by 6.0–10.0 thousand tons when processing 60.0–80.0 thousand tons of steel-smelting slags in a year. Besides, it will have also considerable social effect since the ecological situation around the plant improves.

As a result of the research works which are carried out at department of Metallurgy it has been established that for extraction of iron and its compounds from the processed steel-smelting slags application of methods of gravitational enrichment is possible. The fact that about 90% of iron and manganese ores are enriched with gravitational methods also demonstrates to it and also individual share of gravitational methods in processing of the oxidized iron ores annually increases [3].

For definition of an optimum way of extraction of iron and its connections the following methods of gravitational enrichment have been used: jigging; enrichment on a screw separator; enrichment on a concentration table.

Optical properties of Fe_2O_3 sample were determined through UV-spectrum. The optical absorption spectra was recorded by using SHIMADZU IRAffinity – 1 (Figure 1).

Table 1. – Chemical consists steelmaking slag SC “Uzbeksteel”

Fe	FeO	Fe ₂ O ₃	CaO	SiO ₂	Al ₂ O ₃	MnO	MgO	P ₂ O ₅	SO ₃	Others
1.5–1.6	7.4–9.8	15.4–17.5	22.0–26.0	24.0–28.0	5.8–7.0	7.9–10.2	7.61–10.7	0.2–0.13	0.2–0.26	2.8–5.1

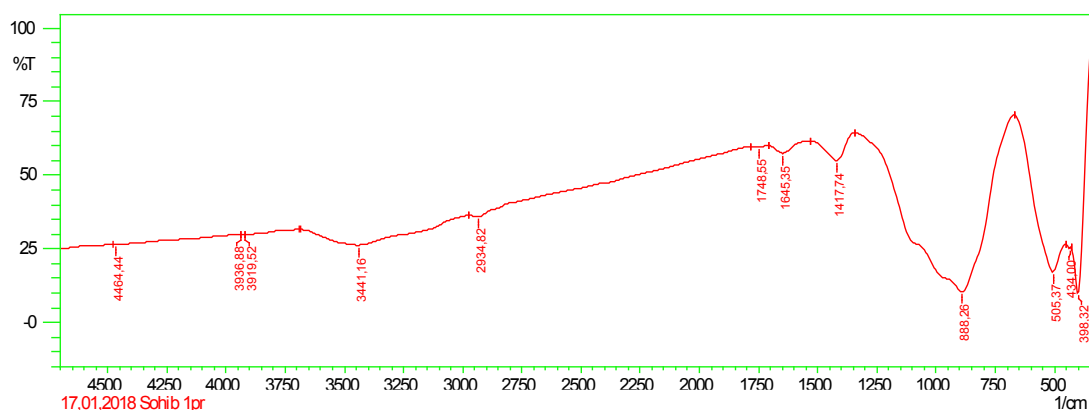


Figure 1. UV-spectrum of steel smelting slag SC “Uzbeksteel”

The UV spectrum of iron oxide manifests prominent absorption band located at 398.32, 434.00 and 507.37 cm⁻¹.

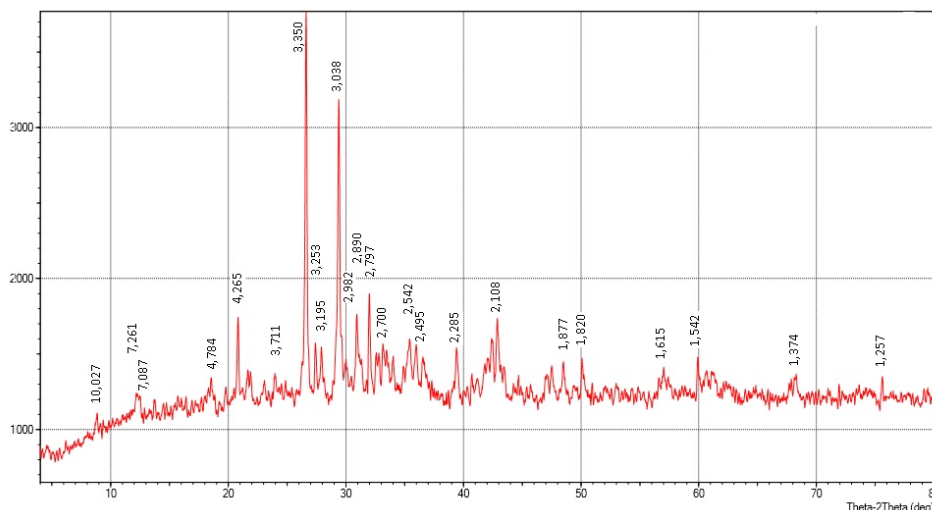


Figure 2. XRD pattern of steel smelting slag SC “Uzbeksteel”

The structural features of minerals are explored from XRD date (Figure 2). They are: anortit with sodium feldspar – 4.265; 3.343; 1.813; 1.539 Å; mullite – 2.855; 2,452 Å; hematite – 2.696; 2.518; 1.834; 1.688 Å; enstatit – 3.157 Å; magnetite 2.541; 1.612 Å.

On the structure steel-smelting slags are self-breaking up and low-active. The maintenance of Fe in slags fluctuates within 50–70%, pure iron – 10–12%.

Table 2. – Particle size distribution of the processed steel-smelting slag

Class, mm	Mass, kg	Out put, %	Total «+», %
1	2	3	4
+3.0	0.859	17.18	17.18
–3.0+2.5	0.280	5.6	22.78
–2.5+2.0	0.320	6.4	29.18
–2.0+1.5	0.470	9.4	38.58
–1.5+1.2	0.243	4.86	43.44

1	2	3	4
-1.2	2.828	56.56	56.56
Total	5.0	100	100

Extraction of iron and its connections from the processed steel-smelting slags is based by method of a jigging on a difference of speeds of a motion of grains in the pulsing environment [4]. The jigging was carried out in the laboratory two chamber jigger. At a jigging initial material is exposed to division into the layers differing on density and fineness which are formed on a jigger sieve in a result of periodic action of the ascending and descending streams of

the dividing environment, the driving mechanism caused by work. In the lower layers the heavy product, and in the top-easy concentrates.

The hinge plate of the processed steel-smelting slags weighing 5.0 kg was exposed to a research. Average values of results of 5–6 pilot studies are presented in (tab. 2). In experiments tails of the first jigging loaded again into the jigger therefore received two concentrates.

Table 2. – Qualitatively – a quantitative index of division of valuable components of the processed steel-smelting slag at a jigging

Products	Out put,%		Content,%		Extraction,%	
	kg	%	FeO+Fe ₂ O ₃	Fe	FeO+Fe ₂ O ₃	Fe
Original	5.0	100	17.6	3.8	100	100
Concentrate 1	2.45	49	15.2	2.21	42.3	28.6
Concentrate 2	1.05	21	16.8	2.3	20.0	12.8
Tails	1.5	30	34.4	7.4	37.7	58.6

At enrichment on a screw separator the uniformity of food was maintained. An amount of water in food it was set at the rate of receiving a pulp with a density of 20–30% of firm. The consumption of flushing water is regulated visually and averages 0.05–0.2 p/a.

Results of distribution of valuable components of the processed steel-smelting slags at enrichment on a screw separator are given in (tab. 3).

Table 3. – Qualitatively – a quantitative index of division of valuable components of the processed steel-smelting slag on a screw separator

Products	Out put,%		Content,%		Extraction,%	
	kg	%	FeO+Fe ₂ O ₃	Fe	FeO+Fe ₂ O ₃	Fe
Original	5.0	100	17.6	3.8	100	100
Concentrate 1	2.10	42.0	15.42	2.96	38.6	32.7
Concentrate 2	1.75	35.0	9.35	2.32	18.6	21.4
Tails	1.15	23.0	35.12	7.58	42.8	45.9

Analysis of data of (tab. 3) shows that losses with tails make considerable size that significantly reduces indicators of process and can hardly be an effective method of processing of the fulfilled steel-smelting slags.

At extraction of iron and its connections on a concentration table division of materials of slag comes from the processed steel-smelting slags in thin water flow, (sound board) flowing on a low-bevel flat surface of a table [5]. The sound board makes asymmetric returnable step the movements in the horizontal plane.

Pilot studies were conducted on a laboratory single-tier concentration table of LKS – 1Ya. The table is intended for material enrichment by fineness – 3 mm, productivity of a table of 15–20 kg/h; the size of the course of a sound board

is regulated in repartitions of 8–16 mm; number of the courses in a minute 275–325; inclination of a sound board from 0 to 100; water 0.5 consumption of m³/h [6].

After establishment of technical indicators of a table began performance of pilot study.

At first water in the quantity sufficient for a covering was pumped by a thin layer of all surface of a table. The processed steel-smelting slag moved in a loading box of a table in the form of the pulp received after crushing with L: S relation = 2:1.

Qualitative quantitative indices of enrichment of the crushed processed steel-smelting slags on a concentration table are given in (tab. 4).

Table 4. – Average values qualitatively – quantitative indices of division of valuable components of the processed steel-smelting slag on a concentration table

Products	Out put,%		Content,%		Extraction,%	
	kg	%	FeO+Fe ₂ O ₃	kg	%	FeO+Fe ₂ O ₃
Original	5.0	100	17.6	3.8	100	100
Concentrate 1	1.46	29.3	37.9	10.2	63.0	78.2
Concentrate 2	1.2	24.0	16.8	1.73	22.8	11.2
Tails	2.34	46.7	5.3	0.9	14.2	10.6

By results of the conducted researches it is visible that at enrichment of the processed steel-smelting slags on a concentration table extraction of valuable components makes,%: a concentrate 1 – FeO + Fe₂O₃–63.0; Fe – 78.2; a concentrate 2 – FeO + Fe₂O₃–22.8; Fe – 11.2.

The comparative analysis of indicators of extraction of FeO, Fe₂O₃ has been made for the choice of an optimum way of gravitational enrichment of the processed steel-smelting slags, Fe results of which are given in (tab. 5).

Table 5. – The comparative analysis of extraction of useful components from the processed steel-smelting slags by method of gravitational enrichment

Method extraction	Extractive valuable compounds	Extraction,%		
		Concentration – 1	Concentration – 2	Tails
Jigger	FeO+Fe ₂ O ₃	42.3	20.0	37.7
	Fe	28.6	12.8	58.6
Screw-separator	FeO+Fe ₂ O ₃	38.6	18.6	42.8
	Fe	32.7	21.4	45.9
Concentration table	FeO+Fe ₂ O ₃	63.0	22.8	14.2
	Fe	78.2	11.2	10.6

As a result of the carried-out comparison of results of enrichment of the processed steel-smelting slags, it is established that an optimum method at which the maximum extraction of FeO, Fe₂O₃, Fe is reached is enrichment of the processed steel-smelting slags on a concentration table.

The analysis of chemical, fractional and mineralogical composition of the processed steel-smelting slags is carried out.

It is established that for processing of these slags by the most acceptable use of gravitational enrichment is.

Conclusions: 1. It is shown that from all studied enrichment methods the most suitable technical and economic and technological indicators are received at enrichment of slags on a concentration table which can be recommended for industrial introduction.

2. Use of this development in the industry will allow to expand a source of raw materials of plant without capital expenditure for geological and mining operations and to pass to low-waste technology. At the same time waste slag can be actually eliminated that will favorably affect an ecological situation around iron and steel works.

References:

1. Sanakulov K. Scientific and technical bases of processing of waste of mining and metallurgical production. – Tashkent: Publishing house of FAN of AC of RUz, 2009. – 404 p.
2. Yusupkhodjayev A. A., Valiyev X. R., Khudoyarov S. R., Matkarimov S. T. Increase in efficiency of steel-smelting production by additional recovery of valuable components from the utilized slags. – M.: Magazine of “Ferrous metals”, 2015. – No. 1. 19–22 p.
3. Matkarimov S. T. and others, Studing methods of extraction iron and its compounds from steel-smelting slags // Proceedings of the international conference on integrated innovative development of Zarafshan region: achievements, challenges and prospects, Navai, 26–27 october 2017. – P. 182–184.
4. Yusupkhodjayev A. A. Theory waste free technology on the ferrous metallurgy. – Tashkent: TSTU, 2017. – 4 p.
5. Matkarimov S. T. and others, Researching of an optimum way of extraction of iron and its compounds from the steel-smelting slags / Proceedings of the international conference “Scientific–technical progress as factor of improving modern civilizations”, – Magnitogorsk, – 14 November, 2017. – P. 77–81.
6. Panfilov M. I. and others, Processing of slag and waste free technology on metallurgy, – M.: Metallurgy, 2009. – 156 p.

Astanakulov Komil,
doctor of technical sciences,
"Agricultural machines",
Tashkent Institute of irrigation and
agricultural mechanization engineers
E-mail: komil_uzmei@mail.ru

Ochildiyev Otabek,
Scientific-Research Institute of
mechanization and electrification of agriculture,
Scientific employee, laboratory
of cereal harvesting machines, Uzbekistan
E-mail: otabek_uzmei@mail.ru

RESEARCH THE LENGTH OF DIVIDER-GUIDE OF THE CEREAL COMBINE HARVESTER'S HEADER FOR ADAPTATION TO HARVEST THE SUNFLOWER

Abstract: It is optimal to equip with divider-guide for adaptation to harvest the sunflower of the cereal harvester combines' header, the solutions of this issue were developed in condition of Uzbekistan. Thus theoretical and experimental researches were explored according to define the length of divider-guide. As a result of the researches it was defined that, the optimal length of the divider-guide should be about 600 mm.

Keywords: sunflower, harvest, header, divider-guide, seed loss.

At present time oil plants are being grown in more than 115000 hectares by farms of our republic, the sunflower consists of more than 33000 hectares of them, and also it makes up more than 30 per cent of total oil plants and near 50 per cent of oil production that is produced from natural plants [1].

One of the most responsible and more manual work as well resource demander processes is harvesting crop during the growing of agricultural plants [2]. In practice of the world the sunflower is harvested by special header that harvests only the sunflower or by ordinary combines that their headers are equipped with additional mechanisms. In Uzbekistan there is no enough experience for using above mentioned means. Therefore, the sunflower is being harvested by the headers of the cereal harvester combines. However this technique is causing to increase of the seed loss that is more many times than defined requirement. In Uzbekistan growing the sunflower has not developed in recent years, therefore scientific-researches have not been done about harvesting sunflower in the republic. However, nowadays harvesting the sunflower without losing has been one of the actual tasks.

According to above mentioned ideas, the research-works are being carried out at scientific-research institute of mechanization and electrification of agriculture according to develop special mechanism to the cereal header for harvesting the sunflower. The developed mechanism consists of obstacle 1 and divider-guide 3, the obstacle 1 is installed behind the wall of

the header, the divider-guide 3 is installed bottom side of the header, and namely it is installed instead of stalk lifter that is used for harvesting the cereal crops (figure 1).

One of the most important parameters of the divider-guide is its length. As a result of the theoretical researches its length L_T was found according to conditions that the sunflower should not go down on the land, namely in front of header and this formula can be illustrated as a following manner [3]

$$L_T \geq x_{\kappa_1} + S_1 - S_\kappa \quad (1)$$

where x_{κ_1} – form of the stalk that after bending down, namely the situation of the stalk till cutting down it and a distance till the gravity center of the sunflower head, cm;

S_1 – a distance that the cut sunflower head moves along horizontal direction between time for going down at equal distance of installing height of the divider-guide, cm;

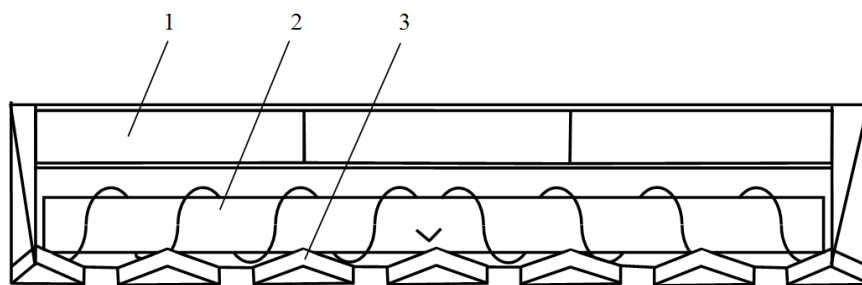
S_κ – a distance which combine harvester moves during the time of cut sunflower goes down at equal distance to the installing height of the divider-guide, cm.

The distance from base of the stalk and the gravity center of sunflower head that bent down until cutting it is defined by following formula

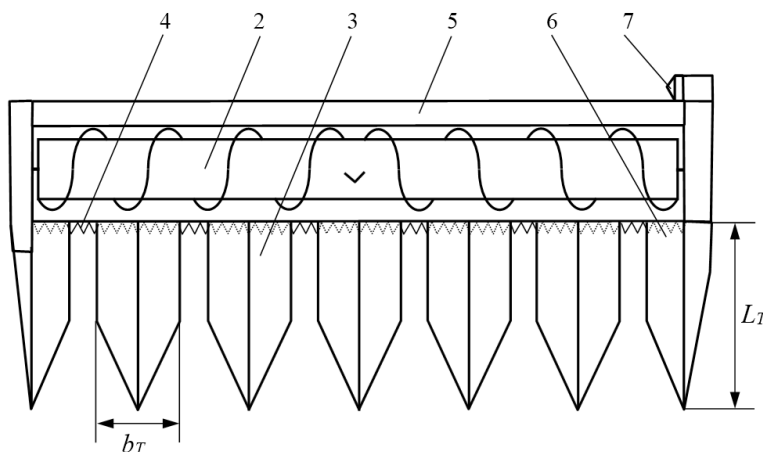
$$x_{\kappa_1} = \sin(\arctg \frac{x_\kappa}{y_\kappa} + \phi) \sqrt{x_\kappa^2 + y_\kappa^2} \quad (2)$$

where x_κ, y_κ – the location point of the sunflower head on x and y axes, m;

ϕ – the bending angle of the stalk that combine harvester bends till the stalk is cut down, degree.



– frontal side view of the implement;



– top view of the implement

- 1 – back obstacle, 2 – auger, 3 – divider-guide, 4 – knife, 5 – frame, 6 – side implement-bar, 7 – action sender part

Figure 1. Scheme of the cereal combine header that equipped with units of the implements which were developed for harvesting the sunflower

The distance that the cut sunflower head moves on horizontal direction between time the head goes down to distance that is equal to height of installing height of the divider-guide is defined by following formula

$$S_1 = V_{0x} t_1 \quad (3)$$

where V_{0x} – the projection the angle velocity of the sunflower head on x axis as a result the bending of the stalk, m/s;

t_1 – the time that a cut sunflower head arrives to distance which is equal installing height of the divider-guide, s.

The distance which combine harvester moves during the time of cut sunflower goes down at equal distance to the installing height of the divider-guide is defined by following manner

$$S_k = V_m t_1 \quad (4)$$

where V_m – velocity of combine, m/s.

According to above mentioned analysis formula (1) is formed as following manner

$$L_T \geq (V_{0x} - V_m) t_1 + \sqrt{x_\kappa^2 + y_\kappa^2} \sin(\arctg \frac{x_\kappa}{y_\kappa} + \phi) \quad (5)$$

This formula gives a defining opportunity of minimal length of the divider-guide that is installed on the header of

combine. When values $x_{\kappa l} = 0.54 \text{ m}$; $S_1 = 0.33 \text{ m}$ and $S_k = 0.37 \text{ m}$ were placed to this formula then it was counted, it was defined that the length of the divider-guide is not smaller than 51 sm.

Experimental researches were done at the aim checking results of the theoretical researches that according to define the length of the divider-guide. During the experiments different divider-guides were made that their lengths were 400, 500, 600 and 700 mm and they were installed on header, after that field experiments were done. The results of the experiments are illustrated by following line graph (figure 2).

The results of the done experiments showed that, when the length of the divider-guide was 400 mm, losses of the seed in header was 4.35 per cent, when the length was 500 mm, 2.18 per cent, at 600 mm it decreased to 1.84 per cent. However, when the length of the divider-guide was 700 mm, the losses increased (Figure 2).

The analysis of the results that were defined by theoretical and experimental researches showed that the length of the divider-guide should be received about 600 mm. So that the header of the combine can provide the work-efficiency at defined demands with this length of the divider-guide.

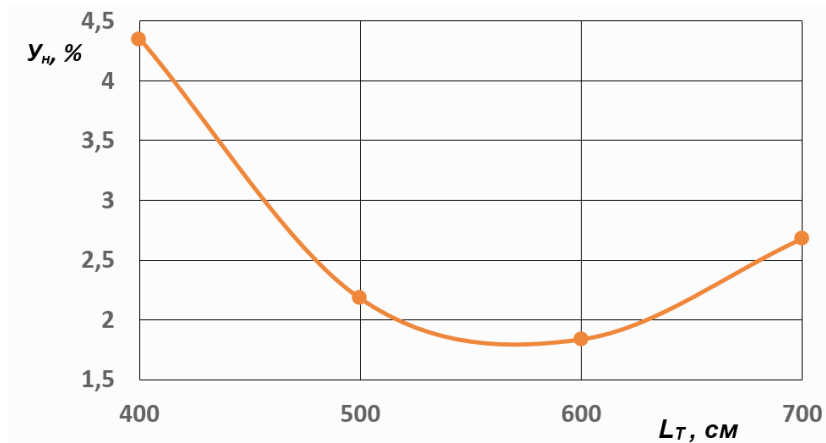


Figure 2. Changing of the seed losses in combine header by connection to L_T that is the length of the divider-guide

References:

1. Astanakulov K. D., Karimov M. Working out and implementation of the safflower cleaning machine // European science review. Austria, – Vienna. 2016. – No. 3–4. – P. 278–280.
2. Astanakulov K. D., Fozilov G. G., Baratov A. Researching of machines for early harvesting the cereal crops on small farm // European science review. Austria, – Vienna. 2015. – No. 9–10. – P. 127–128.
3. Scientific-technical solution of the sunflower harvesting in condition of Uzbekistan // From innovative ideas to innovative economy: Proceedings of the III Tashkent international innovation forum. The science and technology agency of the republic of Uzbekistan, – Tashkent, 10–12 may, 2017. – P. 245–249.

*Ravshanov Suwankul,
candidate of technical sciences Ph D.,
Tashkent Chemical Technology Institute,
Tashkent, Uzbekistan*

*Kholmuminov Abdulfatto,
doctor of technical sciences professor
Nationally University Uzbekistana,
Tashkent, Uzbekistan*

*Musaev Khasan,
researcher of Tashkent Chemical Technology
Institute, Tashkent, Uzbekistan*

*Baltabayev Ulugbek,
Ph D., of Tashkent Chemical Technology
Institute, Tashkent, Uzbekistan.*

*Ismatova Shaxnoza,
researcher of Bukhara Engineering-Technological Institute,
Bukara, Uzbekistan
E-mail: suvanbex@mail.ru*

EFFECT OF WATER-SORPTION PROPERTIES OF WHEAT GRAINS ON HYDROTHERMAL TREATMENT PROCESS

Abstract: In article influence moisture – sorption properties of seed of wheat on process of hydroheat treatment is investigated. In the studied grades of “Brigada”, “Pervitsa”, “Sila”, “Gazgon” and “Astana-2” wheat a time and macrocapillaries endosperm in 1000–2000 multiple increase on the electronic scanning microscope are defined. The course of infiltration in the center endosperm is revealed.

Keywords: wheat, moisture-sorption properties of seed of wheat, moistening, hydroheat treatment, moisture absorption, process of moisture transfer, capillaries.

The quality of products in any flour mills depends largely on the quality of the original grain. In this direction, European countries and Uzbekistan, as well as the CIS countries, have a different approach to the implementation of multi-grade grinding of wheat flour. In Europe, the delivery of grain to the mill is made with the moisture content specified in the general recommendations of the grain mill conditions, minimal contamination, etc. [1]. Grain coming from the elevator for processing usually has a low moisture content, while the structural and mechanical properties of the endosperm and membranes differ slightly. However, the quantity and quality of finished products obtained from wheat with initial moisture will not be compatible with the rules for organizing and conducting technological processes in mills [2].

To change the technological properties of wheat grain to obtain multi-grade grinding, various methods of hydrothermal treatment (HTT) or conditioning are used. When conducting the HTT, the grains seek, above all, to increase the strength of the membranes, and to reduce the strength of the

endosperm. The ability of hydrophilic biopolymers of a grain to absorb and retain moisture depends on the temperature of the environment, the process temperature and some other factors, the most important of which are the features of the anatomical structure and chemical composition of the grain.

The mechanism of sorption interaction of grain with water can be represented as follows. More than 90% of the dry matter content in wheat is hydrophilic biopolymers (proteins and carbohydrates). Their macromolecules contain a large number of functional groups that have a stock of free energy. Such groups in carbohydrates are –OH and –O, and in proteins –NH, –NH₂ –COOH, –CONH₂, –OH and others. Each of the above groups has a certain amount of energy sufficient to capture and hold one, two or more water molecules. In the literature for each of these active groups there are contradictory data [3; 6].

These differences appear to be due to the fact that the sorbing ability of the active groups is not constant, but depends on a large number of factors: the location of the group

in the protein or carbohydrate molecule (for example, in the peptide chain or in the side branch of the protein molecule), the presence of the shielding environment of the nearest segments of the macromolecule and etc. It is logical to assume that the energy level of the active centers of macromolecules of grain biopolymers is a certain continuous function of many variables, varying from the lowest to the highest value, depending on the specific circumstances.

A feature of polymers is the absence of a solid crystal lattice. Therefore, adsorbed molecules can penetrate deep into it, which causes swelling of substances, especially during the formation of hydrogen bonds, as is observed when interacting with water. Due to the irregular arrangement of the active centers in the volume of the grain, the sorbed water molecules do not form a continuous, continuous layer (monomolecular layer), but are grouped around the active centers in the form of bunches. It is conditionally possible to imagine that active

centers are evenly distributed on a certain plane, forming an active surface. It may form a mono – or polymolecular layer of water molecules. This model of active surface will be used in the future. There is evidence that the absorption of moisture in the grain can be dramatically accelerated by external influences, including vibration. This effect is partially reflected in the scientific article by L. V. Ustinova [4].

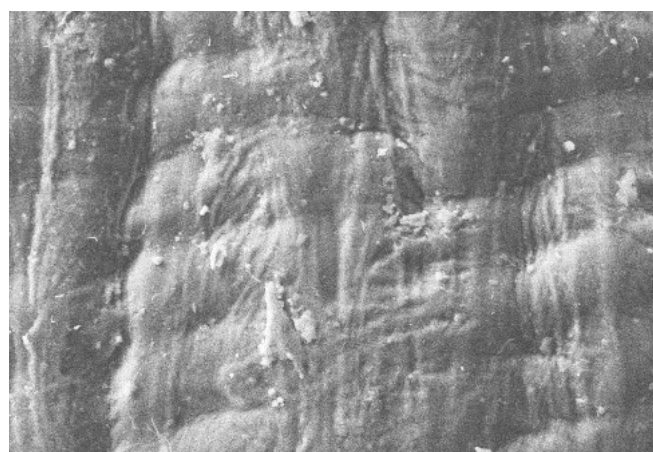
The calculation shows that the total volume of capillaries is 10–12% of the total volume of grain. The surface area of their walls is about 200 m² for 1 g of grain. Thus, if we expand the capillary formations of grain onto the plane, we will obtain a huge surface accessible for interaction with water molecules.

But even more is the area of the so-called active surface of the grain. It is obtained if the entire amount of water that forms the monolayer in the process of sorption wetting is distributed with a thickness of one molecule on a certain surface. The active surface of the grain is about 300 m² per 1 g of grain.



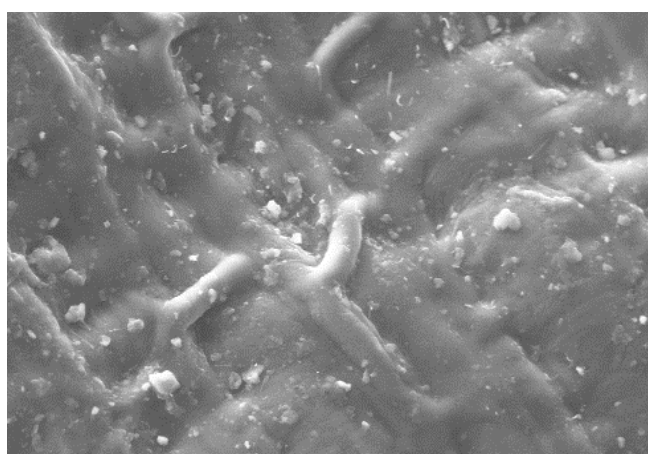
10 μm EHT = 10.00 kV Signal A = SE1 Date :5 Nov 2018
WD = 8.5 mm Photo No. = 4312 Time :17:57:21 ZEISS

“Brigade”



10 μm EHT = 10.00 kV Signal A = SE1 Date :5 Nov 2018
WD = 8.5 mm Photo No. = 4307 Time :17:37:41 ZEISS

“Pervitsa”



10 μm EHT = 15.00 kV Signal A = SE1 Date :3 Nov 2018
WD = 8.5 mm Photo No. = 4296 Time :17:06:26 ZEISS

“Strength”

Figure 1. Image of the fruit shells of the grain “Team” “Pervitsa” and “Force” as well as local wheat grains, 1000 times the magnification of the electron microscope SEM – EVO MA-10

This work was carried out in the direction of experimental studies of ultrasonic modes, which determine the vibration effects in the process of hydrothermal processing of local wheat grain. The studies were conducted on UZDN-2T with a frequency of 22 kHz on wheat located 1 min in aqueous media at 20 °C [5]. Based on the results of the study, it is possible to reduce the time of soaking in 1.5–2.0 times of moisture due to the vibration effect of the grain, which leads to uniform absorption of water molecules in the grain and an increase in the sorbent properties of the grain.

The absorption of water by the grain in the liquid state has features. In the first few seconds, the grain absorbs 3–5% of moisture, and then for a certain period the moisture of the grain remains unchanged. This initial capture of water is carried out by fruit membranes, which have a large number of capillaries, pores, voids, which serve as a reservoir for the primary accumulation of moisture. The process is illustrated in fig. 1 on the example of grain “Brigade”, “Pervitsa”, and “Strength”, as well as local wheat grains. Images are presented at 1000x magnification and performed on an electron scanning microscope SEM – EVO MA-10.

It has been studied that water absorbed by the fruit membranes is bound fragile and partially evaporates in the atmosphere

[3]. Scientists have studied the durable retention of water and the prevention of its loss is due to the high hydrophilicity of the seed coat, the embryo and the aleurone layer, in which water moves rapidly and is firmly bound by proteins and starch.

In the literary analysis, it was shown that the boosted water will actively interact with the grain proteins and carbohydrates of grains, change their structure and properties and become bound, as well as the degree of adhesion, energy levels of active centers, separation of sizes and structure of granular capillaries [3].

In order to study the structure and size of the endosperm capillaries, pores and cavities of wheat, the local varieties “Strength”, “Pervitsa” “Brigade”, from Russia “Gazgon” and from Kazakhstan “Astana-2” and scanning electron microscope SEM – EVO MA were used. –10, it increases from 1000 to 2000 times and determined the following:

Physico-chemical parameters of wheat varieties grain moisture (GOST 13586.5–85), nature (GOST 10840–64), weight 1000 wheat grain (GOST 10842–89), glassiness of grain (GOST 10987–76), ash content of grain (GOST 10847–74), according to (GOST 23586.1–68), the quality and quantity of gluten in wheat was determined. The results are presented in (table 1).

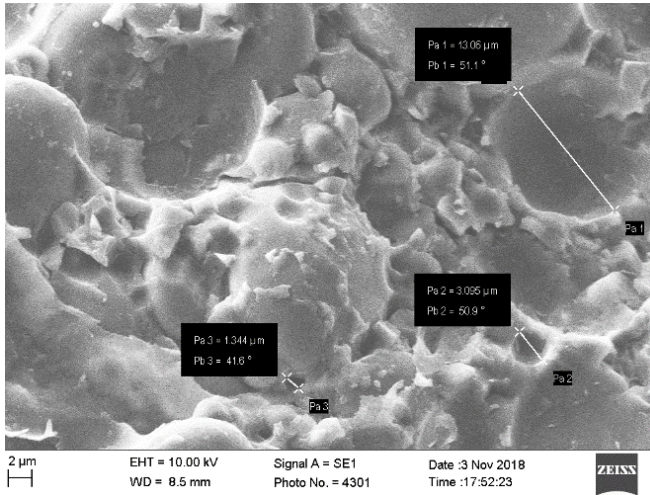
Table 1. – Physical and chemical parameters of wheat varieties

Wheat varieties	Glassiness,%	Grain nature, gr / l	Humidity,%	The amount of endosperm,%	mass of 1000 grains, gr	ash content,%	Amount of gluten,%	IDK indication,	Grain volume, mm ³	Outer area, mm ²
“Strength” (Uzbekistan)	45	760	10.2	82.35	37	1.74	27	86	25.09	58.60
“Pervitsa” (Uzbekistan)	38	770	10.0	82.56	43	1.65	24	85	29.39	67.57
“Brigade” (Uzbekistan)	46	782	9.2	82.84	39	1.72	26	66	26.89	60.62
“Gazgon” (Russia)	41	720	10.4	82.22	38	1.63	28	82	26.31	61.85
“Astana – 2” (Kazakhstan)	40	803	12.8	82.87	36	1.69	26	75	26.11	58.84

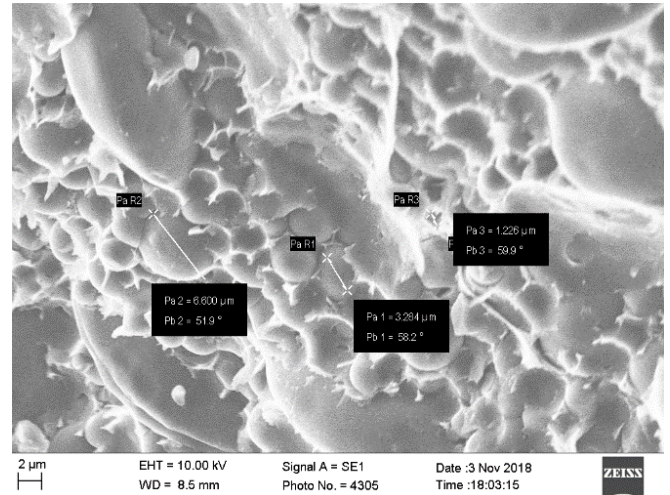
A. B. Ginzburg, V. Dubrovsky, E. D. Kazakov, G. S. Okun, V. A. Rezchikov It has been studied that the humidity, temperature, vitreousness and chemical composition of a grain have a significant effect on the size and structure of the capillaries, pores and voids of wheat grain [6]. In (fig. 2) shows the size and structure of the capillaries, pores and voids of wheat grain at room temperature 200 °C.

The results of the study showed that the smallest pore size of wheat endosperm was 0.175 µm in the “Brigade” variety (Uzbekistan), and the largest in the “Gazgon” variety (Russia) was 13.060 µm. The average pore size, wheat

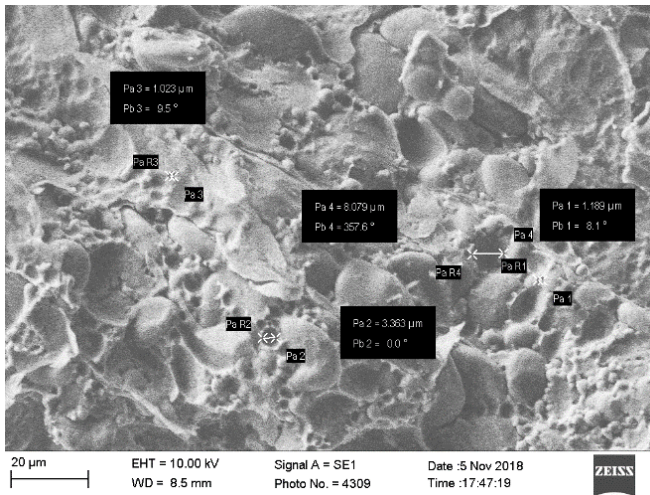
varieties Astana-2 (Kazakhstan) is 3.700 microns, Gazgon (Russia) – 5.833 microns, Brigada (Uzbekistan) – 3.637 microns, Pervitsa (Uzbekistan) – 3.413 microns, Sila (Uzbekistan) 2.465 microns. Here you can determine the free volume of water contained in the pore of the endosperm of wheat. From this we can conclude that the increase in pore size within terms of chemical composition is different, the structure allows to save energy and yield of intermediate products. With increasing pore size, the time of diffusional absorption of moisture inside the grain during hydrothermal processing decreases.



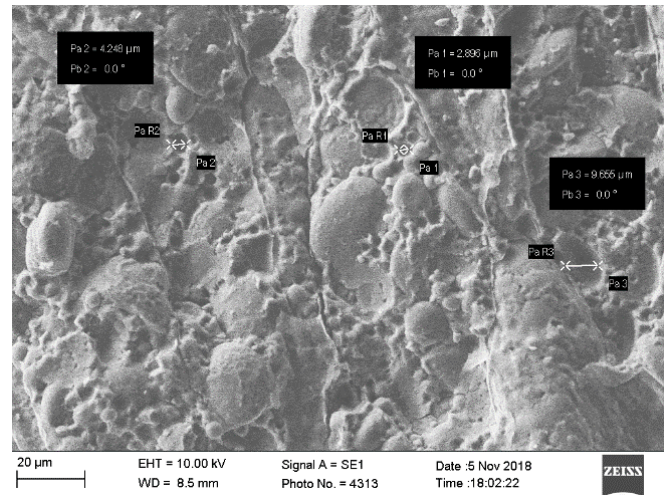
“Gazgon” (Russia)



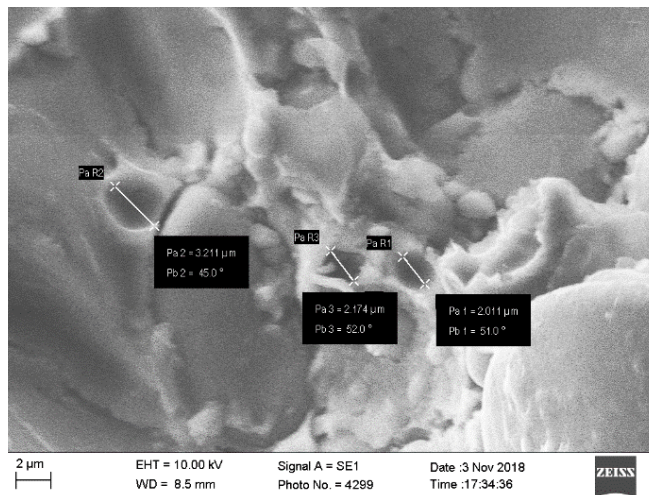
“Astana-2” (Kazakhstan)



“Pervitsa” (Uzbekistan)



“Brigade” (Uzbekistan)



“Strength” (Uzbekistan)

Figure 2. Electron microscopic image of cuts of various grain samples

Internal friction decreases as a result of internal friction. Experimental results show that Gazgon (Russia) has an en-

dospersm pore size of 5.833 microns, and has high milling properties.

Taking into account that the average pore size of the Astana-2 wheat variety (Kazakhstan) is 3.700 microns, and considering that the moisture content is more than 2–2.5% compared to other varieties, there are also larger pores than the local wheat.

The size of the macrocapillary endosperm is from 0.144 mkm to 0.268 mkm. The degree of development of

the protein part of the endosperm, and its microstructure, increase the efficiency of hydrothermal processing in preparing wheat for the production of varietal flour. Experimental results show that when preparing local wheat varieties for processing, it is necessary to modernize the hydrothermal treatment.

References:

1. Vorobiev V.P. Tekhnologicheskiy process na melnitsax po pererabotki pshenitse myagkix sortov i rji.– Barnaul: TTO AdministratiiAltayskogokraya, 2002.– 81 p.
2. Pravila organizatsii I vedeniya texnologicheskogo protsessa na mukomolnix zavodax, ch1 I ch. 2.– Moskva “Zernoprodukt”, 1991.
3. Egorov G. A. Upravlenie texnologicheskimi svoystvami zerna. VGU – Voronej: 2000.– 348 p.
4. Ustinova L. V. Vibratsionnoy uvlajnenie zerna // Jurnal “Xraneniya I pererabotka selxozsiryaya” – M., 2011.– No. 12.– P. 62–63.
5. Ravshanov S. S., Kholmuminov A. A., MusaevKh.P. Bug` doy don gigahydrotermic ishlov berishni ultratovush tasirida jadallashtirish // Jurnal “Kimyo va kimyotexnologiya” – Toshkent, 2018.– No. 4.– P. 62–63.
6. Ginzburg A. S., Dubrovsky V.P., Kazakov E. D., Okun G. S. Rezchikov V. A. Vlagizerna.– M.: Kolos. 1969.– 224 p.

Sayfiddinov Sadriddin,
 associated-professor,
 Tashkent Institute of Architecture and Civil Engineering
 Tashkent, Republic of Uzbekistan
 E-mail: ssadriddin51@mail.ru

TRANSFER OF HEAT THROUGH PROTECTIVE OPERATED WALL STRUCTURES AND THEIR THERMOPHYSICAL CALCULATION FOR ENERGY EFFICIENCY

Abstract: This article deals with the issues of thermo physical calculation for energy efficiency operated wall constructions.

Keywords: Energy efficiency, thermo physical, constructions, calculation, building, structures, temperatures.

Introduction

The main task of building thermal physics is to substantiate the most appropriate heat and energy efficiency in the operation of building solutions (space-planning, structural, material, etc.) and enclosing structures that meet the requirements of providing an optimally favorable microclimate and energy efficiency in the premises technological processes.

The methods of building thermal physics are based on the general theory of heat exchanger and mass transfer processes in the material systems of walling (walls, windows, coatings, floors, etc.).

Thermodynamically, building envelopes are open systems that exchange energy (heat exchange) and matter (moisture exchange, air exchange) with the surrounding air environment.

Thermo physical methods and the greatest simplicity of computational operations are achieved using computational methods for steady-state, stationary, time-varying processes of heat exchange and mass transfer. However, the natural conditions of energy and substance exchange usually (in summer) are not of a steady state, but are associated with periodically changes in t , cf , J , V , and others. moisturizing, destruction).

Construction thermo physics, especially now, is more and more necessary and indispensable for improving the quality of construction, its energy efficiency, reducing the mass of the structure, applying new efficient materials, taking into account climatic features.

Thermo physical calculation of enclosing structures with a stationary, steady heat flow (winter conditions), in its simplest form, the enclosing structure of a building is a flat structure (wall, slab) bounded by parallel surfaces, i.e. it shares the air environment (external and internal) with different parameters.

The enclosing structure is called homogeneous, if it is made of the same material, and layered, if it is made of several layers that are parallel to the external surfaces of the enclosure.

Through a flat and sufficiently long fencing design, the heat flux passes perpendicular to its surface and at steady state – by a stationary heat flux arising at constant tempera-

tures ($t_3, t_5, t_{Mon...}$) of air adjacent to the warm and cold surfaces of a uniform fencing, the amount of heat Q passing through it can be determined on the basis of the Fourier law:

$$Q = (t_B - t_H) \frac{l}{\delta} FZ (Wt / m^{\circ}C) \quad (1)$$

Where τ_B and τ_H – temperatures on the inner and outer surfaces of the fence, $^{\circ}C$;

λ – material thermal conductivity ($Wt / m^{\circ}C$);

δ – fencing thickness, m;

F – fencing area, m^2 ;

Z – heat transfer time h (c).

From the above equality we get

$$l = \frac{Q\delta}{FZ(t_B - t_H)} (Wt / m^{\circ}C) \quad (2)$$

If the thickness of the fence, its area, transmission time and temperature difference (τ_B and τ_H are taken equal to one. T_0 $l = Q$ – thermal conductivity coefficient represents the amount of heat (joules), which passes per unit of time through $1m^2$ uniform fencing with a thickness of 1 m with a temperature difference on its surfaces $1^{\circ}C$.

The coefficient of thermal conductivity – λ is one of the main thermal characteristics of building materials. Its values vary widely (for example, marble is $\lambda = 3.5$ $Wt/m^{\circ}C$, for foam plastic is 0.04, metal-steel is $\lambda = 58$).

Pa the quality of construction can affect the change in thermal conductivity depending on:

a) from bulk density γ , kg/m^3 ;

b) the moisture state of capillary-porous materials.

The lower the bulk density of the material, the lower its coefficient thermal conductivity, the higher the heat-shielding function. So for brickwork with $\gamma = 1200$ kg/m^3 $\lambda = 0.4$, and at $\gamma = 1800$ kg/m^3 ; $\lambda = 0.7$.

In this regard, the ratio of thermal conductivity to the thickness of the fence λ / δ formula (1) is replaced by the reciprocal δ / λ ($^{\circ}C m^2 / Wt$) which is called the thermal resistance of the uniform fence and is denoted by the letter R.

Thermal resistance of the layered structure – equal to the sum of the thermal resistance of the layers, then eats.

$$R_k = \frac{\delta_1}{\lambda_1} + \frac{\delta_2}{\lambda_2} + \frac{\delta_3}{\lambda_3} + \dots + \frac{\delta_n}{\lambda_n} \quad (3)$$

When heat is transmitted through the building envelope from t_B to t_H , there is a temperature drop on the inner surface τ_B of the building envelope during the cold period of the year more uniform than the temperature of the room air – then eats. temperature period $t_B - \tau_B$.

Within the thickness of the structure, the temperature period is $\tau_B - \tau_H$. The temperature of the outer surface of the structure is slightly higher than the temperature of the outside air, and this difference is $\tau_H - t_H$. Each of these temperature differences is caused by the resistance of thermal absorption R_B or the resistance to heat transfer R_H .

The total resistance of the building envelope to heat transfer

$$R_0 = R_B + \sum_{\lambda}^{\delta} + R_H (^\circ C m^2 / W t) \dots \quad (4)$$

$$t_B - t_H = (t_B - \tau_B) + (\tau_B - \tau_H) + (\tau_H - t_H)$$

$R_B = \frac{1}{\lambda}$ depends on the size of the room, the texture of the surface of the fence, the speed of convection air flow, the magnitude of the differential $t_R - T_e$ (walls, floors) and accepted $= 0.114 \text{ } ^\circ\text{Sm}^2/\text{Wt}$.

$R_H = \frac{1}{\lambda}$ depends on the height and height of the building, wind speed and conditions of radiant heat transfer $= 0.045 - 0.09$.

The heat flux passing through the inner surface of the fence is determined by the formula:

$$\frac{t_B - \tau_B}{R_B} = \frac{t_B - t_H}{R_0} \quad (^\circ C m^2 / W t) \quad \text{from here}$$

$$R_0 = \frac{t_B - t_H}{t_B - \tau_B} R_B \left(\frac{^\circ C m^2}{W t} \right) R_0^{TP} = \frac{n(t_B - t_H)}{D t_H a_B}$$

$$\text{Reduced design resistance } R_0^{TP} = \frac{n(t_{B_{mean}} - \tau_{H_{mean}})}{\delta^{calc}}$$

Thus, thermal protection of a building is developed taking into account:

- climatic conditions of the area of construction and their parameters;
- rational space-planning and design solutions for buildings, including requirements for reducing energy consumption;
- standardized level of thermal protection of the building;
- normalized values of reduced resistances R_0^{TP} of walls, coatings (level 1 for sanitary and hygienic conditions and elimination of condensation on the internal surfaces of the structure; level 2 – increased energy-saving requirements 1.4–1.8 times; 3 level of energy consumption reduction in 2.5–3 times);
- selection of constructive solutions for external fences that have the required heat transfer resistance and their compliance with the requirements of heat engineering standards, then eats.

$$R_0 \geq 0,95 \div 1,1 R_0^{TP},$$

- calculation for a given area of the object, an indicator of the number of degrees of the heating period $D_d^0 \text{ day}$. according to the formula $D_d = (t_{B_{mean}} - t_{from\ the\ first}) Z_{from\ the\ first}$;
- the required calculation of the values of air exchange, infiltration and humidity conditions of the premises;
- determining the normative specific heat consumption for heating and ventilation;
- buildings q_v and its compliance with the required q_0^{TP} ;
- compiling tabular values of heat engineering and energy parameters of the project of the planned building using the formula KMK 2.01.04–97*

References:

1. KMK 2.01.04–97* Construction heat engineering. Gosarchitectstroy – Tashkent, 2011.
2. Marakaev R. Yu. “Physical and technical bases of building design” Manual.– Tashkent, 2003.
3. Handbook for the design of new energy-saving solutions for building heating equipment (KMK 2.01.04–97* – Tashkent, 2012).
4. KMK 2.01.18–2000* Regulatory energy consumption for buildings – Tashkent, 2011.

Salyamova Klara Djabbarovna,
D. Sc., professor,

Rumi Dinara Fuadovna,
Ph.D., senior researcher

Turdikulov KhusanboyXudoynazarovich,
junior researcher,

Institute of Mechanics and Seismic Stability of Structures
of the Academy of Sciences of the Republic of Uzbekistan

E-mail: klara_51@mail.ru

ANALYSIS OF SEISMIC STABILITY OF RETAINING EARTH STRUCTURES WITH ACCOUNT OF DISSIPATIVE PROPERTIES OF SOIL

Abstract: Formulation and solution of the problem of natural and forced vibrations and strain state of retaining earth structures (earth dams) under dynamic (seismic) influences are given in the paper with account of dissipative properties of soil, its moisture content and hydrostatic pressure on the upstream side.

Keywords: earth structures, stresses, strains, natural and forced oscillations, dynamic characteristics.

Introduction. Design, construction and operation of important hydro-technical structures in seismic regions, as is the territory of Uzbekistan, require continuous improvement of computational methods for assessing their strength and stability under various loads. Currently used regulatory methods for calculating hydro-technical structures for seismic effects are limited to a one-dimensional elastic scheme of structure [1; 2]. In the previously published works [3; 4] the authors have solved the problems of the dynamics to define stress-strain state of earth structures under basic static loads in a plane elastic statement.

In the proposed paper, dynamic problems concerning determination of oscillations (natural and forced ones) and strain state under dynamic effect are considered taking into account dissipative properties of soil, its moisture content and hydrostatics. The applied design schemes and methods for solving these problems are consistent with modern require-

ments for earthquake-resistant engineering of earth hydro-technical structures; this is reflected in the proceedings of the XIV World Conference on Earthquake Engineering (October 12–17, 2008, Beijing, China).

Intense and long seismic effects can significantly affect dynamic behavior and entire pattern of stress distribution in earth hydro-technical structures located in the zone of high seismic activity. The reliability and strength of such structures, the damage of which can cause great loss to the population of the underlying territories, are determined by the reliability of the forecast of stress-strain state of structures subjected to intense dynamic loads, especially in resonant mode.

The aim of the study is to assess the effect of structural features of the object, its real geometry, soil properties that make up the dam body, hydrostatic pressure on the upstream face and seismic effect causing the structure's resonant oscillations on its stress-strain state and dynamic behavior.

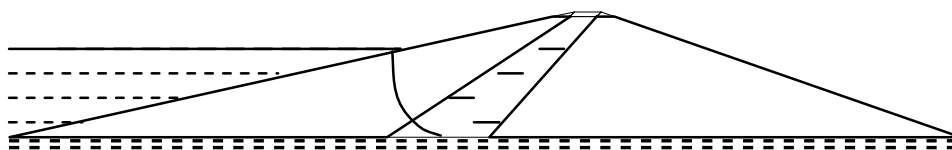


Figure 1. Design scheme of a retaining earth structure

Solution of the problem of unsteady forced oscillations of plane model of retaining earth structure is given in the paper on the example of earth dam of the Rezaksay reservoir [5], operated in the region with 7 point seismicity. The problem is solved numerically by the finite element method. The effect is represented by harmonic two-component acceleration – the record of real accelerogram of an earthquake. For a

$$\delta A = \delta A_{\sigma} + \delta A_Q + \delta A_p + \delta A_{ii} = - \int_V \sigma_{ij} \delta \varepsilon_{ij} dV + \int_V \rho g \delta v dV + \int_S \gamma h \delta v dS - \int_V \rho \ddot{u} \delta u dV = 0 \quad (1)$$

given kinematic effect, the displacements and stresses in the elements of the structure are determined at each moment of time, i.e. dynamic behavior and stress state are defined as functions of time at any point of the structure.

Statement of the problem. To study dynamic behavior of earth structure on a rigid basis under seismic effect, the principle of virtual displacements is used with the d'Alembert principle

The integrals in (1) represent the work of elastic forces, mass forces (ρg), hydrostatic pressure on the surface of upstream face (γh) and the work of inertial forces.

In the absence of hydrostatics, the surface of the side slopes and the dam crest are load-free, static boundary conditions on these surfaces are represented as

$$\sigma_{ij} n_j = 0, \quad (2)$$

where n is the vector of the normal to the surface.

An effect of hydrostatics on the surface of the upstream face of the dam, located in a homogeneous incompressible fluid of the reservoir, is reduced to setting a pressure linearly increasing with depth on the surface of the slope

$$p = \gamma z, \quad (3)$$

where z is the depth measured from the free surface of water; γ is the specific weight of water.

Boundary conditions at the lower boundary of the base are rigid, which is expressed at the absence of horizontal and vertical displacements:

$$y = 0: \delta u|_{y=0} = 0; \delta v|_{y=0} = 0. \quad (4)$$

Discretization of the model is represented by elements of triangular and rectangular shape; their matrices of stiffness and masses are given in monographs describing the FEM, for example, in [5].

As a result of the finite element discretization, the problem of unsteady forced oscillations of plane model of a dam is reduced to solving a matrix system of second-order inhomogeneous differential equations with a time-dependent right side

$$[M]\{\ddot{q}\} + [C]\{\dot{q}\} + [K]\{q\} = \{P(t)\} \quad (5)$$

where $[M]$ and $[K]$ are the matrices of mass and stiffness of the model; $\{P(t)\}$ is the load to be taken into account, which in general case depends on time (kinematic effect $[M]\{\ddot{u}_0(t)\}$), on coordinates (hydrostatic pressure on the upstream face), body weight of the dam (distributed over the dam); $\{q\}$ is the sought for displacements of the nodes of the finite element mesh, determined by the iterative Newmark method [6].

Attenuation matrix $[C]$ describes the internal friction caused by viscosity of the medium. To describe the absorbing, dissipative properties of soil and to obtain the resolving system of equations, the Kelvin-Voigt dynamic model of viscoelastic medium is used.

$$\sigma_{ij} = \lambda \theta \delta_{ij} + 2G \varepsilon_{ij} + \lambda' \dot{\theta} \delta_{ij} + 2G' \dot{\varepsilon}_{ij} \quad (6)$$

where σ_{ij} , ε_{ij} , $\dot{\varepsilon}_{ij}$ are the components of stress, strain and strain rate tensors;

λ, G are the Lamé constants; λ', G' are the corresponding coefficients of viscosity of the medium; $\theta = \frac{1}{3}(\varepsilon_1 + \varepsilon_2 + \varepsilon_3)$; $\dot{\theta} = \frac{1}{3}(\dot{\varepsilon}_1 + \dot{\varepsilon}_2 + \dot{\varepsilon}_3)$ are the average strain and strain rate; δ_{ij} is the Kronecker symbol.

The use of such model in structure calculation (built from earth materials) for seismic effects allows one to take

into account energy absorption in soil due to material viscosity, friction between solid particles, water-soil skeleton interaction under irreversible plastic strains, etc. In addition, this model makes it possible to evaluate absorptive capacity of earth structures, depending on the frequency spectrum of the structure.

Description of viscoelastic behavior is achieved by representing the components of strains and average deformations in a complex form $\varepsilon_{ij} = \varepsilon_{0ij} \exp(i\omega t)$, $\theta = \theta_0 \exp(i\omega t)$, as a result the strain rates and the rate of volume change are equal to $\dot{\varepsilon}_{ij} = i\omega \varepsilon_{0ij} \exp(i\omega t)$, $\dot{\theta} = i\omega \theta_0 \exp(i\omega t)$.

The use of complex modulus $\lambda(i\omega) = \lambda - i\omega \lambda'$; $G(i\omega) = G - i\omega G'$ allows to obtain a complex expression of the Hooke's law

$$\sigma_{ij} = \lambda(i\omega) \theta \delta_{ij} + 2G(i\omega) \varepsilon_{ij}, \quad (7)$$

an explicit expression for the dissipation matrix $[C]$, entering equation (5) before the derivatives of nodal displacements, is obtained as

$$[C] = \eta [K], \quad (8)$$

where $\eta = \lambda' + 2G'$ is the positive constant.

Thus, the resolving system of differential equations takes the form

$$[M]\{\ddot{q}\} + \eta [K]\{\dot{q}\} + [K]\{q\} = \{P(t)\} \quad (9)$$

where η is the viscosity coefficient.

The matrix of damping coefficients in (9) is proportional to the matrix of quasi-elastic coefficients, this case is called internal friction and is associated with the manifestation of viscous properties of material (in our case – of soil).

As a result of transformation of equation (9), a system of separate equations is obtained

$$\{\ddot{q}\} + \eta \text{diag}(\omega_i^2) \{\dot{q}\} + \text{diag}(\omega_i^2) \{q\} = [M]^{-1} \{P(t)\} \quad (10)$$

To fit the value of η the formula is used that links the coefficient ψ with the coefficients of friction η and frequencies (ω_i)

$$\psi = \frac{2\pi \eta_i \omega_i^2}{\omega_i}, \text{ hence } \eta_i = \frac{\psi}{2\pi \omega_i}.$$

Taking into account the range of variation $\psi(0,2 \leq \psi \leq 0,35)$ [6] and the spectrum of fundamental frequencies of the dam (3÷5.4 Hz), the following limits for the coefficient η for the dam soils $0,006 \leq \eta \leq 0,0175$ are obtained, from which the average value $\eta = 0.01$ is selected, later used in calculations of dynamic behavior of earth structures under kinematic harmonic effect.

Considering the problem of non-stationary forced oscillations of the Rezaksay dam, the horizontal kinematic action is represented by a harmonic function with the frequency of natural oscillations of the structure. Initial conditions are assumed to be homogeneous (zero): at $t=0$: $\{q_0\}=0$, $\{\dot{q}_0\}=0$. Duration of the effect is 2 seconds. The entire time interval taken in calculation is 3–4 seconds:

$$\ddot{u}_0 = \begin{cases} A \sin(2\pi pt) & 0 \leq t \leq 2c \\ 0 & t > 2c \end{cases} \quad (11)$$

After the cessation of the effect a free oscillation mode is set in the structure. The structure in the resonant mode makes 6–7 oscillations in 2 seconds; analyzing this it is possible to draw necessary conclusions about its dynamic behavior in seismic process.

Results. This kinematic effect with a frequency equal to the fundamental frequency of natural oscillations of the structure ($p = \omega_1 = 3.1$ Hz) is used to demonstrate the dynamic behavior of the structure in a dangerous resonant mode. In addition, it should be noted that such a harmonic effect with a period of $T = 0.05 \div 0.3$ sec can be classified as

seismic one, since its frequency range coincides with the frequency range of seismic effects. For example, the predominant period of the 1976 Gazli earthquake was about $T = 0.1$ sec. Thus, an artificially chosen effect may be a substitute for a real accelerogram. The amplitude of acceleration A is taken equal to $0.1g$, which corresponds to the intensity of the 7-point earthquake zone.

The studies have been carried out on three options of calculation of the Rezaksay dam under given kinematic effect: 1 – with account of its own weight and soil viscosity; 2 – with account of weight, soil viscosity and hydrostatic pressure on the upstream face; 3 – with account of moisture content of soil below the depression curve.

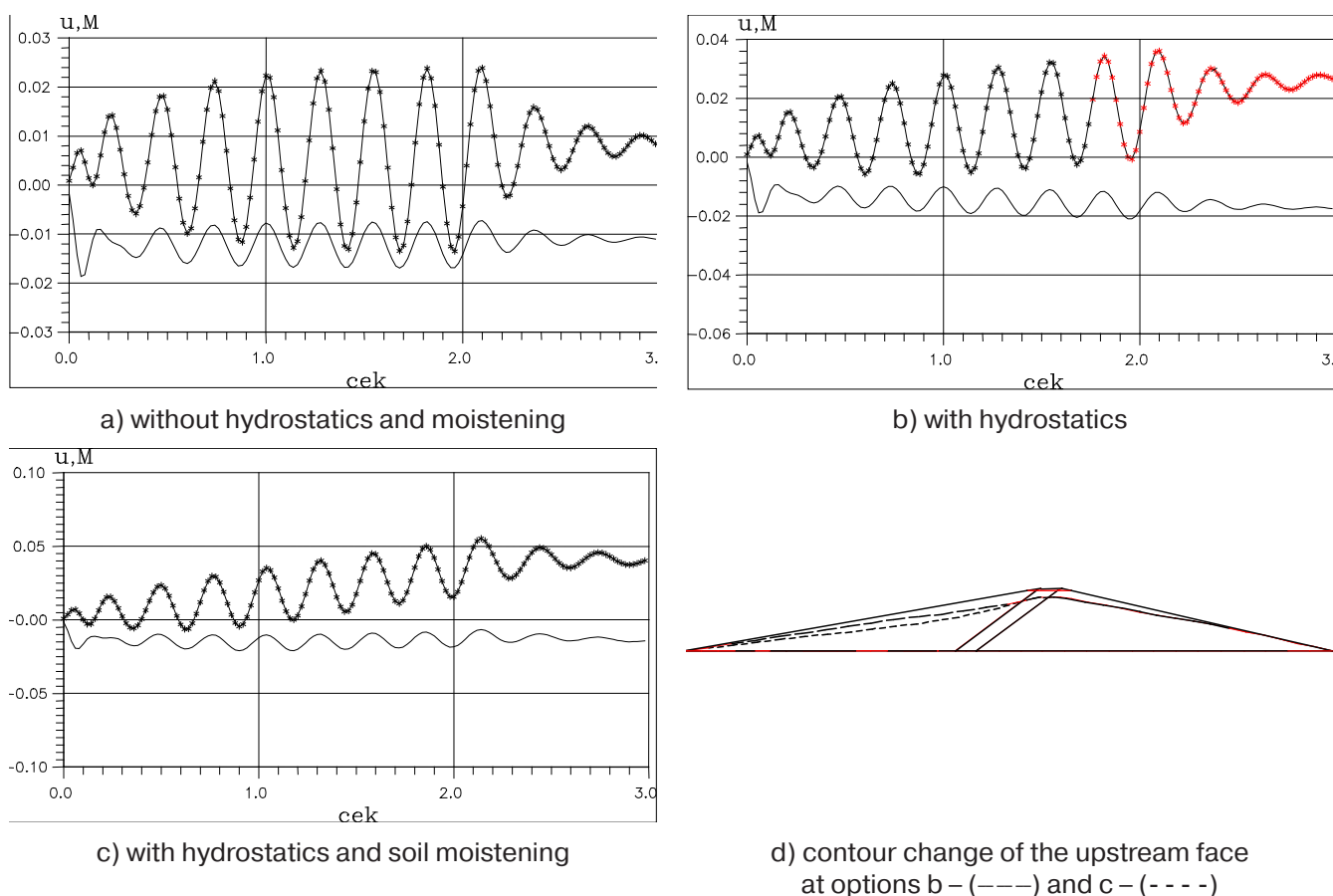


Figure 2. Horizontal (—*—*—) and vertical (—) displacements of the dam crest with dissipation in soil under kinematic effect

Displacements of structure points and the forms of strain of the structure are obtained on the basis of results of solutions are. Figure 2 a-c shows horizontal and vertical oscillations of a point on the dam crest for each of the options of oscillations, and figure 2 d shows a comparison of strains of dam contours at the end of each process (a-c). At the beginning of the effect, as seen from the figures, an increase in the amplitudes of horizontal oscillations, collinear to the direction of the effect, is observed.

An account of internal friction in soil contributes to the stabilization of oscillatory process with time and gradual damping of oscillations after the cessation of the effect. In the absence of hydrostatics, horizontal oscillations occur relative to the neutral position, and vertical ones relative to the position of static equilibrium, determined by structure displacement under its own weight (Fig. 2 a). After the cessation of the effect ($t > 2$ sec), the oscillations quickly attenuate and strain

state of the dam at the end of the process is characterized by low residual strains horizontally and by vertical settling at the level of static equilibrium position (Fig. 2 d).

Studying the effect of hydrostatic pressure of water on the upstream face on the dam dynamics, it is assumed that the level of reservoir filling corresponds to the design one – 77 m. In calculation it is taken into account that the hydrostatic pressure vector $\bar{P}(h)$ increases linearly with depth h and is directed perpendicular to the upstream face, i.e. it has components in both horizontal and vertical directions

$$\bar{P}(h) = \{\gamma h \sin(\alpha), \gamma h \cos(\alpha)\} \quad (12)$$

Here γ is the specific weight of water; α is the angle of inclination of the upstream face; h is the depth of the point on the upstream face of the dam, measured from the level of the free surface of water.

Thus, in calculation presented in (Fig. 2 b), two loads are involved: horizontal one – kinematic according to harmonic law (11) with the natural frequency of the structure and surface one – static (12) on the part of the upstream face that contacts water. Internal friction in soil with a viscosity coefficient of $\eta = 0.01$ is also taken into account. Horizontal and vertical displacements of the dam crest obtained with account of hydrostatic pressure (12) on the upstream face are shown in (Fig. 2 b). A comparative analysis of dam displacements obtained under horizontal kinematic effect without (Fig. 2 a) and with hydrostatics (Fig. 2 b) has shown that in a filled reservoir, dam displacements in horizontal and vertical directions almost doubled. Strain state of the dam at the end of the process versus initial unstrained one is shown in (Fig. 2 d) by long dash lines.

This solution corresponds to the case of filled reservoir with an upstream face reliably protected from moisture. At insufficient protection of the face from moisture in the dam, water is filtered and the parameters of soil below the depression curve change (Fig. 1). The problem of oscillations of the inhomogeneous Rezaksay dam under kinematic effect (11)

is solved in this statement, taking into account own weight, hydrostatic pressure of water and soil moistening.

To select physico-mechanical parameters of moisture-content of gravel-pebble soils, data on soil mechanics [7] were used, according to which the density of soil mass with 10% moisture-content increases and equals to $\rho = 2.2 \text{ tf/m}^3$. Taking into account velocity of propagation of longitudinal waves in such soil ($v = 1 \text{ km/s}$), the value $E = 2200 \text{ MPa}$ is obtained for the Young's modulus. Soils of the prisms (gravel) and loamy soils of the kernel are assumed to be un-moistened, and its physico-mechanical parameters (density, Young's modulus and Poisson's ratio) remain unchanged.

Crest displacements of the Rezaksay dam obtained under such assumptions, accounting its own weight, hydrostatic pressure and moisture-content under kinematic effect with a frequency equal to the fundamental frequency of natural oscillations of the structure, are shown in (Fig. 2 c), and strain state at the end of the process is shown by dash line in (Fig. 2 d) (short dash lines). In the same figure, the line of long dash lines shows the strain state of the dam, obtained without considering soil moisture-content.

The graphs in (Fig. 2 a-c) show a twofold increase in the horizontal residual strains in the crest as compared to vertical ones with account of hydrostatics and soil moistening. A comparison of the contours of the structure in (Fig. 2 d) indicates an increase in the curvature of the upstream face in near-crest zone of the moistened dam, which can cause its collapse.

Conclusions. Solution of the problem of forced unsteady oscillations of earth retaining structures using as example the earth dam of the Rezaksay reservoir has shown that:

- an account of internal friction of soil material over time stabilizes the amplitudes of horizontal and vertical oscillations;
- water pressure almost doubles the displacements of the dam in both horizontal and vertical directions, and soil moisture-content of the upstream fill increases the curvature of near-crest zone of the upstream face, increasing the chances of its collapse.

References:

1. Guidelines to Account Seismic Effects in Design of Hydro-technical Structures (SNIIP II-A.12-75).– Leningrad: Vedeneev VNIIG, 1977.– 164 p.
2. ShNK 2.06.11-04 Construction in Seismic Areas. Hydro-technical Structures. Gosarkhitekstroy.– Tashkent. 2004.– 54 p.
3. Salyamova K. D., Rumi D. F. Numerical Analysis of Stress-strain State of the "Earth Structure-Foundation" System // J. Siberian Federal University. SFU. Tekhnika. Tehnologies. 2016.– 9 (4).– P. 516-535.
4. Salyamova K. D., Rumi D. F. Dynamics of Earth Dams // Publishing House: LAP LAMBERT Academic Publishing Germany. 2015.– 146 p.
5. Zenkevich O. K. The Finite Element Method in Engineering.– Moscow: Mir. 1975.– 542 p.
6. Obratsov I. F., Saveliev L. M., Khazanov Kh. S. The Finite Element Method in Problems of Structural Mechanics of Aircraft.– Moscow: Higher School, 1985.– 392 p.
7. Dalmatov B. I. Soil Mechanics, Bases and Foundations.– Moscow: Stroiizdat. 1981.– 319 p.

*Toshmatov Davlatjon Abduraufovich,
junior researcher, doctoral student
of the Laboratory of Chemical Technology
of Institute of general and inorganic chemistry
of Uzbekistan Academy of sciences
E-mail: best3377@mail.ru*

*Yusupov Farhod Maxkamovich,
doctor of technical science
Head of the Laboratory of Chemical Technology
of Institute of general and inorganic chemistry of
Uzbekistan Academy of sciences
E-mail: fyusupov@yandex.ru*

*Baymatova Gulnoza Achedovna,
junior researcher of the Laboratory of Chemical Technology
of Institute of general and inorganic chemistry of Uzbekistan
Academy of sciences
E-mail: gulnoza6520@gmail.com*

PROCESSING OF OIL SLUDGE FOR THE CONSTRUCTION OF INTERFIELD ROADS

Abstract: As a secondary raw material for the first time, commercial sludge is widely analyzed to determine its group composition and physicochemical properties. Oil sludge contains many high-molecular derivatives of oils, such as condensed aromatic and naphthenic, asphaltene, resinous hydrocarbons. At the same time, a technology has been proposed for processing field sludge into oil-mineralized binders, by oxidizing them with atmospheric oxygen in moderate conditions. We have developed a technological scheme of a model installation for the production of oil-mineralized binders. The novelty of this development is that for the first time it has been proposed to obtain oil-mineralized binders and a technological scheme that works according to the method of converting sludge into a selective product – an oxidized binder for use in interfield road construction.

Keywords: oil, industrial sludge, oil-mineralized binder, asphaltenes, hydrocarbons.

Oil-mineral binders are obtained from the bituminous oil residue, tar and heavy oils by the oxidative condensation of their hydrocarbons. The process takes place with a moderate supply of air heated at 280–320 °C and a reaction time of 6–8 hours [1]. In the Republic, there is a problem of shortage of raw materials for asphalt bitumen production due to the deep processing of crude oil. Therefore, this problem is relevant and is of great practical importance. Methods for producing petro-

leum-mineral binders are based on the oxidative oligomerization reaction of heavy fractions of petroleum hydrocarbons.

One of the ways to obtain oil-mineralized binders from oil sludge is a method of obtaining from oil-water emulsions (prototype) used for the manufacture of road surfaces [2].

For the first time we use commercial oil sludge as a raw material for its transformation into oil-mineralized binder. Table 1 gives their group composition and Table 2 shows its fuel fractions.

Table 1. – Group composition of sludge

Name of group hydrocarbon composition	Varieties of sludge, %	
	Ground	Fishing
High molecular weight paraffin	42–50	25–40
Condensed aromatic	8–10	20–25
Naphthenic aromatic	15–17	15–17
Asphaltene-resinous	13–15	30–35

Table 2. – Characteristic of fuel fractions of commercial sludge (primary pursuit direct steam)

The name of indicators	Types of motor straps		
	Heavy gasoline	Kerosene	Diesel fuel
Fraction temperature, °C	120–200	220–260	220–340
Specific gravity, d_4^{20} , g/sm ³	0.740	0.810	0.835
Refractive index, n_D^{20}	1.4285	1.4420	1.4655
Condition – liquid:	Yellow-mobile	Red-mobile	Slightly brown oil

The essence of the proposed method of obtaining bituminous mineral binder from oil sludge consists of:

- rationing them for humidity and mechanical impurities;
- high-speed catalytic oxidation of oil sludge with intensive contact with oxygen in a mobile unit is quite mild (280–320°C and 6–8 hours) of the reaction;
- taring after normalization of the properties of the resulting oil-mineralized binder [3].

The proposed method differs from the known (prototype) methods for producing mineralized binder by the following qualities:

- significantly reduced the cost of the method of development, because the process is localized and it can be used in the fields;

- reduced cost of oil-mineralized binder;
- the volume of output increases due to the introduction of a new raw material volume – oil sludge into the raw material base for the production of oil-mineralized binder.

The composition and properties of commercial sludge, which contain up to 10–12% of higher paraffins, 25–30% of condensed naphthenes, up to 40% of condensed aromatic hydrocarbons, up to 10% of higher oily fractions, up to 15% of asphaltenes and up to 5% of petroleum resins, have been established.

From the dried tank oil sludge by thermal method, 14% were detected and hydrocarbon fractions with a boiling point up to 360°C, which are dark brown liquids with a specific odor, were investigated.

Table 3. – Characteristics of hydrocarbon fuel recovered from oil sludge

Indicators of fuel fraction of oil sludge	The output of the fraction by distillation, %	Specific weight, kg/m ³	Refractive index, n_D^{20}	Hydrocarbons, C/H, %	Cetane number
Indicators Kerosene fraction T. n.k, °C:					
190	4.2	824	1.4526	88/12	–
210	9.1	845	1.4605	90/10	56.4
230	33.2	868	1.4655	90.5/9.5	57.0
250	52.5	872	1.4682	90.8/9.2	56.9
258	66.8	–	–	–	–
Indicators Diesel fraction T. n.k, °C:					
250	70.4	880	1.4825	90/10	54.0
280	84.6	892	1.4950	91/9.0	53.5
310	98.1	905	1.4995	91.2/8.8	52.7
340	95.3	922	–	–	–
T. n.k, 360	97.8	–	–	91.4/8.6	–

As can be seen from the table, the light fraction of the tank sludge consists mainly of kerosene and diesel fuel [4].

On a gas chromatograph mass spectrophotometer HP GC/MS6890/5973. Under the following conditions: Column – HP 5% Phenyl Methyl Siloxane 30m × 0.25µm × 250 mm

Capillary. Injection: 2 µk. Oven: from 70°C to 260°C, 150°C /min. Mobile phase: Not (helium). Detector: a mass selective detector with a turbo pump. Computer base: laid 250 thousand known individual spectra on willey 275 L. Used to compare the obtained spectrum and its decryption.

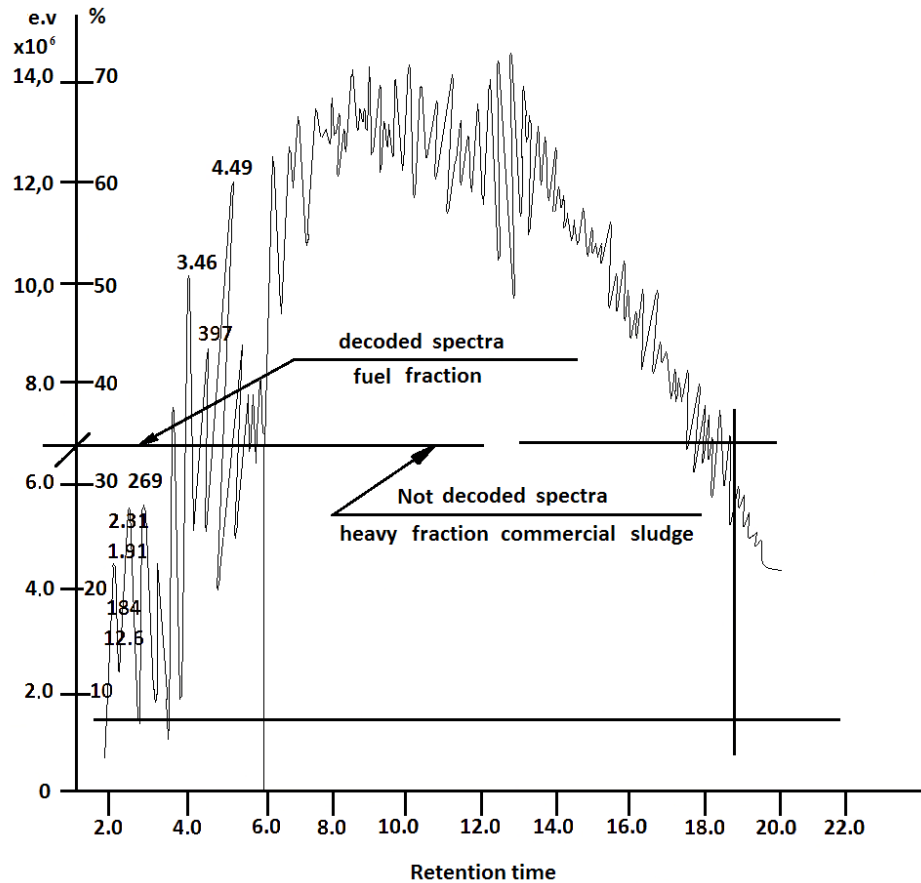


Figure 5. Chromatogram of sludge fuel fraction

According to the chromatogram, fractions of reservoir oil sludge in light fractions were detected in the fuel fraction of the tank sludge; their fractions are in%: heptane – 1.04, cyclopropane 2.05, dimethylhexane – 0.9, nonane – 1.69, decane 3.15, cycloheptatriene – 1.86, dimethyloctane – 2.41, undecane – 3.69, dimethylbenzene – 3.05, methyldecane – 1.73, geneicosane – 3.55, dodecane – 14.62, methylundecane – 11.31, tridecane – 48.60. The sum of the detected components is 99.99%. Thus, according to this method, highly efficient processing and utilization of commercial sludge is achieved and bitumen-mineral binder with quality indicators used to cover asphalt concrete roads is obtained [4].

Examples of the method for preparing mineral bonding from the industrial petroleum

Example 1. 1500 ml of oil sludge is loaded into the reactor of the laboratory installation and it is heated to 2600°C with a spiral electric heater. When the temperature limit is reached, the oil sludge is continuously drip-forcibly fed by an oxidizing agent heated by up to 2800°C – with oxygenation of air by bubbling (air consumption 15 l/min) for 35 hours. In the continuous reactor, the reaction of oxidative condensation proceeds relatively high molecular weight compounds of industrial sludge. The end of the reaction of oxidative conden-

sation of oil sludge hydrocarbons in its pento-octomers with a molecular weight of 3000–4500 g/mol is an indicator of the limit of volume saturation, when equilibrium is observed between the volume of incoming air and its blocking volumes from the reactor. At the same time, oil-mineralized binder continuously flows from the bottom of the reactor.

Indicators obtained petroleum mineralized binder:

- specific weight is 1135 kg/m³;
- softening temperature 520°C;
- dropping point 720°C;
- viscosity VZ-4, 800°C 64 sec.;
- mol. mass 4300 g/mol
- needle penetration in 10 mm 540°C

Example 2. In similar conditions of loading of industrial sludge into the reactor, oxidative condensation is carried out at a different reaction temperature of 280°C. 6–8 h. The result is a bitumen mineral binder with the following indicators:

- specific weight 1155 kg/m³
- softening temperature 54°C
- dropping point 80°C
- viscosity according to VZ-4 at 80°C 70 sec.
- penetration (10 mm needle) 55°C
- mol. mass 4900 g/mol

Example 3. In the above conditions of loading in the reactor sludge after separation of the fuel fraction, the reaction of oxidative condensation of its dodecimer and above. The reaction is carried out at a temperature of 3000°C and 45 hours with an air flow rate of 2 l/min. The result is a viscous mass of dark color – oil-mineralized binder with the following indicators of properties:

- specific weight 1170 kg/m³
- softening temperature 58°C
- dropping point 86°C
- viscosity according to VZ-4 at 80°C 75 sec.
- penetration (10 mm needle) 56°C
- mol. mass 5200 g/mol.

From this it can be seen that for the samples taken, the oil-mineralized binder is obtained with the corresponding indicators that meet the requirements of road construction:

– a method of obtaining oil-mineralized binder from the oil sludge by oxidizing the oil sludge with air oxygen at T = 280°C for 8 hours. At an oxidizer consumption of 1500 m³/t;

– oil-mineralized binder from commercial oil sludge is not inferior in its operational properties to well-known analogues:

- softening temperature 52–56°C;
- penetration, mm 24–25°C;
- dropping of 75–80°C;
- (indicators are defined by standard ISO methods).

Thus, for the first time, a method of producing a cheaper mineralized mineral mixture – a sandy oxidized binder from commercial sludge (up to 10–12%), sandy – oil sludge impregnation (20–30%), a mineral mixture (25–30%), crushed stone (20–30%) and cement (up to 10%). Here, sludge with its natural bitumen (oxidized asphaltenes and resinous compounds) is represented as a binder of mineral additives in sand concrete.

References:

1. Pat. 2171700 of the Russian Federation. The method of treatment of trap oils oil sludge out of barns BI number 22, 2001.
2. Gun R. E. Oil bitumens. – M.: Chemistry, 1973. – 432 p.
3. No. 3808012 / 29–33 Method of preparation of oil-mineral mixture / Gaitenko V. Z. and others. C04B26 Bull. No. 26 of 15.07.0987.
4. Toshmatov D. A., Yusupov F. M., Baymatov G. A. The preparation and properties of oil-mineralized binders from commercial oil sludge. *Universum journal*. 7(52) – Moscow. 2018.

Fayziev Khomitkhan,
doctor of technical sciences, professor,
Tashkent Institute of Architecture and Construction
E-mail: xomitxon@mail.ru

Rakhimov Sherzod Abduvakhobjonovich,
senior lecturer,
Tashkent Institute of Architecture and Construction
E-mail: Sherzod88.2017@mail.ru

Baymatov Shaxriddin Khushvaktovich,
senior lecturer,
Tashkent Institute of Architecture and Construction
E-mail: Shaxriddin82@mail.ru

CALCULATION OF UNSTEADY FILTRATION IN EARTH DAMS BY THE FINITE DIFFERENCE METHOD

Abstract: This article presents the solutions to the problem of unsteady filtering in earth dams using the finite difference method. An algorithm for solving the problem of unsteady filtering has been developed and a calculation program in the C# language has been compiled. The capabilities of the developed methods, the program for calculating unsteady filtering and the assessment of the reliability of the results obtained are illustrated by an example of filtration problems.

Keywords: earth dams, filtration, unsteady filtering, abrupt drawdown in water level in the upstream, rate of drawdown in water level, finite difference method.

At present the problem of harmful effects of filtering flow in dams erected of local materials is very urgent. Especially this concerns the structures of seasonal operation of reservoirs with large-amplitude oscillations in the upstream level. Changes in the upstream and downstream levels cause variations in the position of depression surface and the parameters of filtration flow (filtration gradients, rates and costs). Analysis of the operation of upper wedge of the dam at rapid drawdown of the reservoir has shown that its stability is significantly reduced due to the effect of hydrodynamic forces directed towards the upstream.

The problem of unsteady filtering is one of the most difficult in the field of filtration theory. For the first time the general equations of unsteady filtering have been proposed by N. E. Zhukovsky [1]. However, due to considerable complexity of the solution, these equations have been used much later.

A simplified derivation of the equation of unsteady filtering has been proposed by J. Boussinesq [1]. His assumption is that the horizontal rates of filtration flow are constant along the vertical direction; this formed the basis of the hydraulic theory of unsteady filtering. Further development of the problem of calculating unsteady filtering has been conducted by P. Ya. Polubarinova – Kochina, V. I. Aravin and S. N. Numerov, N. N. Verigin, V. S. Lukyanov, V. M. Shestakov, V. P. Nedriga, A. L. Mozhevitdinov and A. G. Suleymanov, L. N. Rasskazov, N. A. Aniskin, F. B. Abutaliev, Kh. Fayziev, S. N. Babakaev et al.

All solutions to the problems of unsteady filtering solved by analytical, hydraulic and analog methods are performed under certain restrictions: the simplest types of dams are considered; the drawdown in water level in each particular case is taken as instantaneous; an unsteady flow is considered as a succession of steady states. Naturally, these techniques are not equivalent to each other. Each of them has its own limits of application and provides the necessary accuracy within these limits only. Therefore, in general cases, they serve only for estimates in the first approximation. Some of them, more accurate solutions, are hardly ever used because of the complexity of the dependencies obtained.

As is known [1], at horizontal aquiclude and constant filtration coefficient of a medium, the nonlinear Boussinesq equation for a one-dimensional problem has the following form [1].

$$\frac{\partial h}{\partial t} = \frac{K_T}{\mu} \cdot \frac{\partial}{\partial x} \left(h \cdot \frac{\partial h}{\partial x} \right) \quad (1)$$

where h – is the hydrodynamic thrust;

x – is the abscissa of the depression curve point;

t – is the current time;

K_T, μ – are the coefficients of filtration and filter loss in soil.

To solve equation (1), several approximate methods have been proposed, including the linearization method. It is described in detailed in [1].

At present, a qualitatively higher level of solving such problems is achieved using numerical methods and, first of all, using the finite difference method.

Below, we consider the solutions of the Boussinesq equation by numerical-finite-difference method. Here equations (1) are considered together with the following initial and boundary conditions:

$$h|_{t=0} = h_{cp} \quad (2)$$

$$(1 - \alpha_1)(h(0, t)|_{x=0} - h_{cp}) + \alpha_1 \frac{\partial h}{\partial x}|_{x=0} = 0 \quad (3)$$

$$(1 - \alpha_2)(h(L, t)|_{x=L} - h_{cp}) + \alpha_2 \frac{\partial h}{\partial x}|_{x=L} = 0 \quad (4)$$

where h_{cp} is an average hydrodynamic thrust, x and t are the variables; α_1 and α_2 are the corresponding parameters equal to zero or 1 for the boundary conditions of the 1st and 2nd kinds. Problems (1) – (4) are called the boundary value problems of the mathematical physics.

To solve equation (1) with initial and boundary conditions (2) – (4) the finite difference method [2] is used. Transfer to the following dimensionless variables:

$$\begin{aligned} h^* &= \frac{h}{h_{cp}}; & x^* &= \frac{x}{L}; \\ t^* &= \frac{t}{t_m}; & a^* &= \frac{K_T h_{cp}}{\mu}; \\ h &= h^* \cdot h_{cp}; & x &= x^* / L; \\ t &= t^* \cdot t_m; & \alpha &= a^* \end{aligned}$$

Substituting these dimensionless quantities into equation (1) the following dimensionless differential equations convenient for solving are obtained:

$$\begin{aligned} \frac{\partial^2 (h^* \cdot h_{cp})}{\partial (x^* \cdot L)^2} &= a \frac{\partial (h^* \cdot h_{cp})}{\partial (t^* \cdot t_m)} \\ \frac{h_{cp}}{L^2} \cdot \frac{\partial^2 h^*}{\partial x^{*2}} &= \alpha \frac{h_{cp}}{t_m} \frac{\partial h^*}{\partial t^*} \end{aligned}$$

In the last equation we denote $\frac{\partial^2 h^*}{\partial x^{*2}} = \frac{aL^2}{t_m} \cdot \frac{\partial h^*}{\partial t^*}$; $\frac{1}{x} = \frac{aL^2}{t_m}$, then the following dimensionless differential equations are obtained

$$\frac{\partial^2 h^*}{\partial x^{*2}} = \frac{1}{x} \frac{\partial h^*}{\partial t^*} \quad (5)$$

To solve equation (5) with initial and boundary conditions (2) – (4), a grid is built:

$$\begin{cases} x_i = x_{i-1} + \Delta x, & x_0 = 0, & x_N = 1, & \Delta x = \frac{1}{n} \\ i = 1, \overline{n-1}; & t_k = t_{k-1} + \Delta t, & t_0 = 0, & t_k = 1, \Delta t = \frac{1}{k} \end{cases}$$

In further calculations, for convenience, the variables are written without an asterisk. The first order derivatives are approximated as follows:

$$\frac{\partial h}{\partial k} \approx \frac{h_{i+1} - h_{i-1}}{2\Delta x} + 0(\Delta x), \quad \frac{\partial h}{\partial k} = \frac{h_{i+1} - h_i}{\Delta x} + 0(\Delta x),$$

$$\frac{\partial h}{\partial k} \approx \frac{h_i - h_{i-1}}{\Delta x} + 0(\Delta x)$$

To approximate the second order derivative, the Taylor formula is used:

$$h_{(i+1)} = h_i + \frac{\partial h}{\partial x}|_{x=0} \Delta x + \frac{\partial^2 h}{\partial x^2}|_{x=0} \frac{(\Delta x)^2}{2} + \dots \quad (6)$$

$$h_{i-1} = h_i - \frac{\partial h}{\partial x}|_{x=0} \Delta x + \frac{\partial^2 h}{\partial x^2}|_{x=0} \frac{(\Delta x)^2}{2} + \dots \quad (7)$$

Summing up equations (6) and (7) we get:

$$\frac{h_{i+1} - 2h_i + h_{i-1}}{(\Delta x)^2} = \frac{\partial^2 h}{\partial x^2}.$$

In equation (5), the derivatives of the first and second order are replaced by finite difference relation:

$$\frac{h_{i+1} - 2h_i + h_{i-1}}{(\Delta x)^2} = \frac{1}{x} \cdot \frac{h_i - \bar{h}_i}{\Delta t},$$

$$h_{i+1} - 2h_i + h_{i-1} = \frac{\Delta x^2}{x\Delta t} (h_i - \bar{h}_i),$$

$$h_{i+1} - 2h_i - \frac{\Delta x^2}{x\Delta t} h_i = -\frac{\Delta x^2}{x\Delta t} \bar{h}_i,$$

$$h_{i+1} - \left(2 - \frac{\Delta x^2}{x\Delta t}\right) h_i + h_{i-1} = -\frac{\Delta x^2}{x\Delta t} \bar{h}_i.$$

Introducing some notation the following systems of algebraic equations are obtained:

$$a_i h_{i+1} - b_i h_i + c_i h_{i-1} = -d_i \quad (8)$$

$$i = \overline{1, n-1}$$

where $a_i = c_i = 1$, $b_i = 2 - \frac{\Delta x^2}{x\Delta t}$, $d_i = \frac{\Delta x^2}{x\Delta t} \bar{h}_i$,

$$i = \overline{1, n-1}$$

Then, equations (8) are solved by the sweep method using the following recurrent formulas:

$$h_0 = A_0 h_1 + B_0, \quad (9)$$

$$h_1 = A_i h_{i+1} + B_i, \quad i = \overline{1, n-1} \quad (10)$$

where A_0, B_0, A_i, B_i are the sweep coefficients.

If in (3) $a_1 = 0$, then the sweep coefficients are determined as follows:

If $A_0 = 0, B_0 = h_0, P_0 = A_0 h_1 + B_0$, and $\alpha_1 = 1$ then at $i = 1$:

$$h_1 = h_0 + \frac{\partial h}{\partial x}|_{x=0} \Delta x + \frac{\partial^2 h}{\partial x^2}|_{x=0} \frac{(\Delta x)^2}{2} + \dots$$

$$h_1 - h_0 - 0,5(h_2 - 2h_1 + h_0) = \frac{\partial h}{\partial x}|_{x=0} \Delta x = 0$$

$$2h_1 - 2h_0 - h_2 + 2h_1 - h_0 = 0$$

$$4h_1 - 3h_0 - h_2 = 0, \quad h_2 = 4h_1 - 3h_0 \quad (11)$$

$$a_1 h_2 - b_1 h_1 + c_1 h_0 = -d_1 \quad (12)$$

At $i = 1$, substituting (11) into equation (12) the dependencies for the sweep coefficients are obtained:

$$a_1(4h_1 - 3h_0) - b_1h_1 + c_1h_0 = -d_1$$

$$4a_1h_1 - 3a_1h_0 - b_1h_1 + c_1h_0 = -d_1$$

$$(4a_1 - b_1)h_1 - (3a_1 - c_1)h_0 = -d_1,$$

$$(3a_1 - c_1)h_0 = (4a_1 - b_1)h_1 + d_1.$$

$$h_0 = \frac{4a_1 - b_1}{3a_1 - c_1}h_1 + \frac{d_1}{3a_1 - c_1}$$

$h_0 = A_0h_1 + B_0$. Determine the sweep coefficients.

$$A_0 = \frac{4a_1 - b_1}{3a_1 - c_1}, B_0 = \frac{d_1}{3a_1 - c_1}$$

In the general case, the sweep coefficients are determined by the following formula:

$$A_i = \frac{d_i}{b_i - c_i A_{i-1}}, B_i = \frac{c_i B_{i-1} + d_i}{b_i - c_i A_{i-1}}, i = \overline{1, n-1} \quad (13)$$

If from initial conditions (4) $\alpha_2 = 0$, then $h_N = 1$. If $\alpha_2 = 1$, then:

$$h_{N-1} = h_N - \frac{\partial h}{\partial x} /_{x=N} \Delta x + \frac{\partial^2 h}{\partial x^2} /_{x=N} \frac{(\Delta x)^2}{2} + \dots$$

$$h_N - h_{N-1} + 0,5(h_N - 2h_{N-1} + h_{N-2}) = 0$$

$$2h_N - 2h_{N-1} + h_N - 2h_{N-1} + h_{N-2} = 0$$

$$3h_N - 4h_{N-1} - h_{N-2} = 0$$

With the following recurrent formulas:

$$h_{N-1} = A_{N-2}h_N + B_{N-1},$$

$$h_{N-2} = A_{N-2}h_{N-1} + B_{N-2} = A_{N-2}(A_{N-1}h_N + B_{N-1}) + B_{N-2} =$$

$$= A_{N-2}A_{N-1}h_N + A_{N-2}B_{N-1} + B_{N-2},$$

$$3h_N - 4h_{N-1} + A_{N-2}A_{N-1}h_N + A_{N-2}B_{N-1} + B_{N-2} = 0,$$

$$3h_N - 4h_{N-1}h_N + A_{N-2}A_{N-1}h_N = 4B_{N-1} + A_{N-2}B_{N-1} - B_{N-2}$$

$$(3 - 4h_{N-1} + A_{N-2}A_{N-1})h_N = 4B_{N-1} + A_{N-2}B_{N-1} - B_{N-2}$$

At $i = N$ for h_n the following formulas are obtained:

$$h_N = \frac{4B_{N-1} - A_{N-2}B_{N-1} - B_{N-2}}{3 - 4A_{N-1} + A_{N-2}A_{N-1}} \quad (14)$$

If $\alpha_1 = 0$, then h_0 and $\alpha_1 = 1$.

$$A_0 = \frac{4a_1 - b_1}{3a_1 - c_1}, B_0 = \frac{d_1}{3a_1 - c_1}.$$

At $i = \overline{1, n-1}$ the sweep coefficients are determined by (8):

$$a_i h_{i+1} - b_i h_i + c_i (A_{i-1} h_i + B_{i-1}) = -d_i$$

$$a_i h_{i+1} - b_i h_i + c_i A_{i-1} h_i + c_i B_{i-1} + d_i = 0,$$

$$a_i h_{i+1} - (b_i + c_i A_{i-1}) h_i + c_i B_{i-1} + d_i = 0,$$

$$(b_i - c_i A_{i-1}) h_i = a_i h_{i+1} + c_i B_{i-1} + d_i,$$

$$h_i = \frac{d_i}{b_i - c_i A_{i-1}} h_{i+1} + \frac{c_i B_{i-1} + d_i}{b_i - c_i A_{i-1}},$$

$$h_i = A_i h_{i+1} + B_i, \quad i = \overline{1, n-1}.$$

$$A_i = \frac{d_i}{b_i - c_i A_{i-1}}, B_i = \frac{c_i B_{i-1} + d_i}{b_i - c_i A_{i-1}},$$

$$i = \overline{1, n-1}.$$

If $i = 1$, then

$$A_1 = \frac{a_1}{b_1 - c_1 A_0}, B_1 = \frac{c_1 B_0 + d_1}{b_1 - c_1 A_0}.$$

The values of A_0, B_0 are determined from boundary conditions (3).

$$\text{If } i = 2, \text{ then } A_2 = \frac{a_2}{b_2 - c_2 A_1}, B_2 = \frac{c_2 B_1 + d_2}{b_2 - c_2 A_1}.$$

$$A_i = n-1, A_{n-1} = \frac{a_{n-1}}{b_{n-1} - c_{n-1} A_{n-2}}, B_{n-1} = \frac{c_{n-1} B_{n-2} + d_{n-1}}{b_{n-1} - c_{n-1} A_{n-2}}.$$

Thus, the sweep coefficients are determined by a straight sweep from initial and boundary conditions (2) (3). The values of the function

$$h_i - A_i h_{i+1} + B_i, \quad i = \overline{N-1, 1}.$$

are determined by the inverse sweep of the boundary condition (4).

The error of the problem approximation is of $O = (h^2 + \tau)$ order where $h = \max(\Delta x), \Delta x = 1/n$, the computational scheme is unconditionally stable in time and is reduced to solving the problem at h and τ tending to zero [8].

On the basis of the stated method of solving the boundary value problem [3] and numerous experiments on its testing on a computer, a working algorithm of calculation is developed.

Calculation program in C# language is aimed to perform the following computational operations:

1. Start the program.
2. Input of initial data.
3. Input of initial value of the thrust.

Organization of the first stage of the cycle in time ($t = 0, t = t + 0.5\tau$).

1. Calculation of coefficients of difference equations $a_i, b_i, c_i, u d_i (i = \overline{1, n-1})$.

2. Calculation of coefficients of direct sweep E_0, B_0 .

3. Determination of coefficients of direct sweep at the remaining points ($i = \overline{1, n-1}$).

4. Calculation of H_i at $i = n$.

5. Calculation of the field of thrust $H_n \cdot (i = \overline{n-1, 1})$.

6. Replacement of old values with new ones $\bar{H}_i = H_i (i = \overline{0, N})$.

7. Check of the time condition ($t \leq T$). If the time condition is met, this is the end of the program, and if not, the control is transferred to 4.

8. End of the program.

The developed methods and calculation program allow solving the problems of unsteady filtration in earth dams without drainage and with various types of drainage systems

(drainage prism, tubular drainage, layered drainage etc.) with impermeable and permeable bases.

The possibilities of the developed methods, the program for calculating unsteady filtering and the assessment of the reliability of the results obtained are illustrated below using the example of filtration problems [4].

A homogeneous earth dam with permeable base is considered. The initial depth of the upstream is $h_1(0) = 27$ m; the laying of the upstream is $m_1 = 3$; the laying of the downstream is $m = 2$; the filtration coefficient of soil of the dam body and the base is $K_T = K_{ocu} = 0.44$ m/day; the coefficient of water loss in soil of the dam body and the base is $\mu = 0.2$; the rate of water level drawdown in the reservoir is $\nu = 0.6$ m/day, the

level of the downstream is assumed unchanged and equal to $h_2(0) = 9$ m.

Solution of the filtration problem for the steady-state regime is taken as initial condition at the depths of the upstream and downstream 27 m and 9 m, respectively. Results of solving this non-stationary problem by the method of finite differences and its comparison with the V. Shestakov method are presented in (Fig. 1).

Thus, the results obtained using the FDM well agree qualitatively and quantitatively with the results of the methods compared. Differences in the estimates of the depression surface in the calculated sections do not exceed the permissible limits.

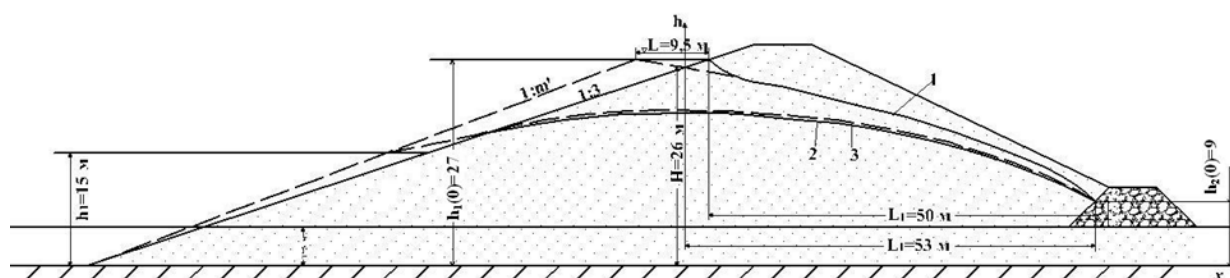


Figure 1. Results of calculations of unsteady filtering: 1 – initial depression curve at $t = 0$; 2 – positions of the depression surface by the V. Shestakov method at $t = 20$ days; 3 – positions of the depression surface by the FDM at $t = 20$ days

References:

1. Polubarinova-Kochina P. Ya. Theory of Groundwater Movement.– Moscow: Nauka, 1977.– 664 p.
2. Samarsky A. A. Introduction to the theory of difference schemes.– Moscow, Nauka, 1971.– 552 p.
3. Fayziev Kh., Babakaev S., Khazhiev I., Normatov M., Akhmedov I. Numerical Solution of a Boundary Value Problem of Unsteady Filtration in Homogeneous Earth Dams by the Finite Difference Method. Architecture. Building. Design.– No. 3. 2013.– P. 52–56.
4. Fayziev Kh., Babakayev S., Khazhiev I. O. Calculation of Unsteady Filtration in Homogeneous Earth Dams with Permeable Base. Vestnik. TIIZHT.– No. 1. 2014.– P. 21–25.

*Khasanov Bakhrom Bakhodirovich,
Senior teacher, Construction-technology faculty
Namangan Engineering-Construction Institute, Uzbekistan
E-mail: hasanovbahrom80@gmail.com*

CUBE AND PRISMATIC STRENGTH CHARACTERISTIC LIGHTWEIGHT CONCRETE ON POROUS AGGREGATES

Abstract: The issue of lightweight concrete, the cubic and prismatic strength on porous aggregates is revealed in the article below.

Keywords: lightweight concrete, cubic and prismatic strength, porous aggregate, cement, longevity, solidity, durability.

Provided article reflects the results of experimental and production tests and the calculation of the economic efficiency of the new material. Cubic strength was determined on cubes measuring 15 × 15 × 15 cm. 9 pieces from 3^x series-I, II and III. For the first series of samples, quartz sand was used as a fine aggregate, for the second and third, porous sand from the crushing of a porous aggregate. Cubes were tested at the age of 3, 7, 14, 28 days, and also 6 and 12 months. The loading speed on the press was 0.4–0.5 MPa per second.

The results of the conducted studies showed that the increase in strength of concrete continues after 28 days, and

this agrees with the conclusions of other researchers. The strength of the first series of concrete for the sixth month of storage increased by 16%, and the concrete of the third series by 21%. (Fig. 1).

Prismatic strength was determined by testing 9 samples with dimensions of 15 × 15 × 60 cm. The general view of the prisms in the tests in (Fig. 2). The values of the prismatic strength, as well as the coefficient of prismatic strength K_{ps} (the ratio of prismatic strength to cubic) is given in (Table 2) and (Fig. 3).

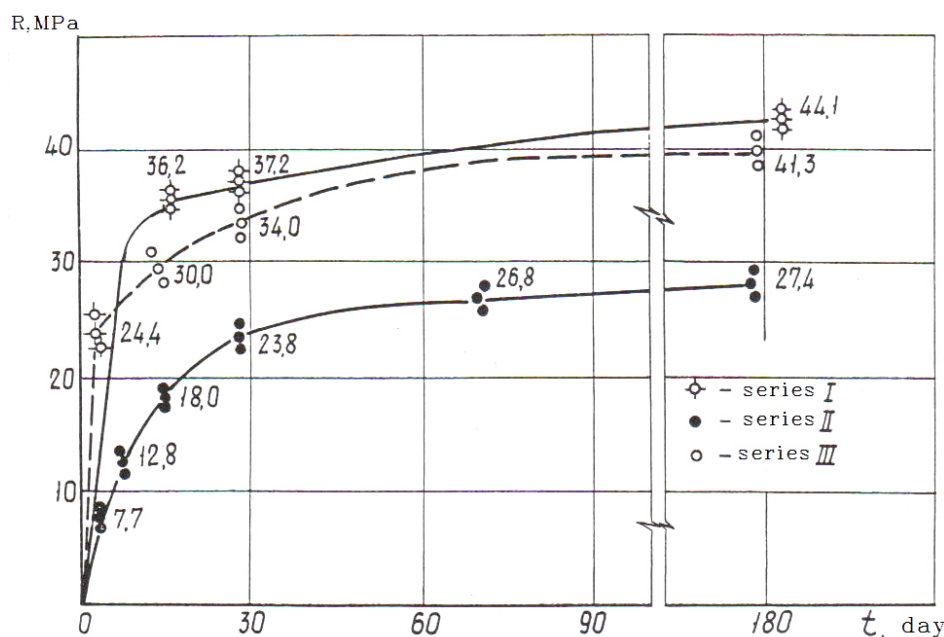


Figure 1. Change in strength of concrete on porous fillers from quartz porphyries and carbonized clay

Results of tests of control samples for cubic and prismatic strength (Table 1).

This table shows that the value of the coefficient of prism strength K_{ps} is in the range 0.8–0.970, that is, the arithmetic mean value is 0.88, only 0.6–2.3% higher than the value calculated for concrete with strength 25–35 MPa by volume

$$K_{ps} = 0.9 - 0.001R_c$$

According to G. P. Kurasova in the process of processing several experimental data for concrete on artificial porous aggregates (expanded clay concrete, agloporitobeton, etc.).

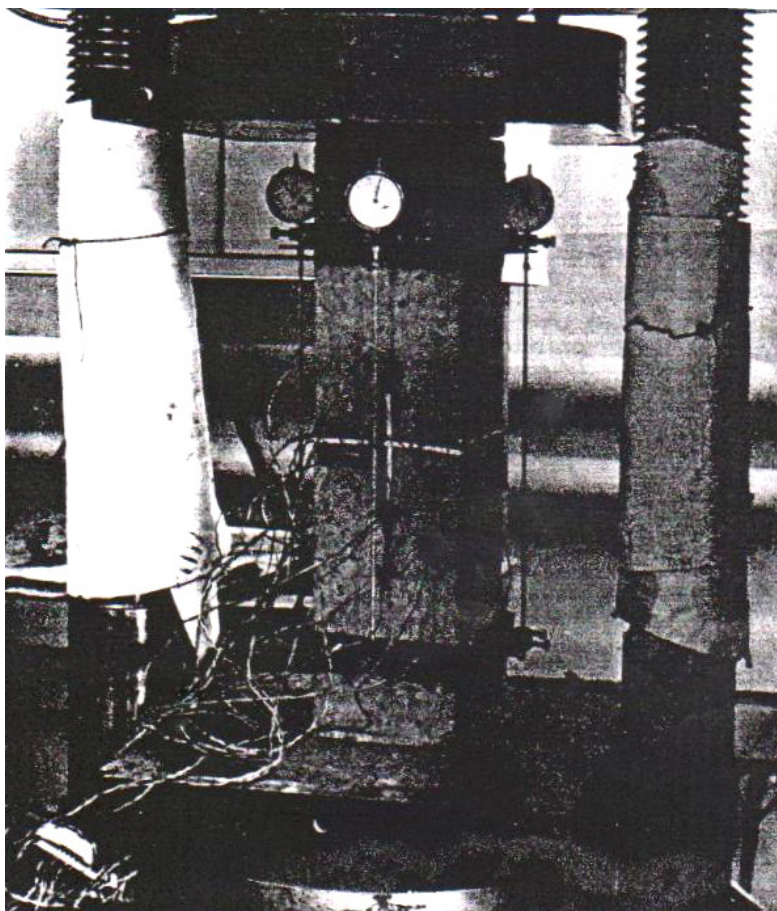


Figure 2. General view of the prism during testing

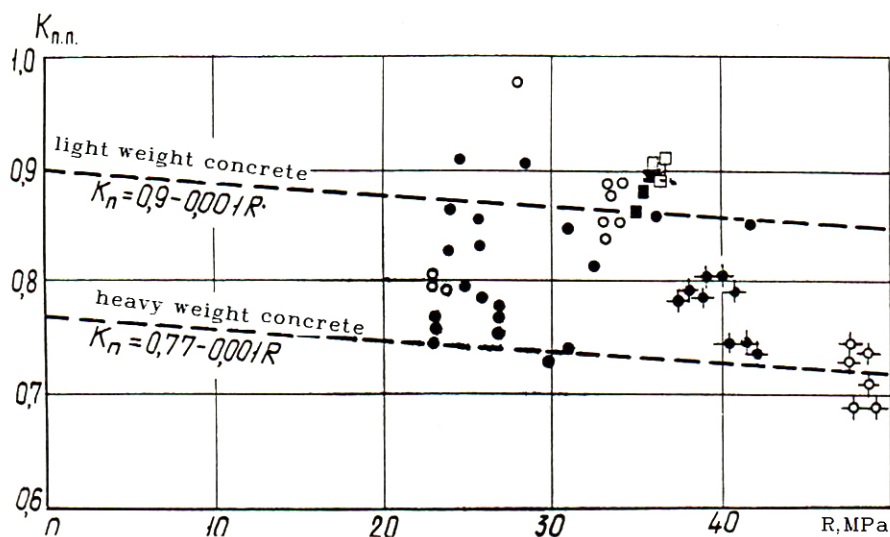


Figure 3. Prismatic coefficient of strength

- – concrete on porous aggregates of quartz porphyries and fine porous aggregates;
- – concrete on porous aggregates of quartz porphyries and quartz sand;
- – claydite perlite concrete (according to G. A. Buzhevich);
- , ○ – according to G. P. Kurassova;
- – expanded clay concrete (according to M. M. Nasritdinov)

Table 1.

Age of the samples in days	Cubic strength of R_c , MPa		Prismatic strength R_r , MPa		$K_{ps} = \frac{R_r}{R_c}$
	samples apart	Average	Samples apart	average	
28	22.4	23.1	18.4	18.6	0.790
	23.1		18.7		
	23.4		18.6		
180	37.0	37.6	33.6	33.9	0.890
	37.1		34.2		
	38.0		33.5		
340	33.5	33.9	29.0	29.10	0.856
	34.2		30.0		
	33.5		28.5		

References:

1. Ботвина Л. М., Билялов К. Б. Пористый заполнитель для легкого бетона. Строительство и Архитектура Узбекистана. – Ташкент, 1976.
2. Газиев У.А., Хасанов Б.Б. Математическое моделирование оптимальных составов легкого бетона на пористых заполнителях из кварцевых порфиров и зауглероженной глины. Материалы Республиканской НТК. – Ташкент, 2008.
3. Газиев У.А., Хасанов Б.Б. Методика определения составов легкого бетона на пористом заполнителе из дацитовых порфиров и зауглероженной глины. Проблемы Архитектуры и Строительства. НТЖ-Самарканд 1/2007.

Kholiqulov Doniyor,
candidate of Technical Sciences,
Almalyk branch Tashkent state technical university
E-mail: doniyor_xb@mail.ru

Samadov Alisher,
doctor of technical sciences
Almalyk branch Tashkent state technical university

Boltaev Olmos,
senior teacher of chair "Metallurgy"
Almalyk branch Tashkent state technical university

Akhtamov Fozil,
senior teacher of chair "Metallurgy"
Almalyk branch Tashkent state technical university

THE RESULTS OF LABORATORY RESEARCH PROCESSING OF ZINC CAKE ZINC PLANT JSC "ALMALYK MMC"

Abstract: In the work analyzed pyrometallurgical and hydrometallurgical methods for processing of zinc cakes. Defined methodology for conducting the calcination of the zinc filter cake in the presence of water vapor, facilitating the extraction of valuable components from the filter cake. The optimal parameters of roasting.

Keywords: zinc, technology, roasting, sulfides, cake, roasting, steam, gas, composition.

The main sources of obtaining of zinc on the joint-stock company "Almalyk mining and metallurgical plant" are zinc concentrates by selective flotation concentration of polymetallic ores. Zinc concentrates are fired in a kiln "Fluidized Bed Roaster" for the oxidation of sulfides of metals and the resulting calcine leached with an aqueous solution of sulphuric acid to convert zinc into the solution. In the leaching of zinc calcine in a solution of partially transformed there in components – copper, cadmium, iron, arsenic etc. the work Purpose is research and development of technology for roasting zinc sludge cake in the presence of water vapor (thermoprocessing).

Nowadays, in the JSC "Almalyk MMC" for extractions of zinc cakes are waelz processing (restoration variety firing) at a temperature of 1100–1300°C laced with coke and petcoke in the amount of 30–40% by weight of the processed material. At the same time, get zinc sublimates and clinker – residue from waelz. Disadvantages waelz-process are: the high consumption of expensive and scarce coke; high temperature regime of the process; the unresolved issue of extraction of other valuable components like gold, silver, lead, copper, iron, etc., to the lack of rational technology of processing of clinker. Therefore, the development of improved technology for the processing of zinc cakes, providing a high extraction of zinc and other valuable metals into marketable products is an urgent task [1].

Nowadays in the world practice are used pyrometallurgical and hydrometallurgical methods for processing of zinc cakes. Pyrometallurgical methods of processing of the cakes

are very diverse and are based mainly on the reactions of recovery of the oxide and ferrite of zinc, using a carbonaceous reducing agents at relatively high temperatures, sublimation of zinc, lead, rare metals and the oxidation of sublimates in the gas phase [2–3]. Pyrometallurgical methods include melting sludge in furnaces of various types (mine, electric) and the reduction-distillation roasting – waelz processing in tubular furnaces. Known methods for processing of zinc cakes can be divided into three groups: 1) methods of destruction of the zinc ferrites by the action of carbonaceous reducing agents (C and CO); 2) methods of decomposition of the ferrites of zinc sulfur and sulfurous anhydride and sulfuric acid; 3) the methods of direct dissolution of zinc ferrites in sulphuric acid.

In world practice, the transition from pyrometallurgical to hydrometallurgical methods of processing zinc cakes is successfully carried out. As is known, due to ferrite formation during roasting of zinc concentrates in the process of leaching of the calcine, part of the zinc remains in the cakes in the form of ferrite and other insoluble compounds. Together with zinc, lead, gold, silver, as well as up to 50–60% Cu and 30% Cd almost completely go to the leaching residue. The zinc content in the cake and its distribution between the solutions and the residue from leaching depends on the quality and nature of the raw materials. When processing high-grade zinc concentrates with a low content of iron and lead, no more than 10–12% Zn from the initial amount passes into zinc cakes. In the case of processing low-grade concentrates (with a high

iron content), the degree of zinc conversion to cakes increases to 20–25% [2–5].

In recent years, hydrometallurgical methods of processing zinc cakes, based on reactions of decomposition of zinc ferrites with sulfuric acid at atmospheric or elevated pressure, have received the greatest development. Since the use of sulfuric acid as the main reagent is technologically combined with the standard hydrometallurgical zinc production scheme, these methods seem to be the most perspective. Hydrometallurgical methods for processing cakes have been developed relatively recently and are based on reactions of dissolving ferrites and zinc sulphide with sulfuric acid at atmospheric or elevated pressure, converting zinc, copper, cadmium, rare metals and iron into solution, followed by separation of iron from the solution in the form of various compounds. The use of sulfuric acid is technologically and economically feasible, since this produces a solution of zinc sulfate, which can be introduced into the main cycle of an electrolytic zinc plant.

Currently, there are three known schemes for hydrometallurgical processing of zinc cakes [2, 5]: leaching of cake under pressure with the release of iron from solution in the form of (Fe_2O_3) – hematite -process; leaching of the cake at atmospheric pressure with the release of iron from the solution in the form of goethite (FeOOH) – goethite-process; leaching cake at atmospheric pressure with the release of iron from solution in the form of jarosite $(\text{MeFe}_3(\text{SO}_4)_2(\text{OH})_6)$ – a jarosite process.

The chemical composition of zinc cake, %: $\text{Zn}_{\text{common}}$ – 21.42; Zn_{water} – 5.5; Zn_{sour} – 13.26; C – 0.14; S_{common} – 7.55;

S_{SO_4} – 6.86; Pb – 5.65; Fe – 12.21; SiO_2 – 9.3; Al_2O_3 – 1.42; Cu – 2.32; Cd – 0.26; CaO – 2.67; MnO – 0.85.

The methodology of extraction of valuable components from cakes of zinc production. The filter cake zinc production, designed for leaching, must responsible the following requirements: to have a sufficiently low content of sulfide sulfur (< 0.1 – 0.3%); moderate content of soluble sulphides ($\text{S}_{\text{SO}_2} \leq 2$ – 4%); high content of fine fraction (-0.15 mm); moderate content of ferrite and silicate of zinc.

These requirements derive from technological problems of hydrometallurgical processing. Therefore, to achieve this, the cake is subjected to thermobarometry. Laboratory experiments on baking a cake (with weighed samples of 100–200 g) are carried out on the installation (fig. 1) consisting of steam generator cooling and trapping sublimates system, vacuum pump and electric furnace. The experimental procedure is as follows: product size -0.074 mm is dried at a temperature of 105°C to constant weight, after which the sample is transferred to a tubular rotary kiln. When the furnace temperature reaches 250°C in an oven fed dry steam from the steam generator. Exhaust gases pass sequentially through two absorption vessels, containing solutions of copper sulphate and hydrogen peroxide, respectively. During and after the end of the experiment of sinks sampled for analysis on the content of H_2S and SO_2 . The content of sulfur in the absorption solutions are judged on the degree of roasting of the product. After the experiment setup is cooled, the suspension is removed and weighed, is determined by the difference of the initial and final mass, which is judged on the degree of oxidation. Processed, thus, the product is the starting material for leaching.

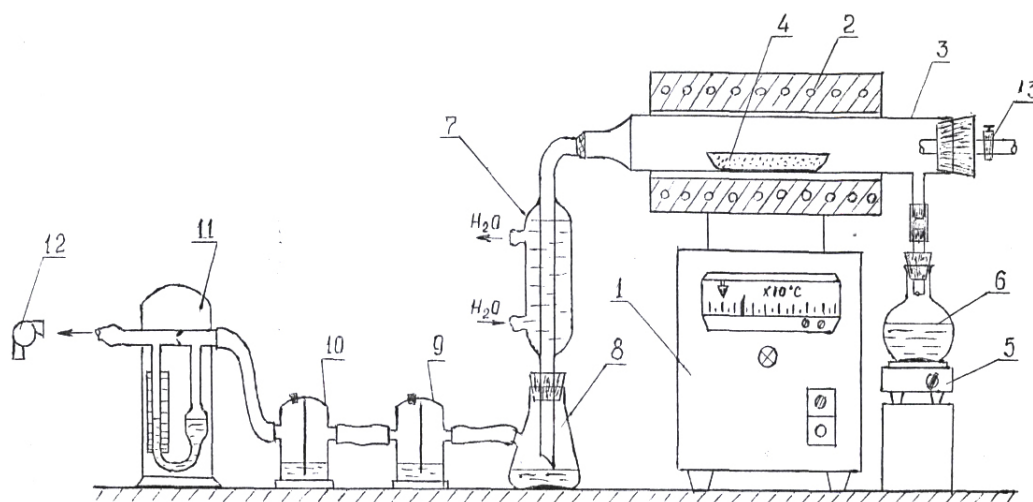


Figure 1. The scheme of laboratory installation:

- 1 – electric furnace of SUOL-0,25.1/12-M1; 2 – heater; 3 – steel tube; 4 – a porcelain boat with a weighed; 5 – appliances stove; 6 – source of water vapor; 7 – refrigerator; 8 – receiver of condensate; 9 – vessel of the absorption of hydrogen sulfide; 10 – absorption vessel, sulphur dioxide; 11 – flow meter; 12 – water-jet pump; 13 – valve for adjusting the air supply; 14 – thermocouple PPT

In order to achieve these goals, it is necessary to select the appropriate composition of the initial charge, temperature and composition of the gas phase for thermal processing. Of great importance is the instrumentation process. To address these issues, it is necessary to consider the scientific foundations of the processes of thermal processing, i.e. their chemistry, thermodynamics and kinetics [6]. At the same time, it should be noted that the processes of thermoprocessing of zinc cakes differ from the processes of firing or fusing cakes. The main difference is that the firing processes occur without the formation of liquid phases of complex composition. Therefore, sulfides, especially ZnS, retain their individuality. This gives grounds to consider these processes as applied to individual sulfides.

Determining the optimal parameters of thermoprocessing cake zinc production. The study studied the effect of temperature thermoprocessing on the degree of extraction

of different metals in a solution. The experiments were performed in the temperature range from 600°C before 1000°C. The results of the experiments shown in (Fig. 2). Pre thermoprocessing at 900–1000°C has a positive effect on the degree of extraction of zinc in sulfuric acid solution. At temperatures above 1000°C the extraction of Zn and Cu from thermoprocessing product in the solution increases slightly. Therefore, it is optimal for thermoprocessing cake zinc production can be considered the temperature 950°C.

Thermoprocessing the calcine is leached with sulfuric acid solution. The use of sulfuric acid is technologically and economically feasible, so as to give a solution of zinc sulphate, which you can enter in the main loop of the zinc plant. Conditions of experiments: thermoprocessing (flow of water vapor of 15–20 ml/min, $t_{\text{processing}} = 1$ hour), leaching (100 g/l, W: T = 5 : 1, $t_{\text{leaching}} = 1$ hour, $t = 60^\circ\text{C}$). The results of the study shown in (Fig. 2, 3).

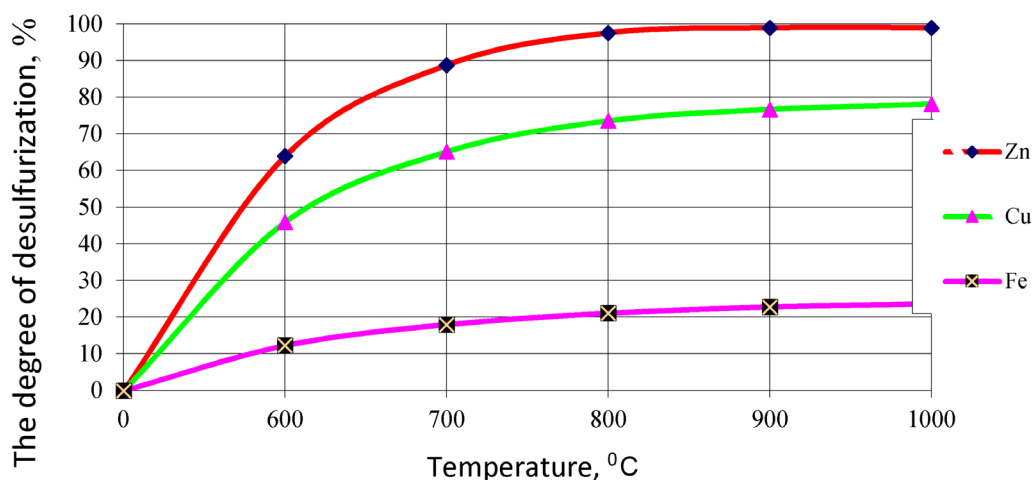


Figure 2. The dependence of the degree of desulfurization metals on temperature

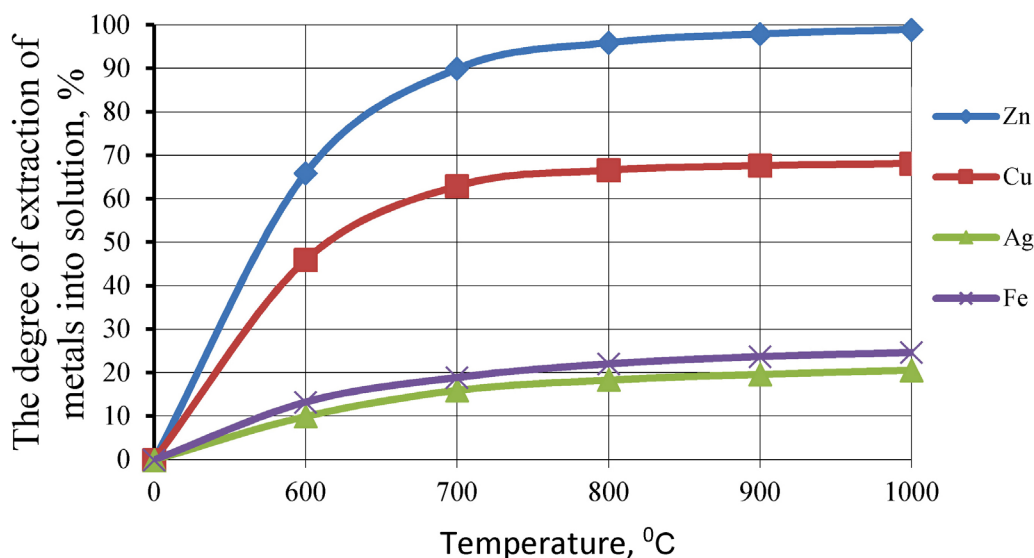


Figure 3. The dependence of the degree of extraction of metals into solution from the temperature

Thermoprocessing zinc cake at the optimum temperature in time leads to a decrease of the mass of sample of the product and increase the content of zinc and other metals in the calcine. Based on these results and on economic grounds it can be argued that the optimum temperature of thermoprocessing is 950°S, and the time of thermoprocessing – 1 hour. The results of the study indicate the possibility of effective processing of zinc cakes with subsequent sulfuric acid leaching. The chemical composition of the product thermoprocessing cake zinc production using chemical method analysis, %: Zn-25.2; Cu-3.02; Cd-0.31; Fe-15.3; S_s-0.2; Pb-5.98; SiO₂-10.5; Al₂O₃-1.6. On the basis of the laboratory tests it

is recommended that the technology of processing zinc cakes, providing a combined technology of extraction of valuable metals, which includes thermoprocessing (for translation of zinc in water soluble form) and sulfuric acid leaching (extraction of zinc in solution).

As a result of analysis of numerous comprehensive studies, it was possible to establish the possibility of processing zinc cakes and extraction of heavy non-ferrous metals. Recycling zinc cakes is environmentally safe and does not form toxic gases. The method of zinc cake roasting in the presence of water vapor is determined, which facilitates the extraction of valuable components from the cake.

References:

1. Kholiqulov D. B., Yakubov M. M., Guro V. P., Rasulova S. N. Effective method of recycling the zinc filter cake. Uzbek chemical journal, 2018. – No. 4. – P. 23–27.
2. Marchenko N. V., Vershinina E. P., Gilderbrand E. M. Metallurgy heavy non-ferrous metals. – Krasnogorsk; IPK SFU, 2009. – 394 p.
3. Snurnicov A. P. Zinc hydrometallurgy. – M., "Metallurgy", 1981. – 384 p.
4. Kline S. E., Kozlov P. A., Naboychenko S. C. Extraction of zinc from ore raw materials. Yekaterinburg. UMTU-UPI. 2009. – 491 p.
5. Kazanbayev L. A. Development of an improved technology for processing zinc production with indium extraction. – M., 2000.
6. Samadov A. U., Kholiqulov D. B., Abdullayev F. R., Akhmadjanov U. M. Chemistry roasting zinc concentrate in the presence of water vapor. EUROPEAN RESEARCH: collection of articles of the XVII International Scientific and Practical Conference. – Penza: MSNC "Science and Education". 2018. – P. 165–167. – 168 p.

*Yusupov Hamza Ibadovich,
candidate of Technical Sciences, associate professor
Tashkent Institute of Architecture and Construction
E-mail: hamza12@mail.ru*

COMPLEX SYSTEM OF QUALITY MANAGEMENT IN PROJECT DESIGN

Abstract: The article deals with the issues of quality management and underlying principles in project design.

Keywords: quality management, regulatory documents, project quality indicators, complex system, principles, quality management system, total quality control.

The quality of construction products is formed by:

- 1) development of regulatory documentation;
- 2) project design;
- 3) manufacture of materials, products, elements and structures;
- 4) construction and installation works.

The quality of the project is determined by the level of the adopted design decisions, their progressiveness, compliance with the latest technologies, achievements of domestic and foreign experience.

There are the following features of project quality:

- functional ones – providing in the designed structures of a normal technological process, subject to the requirements of everyday life, labor and rest norms of the staff;
- constructive ones – performance reliability of a project (structure) as a whole and its elements (the invariability of carrying capacity, trouble-free operation of the elements, water resistance, etc.);
- economic ones – manufacturing high-quality products with minimum material and labor costs;
- aesthetic ones – compliance with the socio-economic level of people life, their cultural needs, architectural composition, building decoration, etc.).

There is a rich experience in creating quality management systems in construction which must be taken into account at present, in conditions of market economy, when creating a new generation of quality management system (QMS).

Comprehensive quality management system for building products consists in the totality of the measures, methods and means aimed at ensuring compliance of the quality of construction and installation works and completed construction projects with the requirements of regulatory documents and design documentation. The composition and content of this system in construction and installation trusts, industrial construction associations, house-building factories and other organizations, in construction ministries and departments are regulated by the “Basic Regulations for the Development of an Integrated System of Quality Management for Construction and Installation Works”.

A comprehensive system of quality management for construction and installation work is built on the principles of: systematic approach, standardization, complex solution of a problem, rational limitation, direct connection and feedback, dynamism, optimality, integration and unit design, automation and innovation tasks.

The principle of systematic approach includes: the need for quality management at all levels; distribution of quality management processes at all stages of the life cycle; coverage of all management functions in relation to the project under management.

The principle of standardization indicates that all basic requirements for product quality and the functions of an integrated quality management system should be regulated or supported by standards and normative and technical documentation.

The principle of complex solution provides for an integrated approach to the quality problem of a final aim of construction, in particular, highlighting the tasks of quality management of intermediate and final products.

The principle of rational limitation involves the continuous implementation of the effect of information filtering to consider only those phenomena, conditions and factors (from the totality) that most affect the quality of the final product of construction.

The principle of direct connection and feedback involves the constant interaction of the subject and object in the management system.

The principle of dynamism provides for a continuous process of improving the integrated quality management system in the course of its operation, taking into account scientific and technical progress, changes in the requirements of normative-technical documentation and accumulated experience.

The principle of optimality provides for ensuring the solution of the tasks set on the basis of the best option choice and the minimum cost for system development and its operation.

The principle of integration and unit design indicates that a comprehensive quality management system should consist of separate units (modules) that can be considered as independent systems operating at different levels of management and life cycle.

The principle of automation and innovation tasks focuses on automated solution of the problems; it is based on the use of computer technology.

In the functional aspect, the quality management system of construction products can be represented as a set of quality management functions performed in design and construction organizations with the aim to establish, ensure and maintain the quality level of design and construction products.

When implementing a quality management system (QMS) in construction, the principles laid down in the Integrated Quality Management System for Construction Products and the principles of Total Quality Control (TQC) should be taken into account; they should be considered as the guides since they are standardized in international standards ISO 9001.

In our opinion, the main objectives of TQC should be the bases of the strategy of all enterprises focused on quality ensuring and improving.

To achieve the goals of TQC, it is necessary to adhere to the principles defining its idea content and based on international experience.

An organization's activities take place in the environment – the macro-environment, its components being the competitiveness of the country, region and industry. The components of the macro-environment affect the organization either directly (for example, the legislative and tax influence of the country's governing bodies) or indirectly (through international, environmental and other factors). These conditions should be considered, but they are not enough to achieve competitive advantages. It is very important to successfully conduct "life cycle processes" determined by micro-factors.

Depending on the stage of the production process, at which micro-factors appear, they can be divided into the following types: production, market, sales and service [1].

When analyzing the competitiveness of economies of the world, attention is drawn to the increased role of microeconomic factors and, according to foreign and domestic experts, to the development gap of Uzbekistan in these factors imple-

mentation. According to experts, our country largely lags behind others in the efficiency of performance of concrete enterprises. In this respect, the construction industry is not an exception, but rather the most problematic area, since so far the competitiveness indicators of domestic construction and design organizations and the characteristics of their products are lagging behind the requirements of the world market. In the conditions of Uzbekistan's accession to the World Trade Organization (WTO) and the expansion of general economic ties and the impossibility to work in isolation in the future, in domestic market only, it is necessary to exert maximum efforts to eliminate this contradiction.

Project documentation is a set of technical documentation that fully characterizes a building, a structure, or a complex of them, planned for construction.

Design presents a process of performing an interconnected complex of work by a team of specialists, the result of which is the development of design and estimate documentation for the construction or reconstruction of enterprises, buildings, structures and their complexes.

Being an intermediate stage between scientific development and construction, it significantly affects the technical progress and efficiency of construction production. The main task of project design in construction is the development of design and estimate documentation for the most rational use of investment decisions, which predetermines the relative quality level of design products.

From the point of view of market competitiveness, the quality of project products can be characterized as the level of work performance and the fulfillment of obligations, determined by the compliance with the requirements and expectations of consumers (individuals and legal entities, the state) [2].

It should be noted that the design enterprises are the most important component of the construction complex, since it is from them that the implementation of plans for investing in new construction, expansion, reconstruction and technical re-equipment of physical assets of enterprises in various sectors of economy begins.

References:

1. Fomin V.N. Qualimetry: Quality Management. Certification: Teaching aid.– M.: Os-89, 2002. Chapter 1.1. – p. 19; Chapter 2.1. – 85 p.
2. Buzirev V.V., Yudenko M.N. Quality Management of Construction Products: Practical work.– Rostov-on-Don, Fenix, 2007.

Yusupov Kh.I.,
candidate of technical sciences, associate professor
Tashkent Institute of Architecture and Construction
E-mail: hamza12@mail.ru

QUALITY INDICES OF CONSTRUCTION PRODUCTS

Abstract: The issues of quality indices of construction products and their feature classification and the methods for their evaluation are discussed in the paper.

Keywords: quality management; technical, economic, technological, operational indices; resource consumption; complex quality index, quality management system, calculation algorithm.

The quality of building materials and products is characterized by a combination of certain properties that satisfy the conditions of their use. For bearing structures these properties are strength and rigidity; for enclosing elements of tanks – fracture strength, impermeability to water, frost resistance; for building envelope – heat and sound insulation.

The quality of construction and installation work is determined by the project requirements and regulatory documents; it depends on the qualification of workers and engineering-technical staff; machines, tools, materials and products used; organizational and technological sequence of work.

A set of quality indices of construction products can be classified according to the following features (Figure 2):

- by the number of characterized properties (single, complex and integral indices);
- by their relation to various properties of the product (indices of reliability, workability, environmental friendliness, etc.);
- by the stage of determination (design, production and operation indices);
- by the method of determination (calculation, statistics, experiment, expert indices);
- by the nature of the level of quality assessment (basic and relative indices);
- by the means of expression (dimensional indices and the indices expressed by dimensionless units of measure, for example, points, percentages).

Table 1. – Indices characterizing the quality of construction products

<p>1. Technical indices</p> <p>1.1. strength;</p> <p>1.2. fracture strength;</p> <p>1.3. corrosion resistance;</p> <p>1.4. moisture resistance;</p> <p>1.5. frost resistance of building structures; service life of buildings and structures; probability of refusal</p> <p>2. Economic indices</p> <p>2.1. specific capital investment per unit of power;</p> <p>2.2. total construction cost;</p> <p>2.3. basic production assets cost;</p> <p>2.4. production net cost; profit;</p> <p>2.5. payback period;</p> <p>2.6. cost per square meter.</p>	<p>3. Technological indices</p> <p>3.1. Construction and technological indices</p> <p>3.1.1. degree of possibility of industrial manufacturing of the parts of designed facilities and structures;</p> <p>3.1.2. indices of the use of advanced structures;</p> <p>3.1.3. overall dimensions of structures and parts;</p> <p>3.1.4. unification indices.</p> <p>3.2. Operational and technological indices</p> <p>3.2.1. conveniences of room layout;m</p> <p>3.2.2. conveniences of current maintenance and repair of facilities and structures;m</p> <p>3.2.3. safety performance indices;m</p> <p>3.2.4. indices of occupational hygiene.m</p> <p>3.3 Ecological indicesm</p> <p>3.3.1. indices of environmental pollution;m</p> <p>3.3.2. impact on nature.m</p> <p>4. Resource consumption</p> <p>4.1. specific consumption of electricity, water, gas, fuel per unit of power.</p>
--	---

Assessment of the quality level of construction products can be made by the differential or complex methods. With the differential method, a comparison of single quality indices of a

new product with identical basic quality indices is made, and with the complex one – actual complex indices are compared with basic complex indices.

The features inherent in the construction production relative to industrial production directly affect the creation of a quality management system (QMS) in a construction organization and the methodology for assessing the quality of construction products.

These features include:

- the uniqueness of products – each project under construction is unique in terms of constructive, space-and-planning decisions, geological conditions in construction site, etc.;
- high capital intensity and duration of construction;
- high complexity and, in some cases, the impossibility to correct the defects in supporting structures of the building at the stage of its operation;
- territorial disconnection of projects under construction;
- seasonal nature of work production, etc.

Based on this, the QMS in construction should be developed taking into account the necessity for certification of each project set into operation and the act of putting into operation is such kind of certificate. At the same time, it is impossible to assess the quality of work stages even with the use of the most modern devices at the stage of putting into

operation, and if this can be done, to correct the identified defects will be almost impossible.

Results of acceptance of work screened by subsequent works, in accordance with the requirements of the project and regulatory documentation, are validated by inspection certificates of screened works. To the procedure of assessing the conformity of individual structures, structure layers (floors), the contractor must submit the inspection certificates for all screened works stages that are part of these structures, geodetic execution schemes and the test reports for structures in cases provided for by the design documentation and/or construction contract.

Thus, in construction it is necessary to assess the quality of almost every stage of work and the quality of the constructed project as a whole. Numerical values of quality indices are determined using the objective and subjective methods. The objective methods are measuring, registration and calculation ones. The subjective methods are organoleptic, sociological and expert ones. Objective methods are based on the use of technical measuring tools. The basis of the subjective method is an analysis of human sense perception, collection and consideration of various opinions, decisions made by a group of specialists and experts.

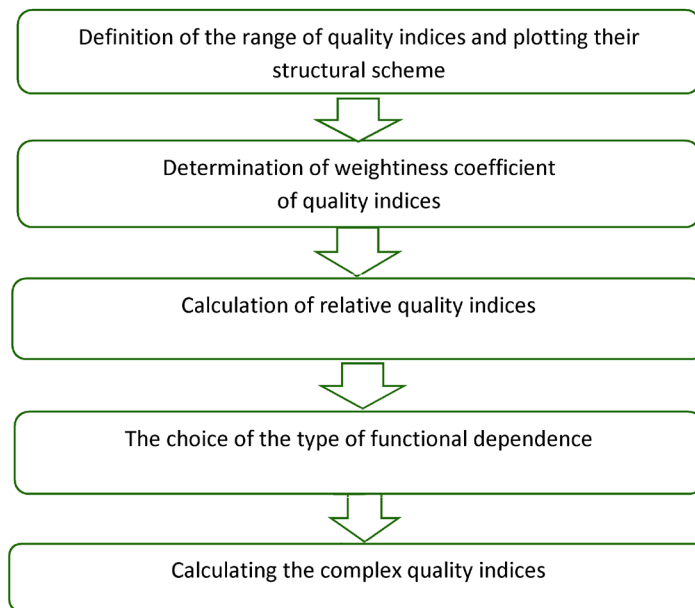


Figure 2. Algorithm for calculating complex quality indices

In the complex method, a complex quality index is used, determined by bringing together individual indices using the weightiness coefficients for each index. In this case, the following functional dependency can be used:

$$K = f(n, l, b_i, k_i), n = 1, 2, 3, \dots, n_p \quad (1)$$

where K is a complex index of the quality of construction products; n is a number of considered indices; b_i is the weightiness coefficient of the i -th quality index; k_i is the i -th quality index.

The algorithm for calculating the complex quality index is shown in (Figure 1).

Experimental-statistical and expert methods are used to determine the range of quality indices, weightiness coefficients and the type of functional dependence f in construction. For example, the quality of the concrete work performed can be assessed by non-destructive methods using instruments and in laboratory conditions by testing concrete blocks (samples)

taken during the concreting process. At the same time, many parameters of the work performed can be assessed only by an expertise on the basis of a given scale of points. In any case, the results of the experimental-statistical method can be supplemented or reduced to expert assessment.

The main quality index in construction is a reliable operation of a project (structure) as a whole and its structural elements and units.

We propose the methods for the calculation of a complex quality index which takes into account the specifics of the construction industry and includes three levels of assessment:

- the first level – work (process) assessment;
- the second level – an assessment of constructive elements;
- the third level – an assessment of the project of construction.

References:

1. Buzyrev V.V., Yudenko M.N. Quality Management of Construction Products: Practical work.– Rostov-on-Don, Fenix, 2007.

Section 13. Transport

*Kurbanov Janibek Fayzullayevich,
Ph D., head of the research laboratory
“Alarm, centralization, blocking and communication”,
Tashkent Institute of Railway Transport Engineers
E-mail: jonik_piter@mail.ru*

*Kolesnikov I. K.,
assistant professor*

*Ortikov M. S.,
assistant*

E-mail: jonik_piter@mail.ru

DIFFECTION METHODS IN PIPELINE EXAMINATION

Abstract: The article discusses modern methods of non-destructive testing in the inspection of sections of pipelines and fittings in operation. The scopes of the devices used for control, their principles of operation are described. Their advantages and limitations of the field of application are analyzed. Optimal methods for detecting defects are identified, criteria for improving the operation of devices are outlined.

Keywords: pipe inspection, flaw detectors, pipe inspection, non-destructive testing, external scanners.

Under operating conditions for a long time, pipelines are exposed to various external and internal influences, as a result of which material degradation occurs, corrosion damage occurs, fatigue cracks appear on surfaces of pipes and other types of defects. Despite the fact that the design of pipelines using modern codes and the manufacturing and installation technology must ensure the implementation of the assigned resource, it is not possible to rule out the possibility of such defects. To avoid serious consequences of growing defects, various examinations are carried out using non-destructive testing methods. Non-destructive testing – monitoring the reliability of the basic working properties and parameters of an object that does not require removal of the object from operation, or its dismantling.

Modern methods and means of non-destructive testing, used to diagnose pipelines, are widely developed and widespread. The most widely used methods are magnetic (magnetic anisotropy, metal magnetic memory, magnetic permeability), acoustic (pulsed ultrasonic, Lamb waves, phase, acoustic emission), electrical and optical (visual – endoscopic, laser, holographic). Such methods are used to identify various defects: leakage, control of the stress state, quality control and condition of welded joints, leakage monitoring and other parameters responsible for the operational reliability of pipe-

lines. At the same time, the programs, methods and means of monitoring pipelines for various purposes (heat pipelines, gas pipelines, oil pipelines, product pipelines, and water pipelines) differ slightly from each other.

The relevance of this topic is explained by the fact that nowadays there are a significant number of pipelines in operation and the production process; damage and destruction of components of which can lead to serious economic losses and adverse effects on nature. It is significant that the pipelines include many fittings, both metallic and nonmetallic, having complex geometric shapes (nodes), access to some parts of which may be limited. In such cases, methods and technical means of non-destructive testing are the best and most convenient solution for conducting surveys of certain areas of pipelines, without removing the object from operation, as well as surveying hard-to-reach areas to identify defects.

Flaw detection as a means of identifying signs of degradation of pipeline material and preventing emergency situations is naturally in the field of attention of the engineering and scientific community. Methods for determining the size, orientation of defects are constantly being developed, equipment is being improved, research and testing is being conducted to identify the characteristics of flaw detector models, and analysis is being carried out to further improve the performance of flaw detection tools.

The need to maintain pipelines in good condition makes it necessary to look for new effective methods for monitoring pipes in order to detect defects and cracks, as well as corrosion on their surface. The emergence of modern automated robots in various industries has led to the development of a robot in the field of flaw detection, which will reduce the time to diagnose various types of pipelines, as well as reduce the cost of monitoring the state of pipelines.

The history of the oldest control method shows a visual transition from the complex process of implementing control, depending on the human factor, to automated and environmentally friendly methods at present.

At present, surveys using non-destructive testing methods should be carried out in accordance with, which will significantly increase the reliability indicator during operation.

Foreign sources, in particular, are considering the possibility of using non-destructive testing methods to improve the accuracy of the results.

Features of criteria for choosing a flaw detector

The principles of operation of flaw detectors are different, but there are a number of parameters by which it is possible to objectively evaluate equipment for conducting diagnostics using non-destructive testing.

When choosing a flaw detector, consider the following:

1. The resolution of the flaw detector. The accuracy of determining the size (location) of the defect.
2. The speed of diagnosis. As a rule, the faster the diagnosis, the lower the accuracy of the defect.
3. The method of mounting the device.
4. The level of protection of the device from external influences. External influences include moisture, pressure, precipitation, etc.

5. Temperature. When scanning at critical temperatures, the device may not measure accurately or fail.

Flaw detectors are used to inspect pipelines. Flaw detector is a device for finding defects in objects from various metallic and non-metallic materials by non-destructive testing. The defects include the appearance of corrosion, the development of cracks, violation of the integrity of the structure, etc.

In this review, we consider the following flaw detectors:

- Eddy current;
- Ultrasound;
- Magnetic Powder;
- Capillary.

The eddy current testing method is based on the measurement of eddy currents that occur near subsurface defects in a magnetic field. When such currents occur in the area under study, the readings of the electromagnetic field of eddy currents formed when a defect is found are recorded. As a result

of processing parameters that have deviations, it is possible to obtain information about internal defects.

Advantages:

- The method allows you to quickly diagnose;
- Results of control with the minimum error;
- Relatively low cost;
- High sensitivity.

Disadvantages:

- Depth of study up to 2mm;
- Control can be carried out on certain materials of the object;
- Equipment reliability is average;
- Ultrasonic flaw detector.

Ultrasonic flaw detectors use the echo method and shadow control methods. The echo method is based on pulses and the measurement of echo signals. The principle of operation consists in sending an ultrasonic signal in the form of a pulse from a flaw detector to an object of study, and the time interval of arrival of echo signals reflected from defects is recorded. The method allows to detect surface and deep defects with different orientations.

In the shadow method, reflectors are used opposite each other (source (A) and receiver (B)). If the distance from A to B is known and the time of passage of the waves from A to B is measured, then as a result of the calculations, it is possible to obtain the distribution of the wave propagation velocity in a certain part of the object of study. In this way, sites can be examined for defects.

Advantages:

- Control can be carried out from virtually any material;
- The prevalence of the method.

Disadvantages:

- High requirements to the state of the surface of the test body (type, dimensions, shape);
- Cost is relatively high;
- Medium to long control time;
- Equipment reliability is average.

Magnetic Powder Inspection

The method is based on detecting the scattering of the magnetic field over defects. This method is the most obvious, since the principle of the examination consists in applying a magnetic powder to the area under study, as a result of which the particles are magnetized and connected under the action of the magnetic field. Visually, one can observe the accumulation of powder in the zones of cracks. This method allows you to control various parts of the form, welds, internal surfaces of the holes.

Advantages:

- Efficient and fast detection of surface defects;
- Visual results;

- Low cost;
- High reliability of equipment.

Disadvantages:

- The difficulties encountered when demagnetizing large parts;
- Unavailability of control in joints or nodes without disassembling;
- The inability to control parts made of plastic, non-ferrous metals and some types of steel;
- Limited depth;
- Capillary Flaw Detector.

The capillary flaw detection method allows detecting thin surface cracks and discontinuities of the material with the naked eye. The cavities of surface cracks are filled with special indicator substances (penetrants) penetrating into them under the action of capillarity forces. A thin white developer powder (magnesium oxide, talc, etc.) with sorption properties is applied to the surface cleared of excess penetrant, due to which the penetrant particles are removed from the cavity of the crack to the surface, outline the contours of the crack and glow brightly in UV rays.

Advantages:

- High reliability of equipment;
- Monitoring time is average.

Disadvantages:

- Finding only defects coming to the surface;
- Survey results.

Summarizing the advantages, disadvantages and principles of operation of various methods, we can draw the following conclusions:

- The efficiency of detecting corrosion damage (external and internal) using ultrasonic flaw detectors can be improved as a result of additional processing of flaw detection results;
- For inspection of pipelines, ultrasonic and eddy current detectors are optimal in their characteristics and wide distribution;
- With the introduction of new models of flaw detectors, productivity is increasing, but qualified and trained specialists are required to work with more modern equipment;
- The requirements in regulatory documents for capillary control do not have any fundamental differences, sensitivity is important;
- Particular attention should be paid to the material of the investigated surface, since the accuracy of diagnosis and the minimum error depend on it;
- Adaptation of the eddy current control to the electromagnetic properties of the surface can significantly increase the reliability of the control and reduce the presence of the human factor.

As a result of the review, it is clear that further research is needed to improve the equipment. Also, new developments can significantly improve the reliability of diagnostics and identify the problem of monitoring the state of pipes in the industry at the international level.

Timely and reliable determination of the size and configuration of defects is extremely important for assessing the residual life of pipeline components, for planning and choosing a technology for repairing damaged areas, for setting deadlines for inspections.

References:

1. Kurbanov J.F. The control system of a single unit of the spatial field // European science review.– Vienna 2016.– No. 7–8.– P. 112–117.
2. Kurbanov J.F. The spectral characteristics of the new functional materials based on a single device spatial field // European science review.–Vienna, 2017.– P. 112–117.
3. Kolesnikov I. K., Kurbanov J.F. The control system and the hardware implementation of a single unit of the spatial field // International Conference «Perspectives for the development of information technologies» – Tashkent, 2015. 4–5 November. Tashkent university of information technologies (TUIT).– P. 171–175.
4. Kurbanov J.F. Management and hardware implementation of a single spatial field // International Journal “International Review of Education and Science”. – No. 1. (8), January-June, – Ottawa 2015. – Vol. II. “Ottawa University Press”.– P. 607–614.
5. Колесников И. К. Халиков А. А., Каримов Р. К. Электромагнитные поля и волны. – Ташкент “Янги аср авлоди”. 2008.– 217 с.

Section 14. Physics

Polvonov Bakhtiyor Zaylobidinovich,
Ph D., Head of the Department of Physics
of Fergana Polytechnic Institute
E-mail: r_rasulov51@mail.ru

Nasirov Mardon,
Researcher of Fergana Polytechnic Institute

Mirzayev Valijon,
Researcher of Fergana Polytechnic Institute

Raziqov Jurabek,
Researcher of Fergana State University

SPECTRUM OF THE SHORT CIRCUIT PHOTO CURRENT OF *CdTe*, *CdTe: In* PHOTOLOLATIC FILMS DEPENDING ON THE TEMPERATURE

Abstract: It is found out that the generation of the abnormal photo voltage in the alloyed angle-sprayed thin *CdTe: In* films is caused by the light of the spectrum sphere of self absorption and mixed as well. The spectrum of short-circuited photo current was analyzed in accordance of the temperature.

Keywords:

In [1], the possibility of generating an anomalously photovoltage (APV, order $10^2 \div 10^3$ V/sm) in skew-deposited films *CdTe: Ag* under light excitation from the region of not only intrinsic but also impurity ($h\nu \leq E_g$) absorption was investigated. It is shown that the impurity anomalous photovoltaic effect (APVE) is due to the quantum deep-level-zone transition in barrier regions upon photoexcitation and the subsequent spatial separation of free carriers of the same sign and residual impurity charge under the influence of the internal electric field of asymmetric micro potential barriers of the grain boundary. The purpose of this work is to research the possible impurity contributions to APV by analyzing the short-circuit current spectra I_{ShC} as a function of temperature in the *CdTe* and *CdTe: In* films with the APV property.

The doped layer of *CdTe: In* was grown by thermal evaporation in vacuum $10^{-4} \div 10^{-5}$ mm.Hg by preparing *CdTe* and *In* from separate crucibles. The initial mass *In* was 3 ÷ 7% by mass *CdTe*. The temperature of the glass substrate was varied within 200 ÷ 500 K. Freshly prepared polycrystalline samples *CdTe: In* with a thickness of $d \approx 0.8 \div 1.5$ mkm and an area of 5×20 mm² (condensation rate $v_k \approx 1.5 \div 2.0$ nm/s, deposition angle 30 ÷ 60°) turned out to be lower resistance and relatively weakly expressed APV properties ($V_{APV} = 50 \div 100$ V). After optimal heat treatment (HT) in

vacuum, the resistance of the samples increased by a factor of 2–3, and at the same time, at room temperature, they generated the maximum photovoltage to values of $(2 \div 4) \cdot 10^3$ V, i.e. an order of magnitude greater than that of specially undoped samples *CdTe* (where $V_{APV} = 200 \div 600$ V), and the short circuit photocurrent increased by more than two orders of magnitude and reached $I_{ShC} \approx 10^{-8}$ A [2].

In fig. 1 shows typical short-circuit current spectra $I_{ShC}(\nu)$ recorded at room temperature (Figure a) and liquid nitrogen temperature (b) for undoped *CdTe* (curve 1), freshly prepared (curve 2) and annealed (curve 3) *CdTe: In* samples. As can be seen from the comparison of the curves of the figures, the spectral sensitivities of I_{ShC} different film samples differ sharply, and depend significantly on temperature.

At $T = 300$ K, the maxima of the spectra with an accuracy of ± 0.05 eV coincide and correspond with the same accuracy to the edge of the intrinsic absorption ($E_g = 1.51$ eV [3]). The long-wavelength tail of spectra I_{ShC} noticeably extends to photon energy $h\nu = 0.9$ eV and is due to impurity absorption of light in the barrier regions of the crystallites, causing impurity APV. The maximum value of I_{ShC} increases significantly in doped samples *CdTe: In* (curves 2 and 3 in fig. 1, a). Absorption of light in the quasi-neutral regions of the grains is responsible for the short-wavelength decrease of

the spectra, leading to bulk photoconductivity of the shunt layer and, thus, to a drop in the spectral value of the photovoltage $V_{APV}(\nu) = I_{ShC}(\nu) \cdot R_{pl}(\nu)$. The integrated short-circuit current in the doped films exceeds by two or three orders of magnitude compared to pure samples *CdTe*. This is achieved in the case of unannealed *CdTe: In* films to a greater extent due to photoconductivity (where V_{APV} is only $60 \div 100$ V/Sm), and for heat-treated films – mainly due to AP effect (in which V_{APV} reaches values $3 \cdot 10^3$ V/Sm).

From the point of view of the analysis of the formation mechanism of APV, the comparison of spectra I_{ShC} for the

three samples considered above, taken at a temperature of $T = 77$ K liquid nitrogen, turned out to be very productive (fig. 1b). In accordance with the results of [4], for films *CdTe*, the integrally I_{ShC} practically does not change with temperature in the $T = (77 \div 300)$ K interval studied. However, in the case of doped samples *CdTe: In*, as the temperature decreases from 300 K to 77 K, both the integral value I_{ShC} and its spectral maximum decrease by more than an order of magnitude. There is a significant long-wavelength shift of the $I_{ShC}(\nu)$ spectrum for the freshly prepared film *CdTe: In* and its doublet structure appears (curve 2 in fig. 1, b).

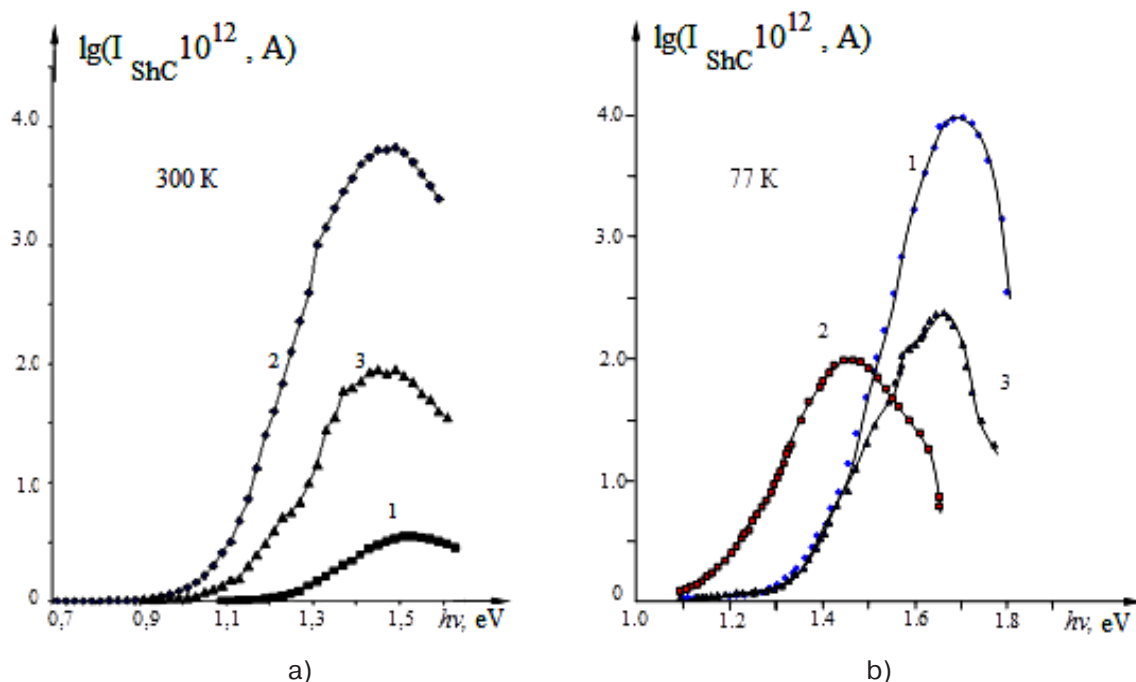


Figure 1. The short-circuit current I_{ShC} spectrum of the *CdTe: In* films (curve 1), (2 – fresh-prepared and 3 – after thermal annealing) with the property at temperatures $T = 300$ K (a) and $T = 77$ K (b)

The latter is due to two contributions of the same order to the integral APV, which are caused by the impurity and intrinsic absorption ($E_g = 1.59$ eV [3]) of light, and it should be especially noted that the “impurity” contribution prevails over the “own” contribution (see curve 2 at $h\nu < 1.6$ eV). However, we note that the “own” contribution APV in the annealed film *CdTe: In* also, as in the unalloyed film *CdTe*, exceeds the “impurity” contribution (curves 1 and 3), while the doublet structure of the spectrum with opposite shoulders than in curve 2 is retained. The short-wavelength shift of the maxima of spectral curves 1 and 3 in (Fig. 2) is associated with an increase in the band gap *CdTe* with a decrease in temperature to $T = 77$ K ([3]). Thus, in skew-deposited films *CdTe: In*, generation APV is caused by light from the spectral region of both its own and impurity absorption, and the “impurity” contribution, depending on the technological conditions, can exceed its own and even change its sign.

To identify specific impurity levels involved in the generation of APV, the long-wavelength tails of the $I_{ShC}(\nu)$ spectra were analyzed in more detail; in fig. 1 by curves 1–3, by studying the photon capture cross section [1]. Comparing the experimental and theoretical spectral curves (Fig. 2), we determined the following deep levels of local centers at $T = 77$ K: $E_1 = E_c - (1.43 \pm 0.02)$ eV, $E_2 = E_c - (1.05 \pm 0.02)$ eV, $E_3 = E_c - (1.31 \pm 0.02)$ eV, $E_4 = E_c - (1.18 \pm 0.02)$ eV and $E_5 = E_c - (0.85 \pm 0.02)$ eV. As can be seen from (Fig. 2), a, in the undoped sample *CdTe*, three levels are photovoltaic: E_1 , E_2 and E_3 , which are created by single, double-charged cadmium vacancies and excess tellurium [5], respectively. In the freshly prepared film *CdTe: In*, the level E_1 is not detected (Fig. 2b), the reason for which is apparently the saturation of the charge state V_{Cd}^{--} and the formation of donor – acceptor pairs ($I_n^+ V_{Cd}^-$) with the energy of the electron transfer to the conduction band equal to 1.18 eV

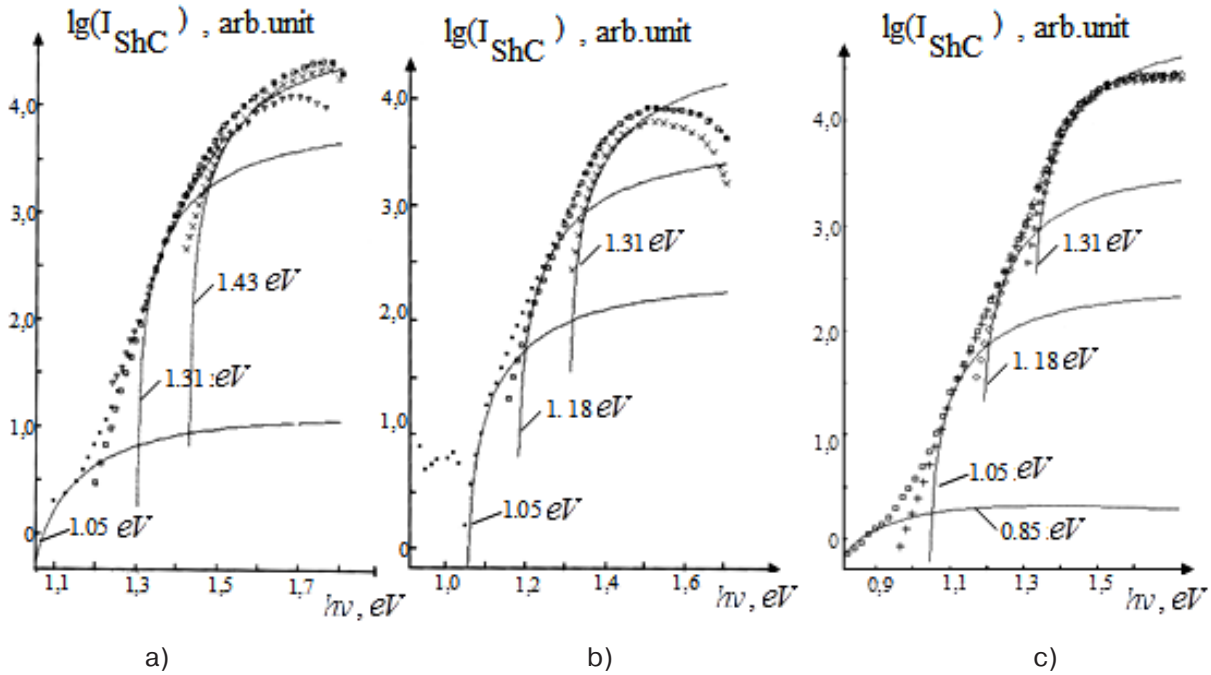


Figure 2. Short-circuit current spectra (bullet points) and theoretical spectra of photon capture cross-section (light points, crosses, triangles, squares) of $CdTe$ films (a), $CdTe:In$ (b- freshly prepared, c-after thermal annealing) at $T = 77 K$.

During thermal annealing doped film self-compensation of donors In and acceptors V_{Cd}^- occurs [6], in the spectrum I_{sc} a level E_5 (Fig. 2 c) appears, which is most likely associated with the formation of pairs ($In^+ V_{Cd}^-$) in the near-surface barrier region of the crystalline grains. This is accompanied by a sharp increase in light resistance and V_{APV} more than an order of magnitude. The contribution of level E_5 to APV is due to the absorption of light in the barrier region, causing an electron to transfer from the level of E_5 to the conduction band. Since the degree of filling with electrons of this level decreases exponentially as it approaches the surface of the

grain, the contribution of centers E_5 to the impurity APV is insignificant compared to the contributions of local centers E_2 , E_3 and E_4 (see Fig. 2 c).

In conclusion, we once again note that the doping of $CdTe$ films with indium in indium qualitatively changes its photovoltaic properties: the maximum value of V_{APV} increases by an order of magnitude, and I_{ShC} increases by more than two orders of magnitude; a sharp temperature dependence of I_{ShC} and its spectrum is detected; the impurity contribution to the integral value of V_{APV} becomes almost of the same order as compared to the contribution due to the intrinsic absorption of light.

References:

1. Yuldashev N. Kh., Vaitkus Yu. Yu., Otazhonov S. M. High-voltage surface photo-emf in thin skew-deposited films with intrinsic and impurity photoexcitation // Uzbek Physical Journal. 2004.–V. 6.– No. 3.– P. 177–187.
2. Akhmadaliev B. Zh., Karimov M. A., Polvonov B. Z., Yuldashev N. Kh. Low-temperature photoluminescence of thin films with an anomalous photovoltaic property // Physical Surface Engineering. 2010.– T. 8.– No. 4.– P. 358–364.
3. Gavrilenko V. I., Grekhov A. M., Korbutyak D. V., Litovchenko V. G. Optical properties of semiconductors. Directory. – Kiev.: Naukova Dumka, 1987.– 607 p.
4. Adirovich E. I., Mastov E. M., Mirzamakhmudov T., Naymanboev R., Rubinov V. M., Shokirov N., Yuabov Yu. M. On Sat Photoelectric phenomena in semiconductors and optoelectronics.– Tashkent: Fan, 1972.– 344 p.
5. Mirsagatov Sh. A., Shamirzaev S. Kh., Makhmudov M. A. Intergrain surface states of polycrystalline films and their influence on the formation of an effective quantum yield // Uzbek physical journal. 1996.– No. 2.– P. 36–40.
6. Matveev O. A., Terentyev A. I. [Basic principles of post-growth annealing of an ingot for producing semi-insulating crystals] // FTP (Semiconductors). 2000.–T. 34.– No. 11.– P. 1316–1321.

Rasulov Voxob Rustamovich,
Researcher of Fergana State University
E-mail: r_rasulov51@mail.ru

Rasulov Rustam Yavkachovich,
Professor of Fergana State University

Karimov Ibrohim Nabiyevich,
Professor of Andijan State University

Abduxoliqov Akmaljon,
undergraduate of Fergana State University

Sultanov Ravshan Rustamovich,
undergraduate of Fergana State University

TWO QUANTUM ABSORPTION OF POLARIZED RADIATION IN n-GaP

Abstract: The two quantum absorption of polarized radiation in a semiconductor with a camel's back band structure is theoretically researched.

An expression is for the spectral and temperature dependence of the absorption coefficient of polarized radiation due to optical transitions between the subbands of the conduction band obtained. In this case, the camel's backness of the lower subband of the semiconductor conduction band is taken into account.

Keywords: matrix element, photon, polarized radiation, optical transition, electrons, conduction band, semiconductor, light absorption coefficient.

Nonlinear absorption of light in a semiconductor with a degenerate valence band, due to direct optical transitions between subbands of heavy and light holes and depending on the state of polarization of the radiation, was studied in [1–8]. In these researches, it is taken to account that nonlinearity in the dependence of the single-photon absorption coefficient on intensity occurs due to resonance absorption saturation. This saturation is due to the photoinduced change in the distribution functions of current carriers in the region of the momentum space near the surface $E_{X_3^C}(k) - E_{X_1^C}(k) - \hbar\omega = 0$ corresponding to the resonance condition. Here $E_{X_3^C}(k) [E_{X_1^C}(k)]$ is the energy spectrum of electrons in the upper (lower) $X_3^C (X_1^C)$ subzone of the semiconductor conduction band, ω is the frequency of light.

However, the issue of absorption of polarized radiation in a semiconductor with a complex zone consisting of two subbands (branches) [9], between which there is an energy gap, remains open. The solution of this issue is devoted this work.

Next, we consider two quantum absorption of polarized radiation in n-GaP type semi-conductors, due to direct optical transitions between the subbands of the conduction band without taking into account the effect of coherent absorption saturation [10], i.e. consider the absorption of polarized radiation, where it is assumed that the photon energy $\hbar\omega$ satisfies the inequalities, where E_g is the band gap, Δ_{so} is the spin-orbit splitting of the valence band.

Due to the smallness of the wave vector of the photon compared to the wave vector of the electron (hole) formed as a result of absorption, when calculating the N-photon absorption coefficient of light ($K(N\omega, T)$), we can assume $q \ll k$ and assume $\mathbf{q} = 0$. Then, according to [2; 3], the absorption coefficient can be written as

$$K(N\omega, T) = N \frac{2\pi \hbar\omega}{\hbar I} \times \sum_{\vec{k}, m=\pm 1/2; m'=\pm 3/2} \left(f_{X_1^C, \vec{k}}^{(N)} - f_{X_3^C, \vec{k}}^{(N)} \right) \left| M_{X_1^C; X_3^C}^{(N)}(\vec{k}) \right|^2 \delta \left(E_{X_3^C, \vec{k}} - E_{X_1^C, \vec{k}} - N\hbar\omega \right) \quad (1)$$

where $M_{X_1^C; X_3^C}^{(N)}(\vec{k})$ is the matrix element of the optical transition from the state $|X_1^C, \vec{k}\rangle$ to $|X_3^C, \vec{k}\rangle$, \vec{k} is the wave vector of electrons, $I = \frac{n_\omega \omega^2 A_0^2}{2\pi c}$ is the light intensity, E_{lk} is the energy spectrum of electrons in the subzone l ($l = X_3^C, X_1^C$), $f_{lk}^{(N)}$ is their nonequilibrium distribution function for N-photon absorption of light, n_ω is light refraction index at frequency ω . Other quantities are well known.

It is clear from the last relation that to determine the spectral or temperature dependence of the optical parameters of a semiconductor, for example $K(N\omega, T)$, it is necessary to calculate the composite matrix elements of the considered optical transitions and we will analyze them below for specific cases.

In the future, to calculate $K(2\omega, T)$ in the case of absorption of linearly polarized light, we choose the following geometry of the experiment $\vec{e} = (0, 0, e_z)$, i.e. light propagates across to the main axis of symmetry of n-GaP. Then

$$K(2\omega, T) = \frac{2\hbar\omega}{I} \left(\frac{eA_0}{c\hbar} \right)^2 \sum_{\vec{k}} |\vec{e}\vec{p}_{31}|^2 f(E_{1\vec{k}}) \delta(E_{3\vec{k}} - E_{1\vec{k}} - 2\hbar\omega),$$

$$K(2\omega, T) = \frac{2\hbar\omega}{I} \left(\frac{eA_0}{c\hbar} \right)^2 \sum_{\vec{k}} |\vec{e}\vec{p}_{31}|^2 f(E_{1\vec{k}}) \delta(E_{3\vec{k}} - E_{1\vec{k}} - 2\hbar\omega), \quad (*6)$$

where the intersubband matrix element of the momentum operator for the vertical optical transition will be as

$$\vec{e}\vec{p}_{31} = \frac{m_0}{\hbar} \langle X_3^{(C)} | \vec{\nabla}_{\vec{k}} \hat{H}(\vec{k}) X_1^{(C)} \rangle = \frac{m_0}{\hbar} [P e_z \sigma_y^{(31)} + \eta \sigma_x^{(31)} D(e_x k_y + e_x k_y)]$$

$$\vec{e}\vec{p}_{31} = \frac{m_0}{\hbar} \langle X_3^{(C)} | \vec{\nabla}_{\vec{k}} \hat{H}(\vec{k}) X_1^{(C)} \rangle = \frac{m_0}{\hbar} [P e_z \sigma_y^{(31)} + \eta \sigma_x^{(31)} D(e_x k_y + e_x k_y)],$$

$$\text{where } \eta = \sqrt{\frac{\Delta^2}{\Delta^2 + 4P^2 k_z^2}}, \quad \sigma_z^{(31)} = \frac{2Pk_z}{\sqrt{\Delta^2 + 4P^2 k_z^2}}, \quad \sigma_y^{(31)} = -i,$$

$$\sigma_x^{(31)} = \frac{\Delta}{\sqrt{\Delta^2 + 4P^2 k_z^2}}.$$

$f(E_{X_3^{(C)}}(\vec{k}))$ is distribution function of electrons with energy $E_{X_1^{(C)}}(\vec{k}) = E$.

1. Spherical zone. Energy spectrum

$$E_{X_3, X_1}(\vec{k}) = A_{3,1} k_z^2 + B_{3,1} k_{\perp}^2 \pm \frac{\Delta}{2},$$

Next, we consider the following geometry of the experiment: $e_z = 0, e_x \neq 0, e_y \neq 0$, where

$$|\vec{e}\vec{p}_{31}|^2 = \frac{m_0^2}{\hbar^2} \eta^2 D^2 (e_x k_y + e_x k_y)^2 \frac{\Delta^2}{\Delta^2 + 4P^2 k_z^2}$$

Then the light absorption coefficient in the spherical approximation in the energy spectrum will be as

$$K_{\parallel}(2\omega, T) = \frac{2 \cdot 2e^2 P^2}{cn_{\omega} \omega \hbar^2 (A_3 - A_1)} k_{\omega} f(k_{\omega}),$$

where $f(k_{\omega}) = \exp\left(\frac{E_F - A_1 k_{\omega}^2 - \frac{\Delta}{2}}{k_B T}\right)$. From the law of conservation of energy $\delta(E_{3\vec{k}} - E_{1\vec{k}} - 2\hbar\omega)$ we have $k_{\omega}^2 = \frac{2\hbar\omega - \Delta}{(A_3 - A_1)}$.

Next, choose the following geometry of light absorption:

$e_z \neq 0, e_x = 0, e_y = 0$, then it is easy to get that $|\vec{e}\vec{p}_{31}|^2 = \frac{m_0^2}{\hbar^2} P^2 e_z^2$. Then the light absorption coefficient is determined by the formula

$$K_{\parallel}(2\omega, T) = \frac{e^2}{cn_{\omega} \hbar} \frac{k_B T}{B} \frac{1}{k_z^{(\omega)}} \cdot e^{\frac{\hbar\omega - Ak_z^2}{k_B T}} \cdot e^{\frac{E_F}{k_B T}}$$

Now choose the following light absorption geometry that satisfies the conditions $e_z = 0, e_x \neq 0, e_y \neq 0$. Then the intersubband absorption coefficient of polarized radiation is determined by the ratio

$$K_{\perp}(\omega, T) = \frac{4\pi^2 e^2}{c\hbar n_{\omega}} \frac{1}{(2\pi)^2} \times$$

$$\times \int dk_x k_y dk_z \frac{m_0^2}{\hbar^2} D^2 (e_x k_y + e_x k_y)^2 \frac{\Delta^2}{\Delta^2 + 4P^2 k_z^2} \cdot (E_{3\vec{k}} - E_{1\vec{k}} - 2\hbar\omega).$$

From the law of energy conservation, the wave vector of electrons participating in intersubband optical transitions depends on the frequency of the light and on the band parameters: $k_z^{(\omega)} = \frac{1}{2P} \sqrt{4\hbar^2 \omega^2 - \Delta^2}$. Then for the spectral and temperature dependence we have

$$K_{\perp}(2\omega, T) = \frac{e^2}{32cn_{\omega} \hbar} \frac{D^2}{P^2} \left(\frac{k_B T}{B} \right)^2 \left(\frac{\Delta}{\hbar\omega} \right)^2 \frac{1}{k_z^{(\omega)}} \cdot e^{\left(\frac{\hbar\omega - A(k_z^{(\omega)})^2}{k_B T} \right)} \cdot e^{\frac{E_F}{k_B T}}$$

where n_{ω} is the refractive index of light for n-GaP at the frequency ω . This shows that the spectral dependence of $K_{\perp}(\omega, T)$ is inversely proportional to k_{z0} , and therefore when

$\hbar\omega \rightarrow \Delta$ it has a root feature of the type $\left[\left(\frac{\hbar\omega}{\Delta} \right)^2 - 1 \right]^{-1/2}$, which arises due to the presence of a ‘‘camel’s back’’ in the lower subband X_1 . If the light propagates along the main axis of symmetry of n-GaP, then

$$K_{\perp}(\omega, T) = \frac{1}{8} \frac{e^2}{c\hbar} \frac{1}{n_{\omega}} \left(\frac{k_B T}{B} \right)^2 \frac{D^2}{P^2} \frac{\Delta}{\hbar\omega} \exp\left(\frac{E_F}{k_B T}\right) \exp\left(\frac{\hbar\omega - 2Ak_z^{(\omega)}}{k_B T}\right)$$

and the above root feature is not. This is due to the absence of a ‘‘camel’s back’’ in the X_1 and X_3 subzones in the direction perpendicular to the main axis of symmetry in n-GaP (It does not take into account the anisotropy in the refractive index of light).

Further, the intersubband light absorption coefficient is investigated in the approximation $A_{\pm} = \frac{1}{2}(A_3 + A_1)$, $B_{\pm} = \frac{1}{2}(B_3 + B_1)$, when the electron energy spectrum has the form

$$E_{X_3, X_1} = A_{\pm} k_z^2 + B_{\pm} k_{\perp}^2 \pm \left(\frac{\Delta^2}{4} + P^2 k_z^2 \right)^{1/2}$$

In this case, the intersubband matrix element of the pulse operator takes the form

$$|\vec{e}\vec{p}_{31}|^2 = \frac{m_0^2}{\hbar^2} D^2 (e_x k_y + e_x k_y)^2 \frac{\Delta^2}{\Delta^2 + 4P^2 k_z^2},$$

From the law of conservation of energy we get

$$k_z^{(\omega)} = \frac{\Delta}{2P} \left[\left(\frac{\hbar\omega}{\Delta} \right)^2 - 1 \right]^{1/2}.$$

Then $K_{\perp}(2\omega, T)$ in this case it is defined as in case 2.1, where in the results it is necessary to make the following replacement $A_{\pm} \leftrightarrow A, B_{\pm} \leftrightarrow B$, i.e.

$$K_{\perp}(2\omega, T) = \frac{e^2}{32cn_{\omega} \hbar} \frac{D^2}{P^2} \left(\frac{k_B T}{B_{\pm}} \right)^2 \left(\frac{\Delta}{\hbar\omega} \right)^2 \frac{1}{k_z^{(\omega)}} \times$$

$$\times e^{\left(\frac{\hbar\omega - A_1(k_z^{(\omega)})^2}{k_B T} \right)} \cdot e^{\frac{E_F}{k_B T}}$$

So for various geometry of the experiment, the relations for the spectral and temperature dependences of the absorption coefficient of polarized radiation in a semiconductor camel’s back band structure were derived and limited only to qualitative analysis due to the absence of experimental results.

In conclusion, we note that a similar problem can be solved for hole conduction tellurium, since one subband of the valence band in which has a camel’s back structure. This case requires separate consideration.

The work was partially funded by a grant OT-Φ2–66.

References:

1. Ivchenko E. L. // FTT. 14, 1972.– 3489 p.
2. Rasulov R. Y. Diss. on the competition degr. of. DSci.– St.-Petersburg, 1993. Chap. 3.– 138 p.
3. Ganichev S. D., Ivchenko E. L., Rasulov R. Ya., Yaroshetsky I. D., Averbukh B. Ya. FTT, 35, 1993.– 198 p.; Rasulov R. Ya. FTT. 35, 1993.– 1107 p.
4. Parshin D. A., Shabaev A. R. JETP. 92, 1987.– 1471 p.
5. Ganichev S. D., Emelyanov S. A., Ivchenko E. L., Perlin E. Yu., Terentev Ya. V., Fedorov A. V., Yaroshetsky I. D. JETP, 91, 1986.– 729 p.
6. Rasulov R. Y., Khoshimov G. H., Holitdinov H. FTP. 30, 1996.– 274 p.
7. Rasulov R. Ya. FTP. 22, 1988.– 2077 p.
8. Rasulov R. Ya. FTT. 35, 1993.– 1674 p.
9. Ivchenko E. L., Rasulov R. Ya. Symmetry and real band structure semiconductors. Fan,– Tashkent. 1989.– 126 p.
10. Rasulov V. R., Rasulov R. Ya., Eshboltaev I. M. FTT. 59. 2017.– P. 453–457 p.

*Tursunbaev Bakhodir Hanazarovich,
Honorary academician of the Academy of Sciences Turon
Tashkent Automobile and Road Institute
E-mail: bahodirtursunbaev@gmail.com*

*Dadamuhamedov Turgun,
associate professor, Ph.D.,
Tashkent Automobile and Road Institute
E-mail: dadamuhamedov@gmail.com*

ATOM SIZE

Abstract: This article uses scientific analysis to find the interrelation between the atomic ionisation energy of an atom and the electron orbit radius. A new pattern has been established for the relationship between the atomic ionisation energy and radius of the atom. New atomic physics constant have been calculated.

Keywords: Ionisation. Atomic ionisation energy. Atomic radius. New constant in atomic physics. New method for determining the atomic radius.

One of the main atomic parameters is ionisation energy – it is the process of electron loss by electrically neutral atoms. The first ionisation potential is the lowest energy required to remove an electron from a neutral atom. Atomic ionisation requires application of the necessary energy, since atomic ionisation cannot occur spontaneously, that is, electrons cannot spontaneously leave the structure of the atom.

At present, the first ionisation energy of all atoms of chemical elements has been determined experimentally and can be found in literature.

This article proposes a new method for calculating the atomic radius of chemical elements of the periodic table using the following formula:

$$r_0 = \frac{ke^2}{E_n} \quad (1) [1, 17], [2, 94]$$

where:

r_0 – is the radius of the single electron orbit; k – is the Coulomb's constant; e – is the electron charge; E_n – is the first atomic ionisation energy, n – is the ordinal number of an chemical element in the periodic table.

Figure 1 shows the values of the radii of chemical elements atoms as the diagrams, calculated using formula (1).

If we transfer unknown variables in (1) to the left-hand side of equation, and known variables to the right-hand side, we obtain the following:

$$\therefore E_n r_0 = ke^2 \quad (2)$$

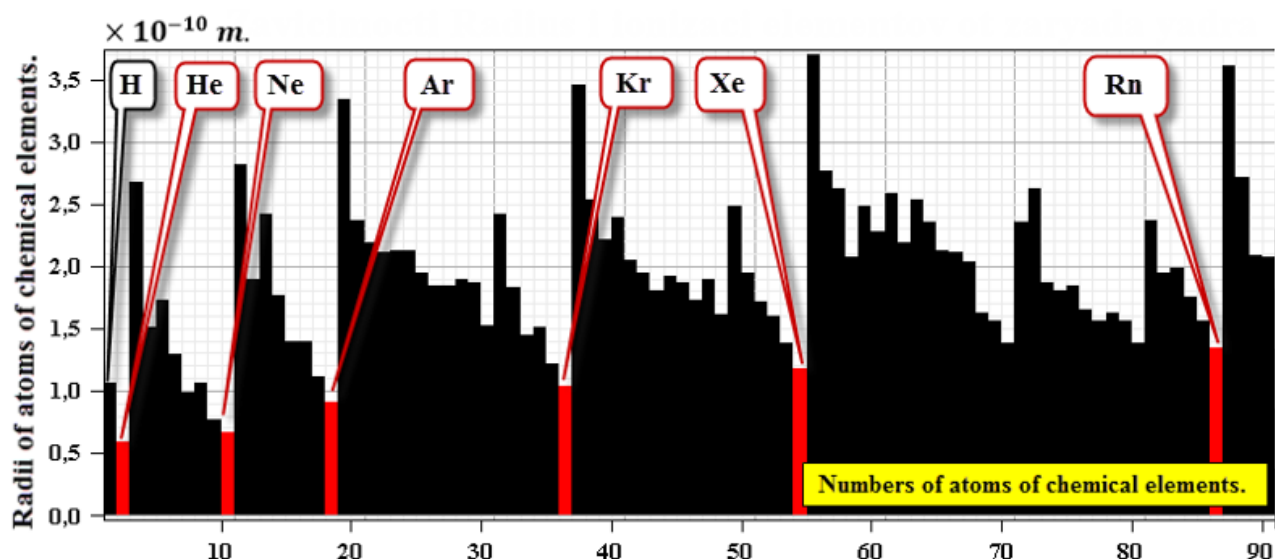


Figure 1. Radii of the atoms of chements elements of the periodic table system

If we denote ke^2 by Ω and, calculate its value, then we obtain another new constant:

$$\Omega = ke^2 = \text{const} = 2.30 \cdot 10^{-28} \quad (3)$$

then,

$$E_n r_0 = \Omega \quad (4)$$

or

$$E_n r_0 = 2.30 \cdot 10^{-28} \quad (5)$$

Therefore, we can draw the following conclusion:

– The product of the numerical values of the ionisation energy and the atomic radius of chemical elements is constant:

$$E_n r_0 = \text{const} \quad (6)$$

Aforementioned allows drawing the following conclusions:

1. Ionisation energy and atom size of all chemical elements are directly interrelated.

2. The product of the numerical values of the ionisation energy and the atomic radius of chemical elements is always a constant:

$$E_n r_0 = \text{const}$$

it equals:

$$\Omega = 2.30 \cdot 10^{-28}$$

References:

1. Нигматов Х. Турсунбаев Б. Методика расчета радиуса атома водорода и других элементов таблицы Менделеева // *Инновации в науке* 2017. – № 8 (69). – С. 17–19.
2. Tursunbaev B. *Deterministic Electronic Structure of an Atom. The origins of the delusions of quantum mechanics and its resuscitation.* Lap Lambert Academic Publishing, 2018. – 130 p.

Section 15. Philology

*Bekbergenova Mariya Dosbergenovna,
candidate of philological sciences, docent
Nukus State Pedagogical Institute named
after Ajiniyaz, Faculty of Philology,
Karakalpak Literature Department
E-mail: Bekbergenova53@mail.ru*

COMPARATIVE TYPOLOGICAL STUDY OF ISSUES IN KARAKALPAK PROSE OF THE XX CENTURY

Abstract: The given article deals with comparative typological study of Karakalpak prose of XX century's 60–80s. It is being connected with historical genre of Karakalpak epics, genetic, Literary and typological relations of questions. Moreover, there are given materials about historical origin of contemporary prose, literary and typological relations between folks, and also the role of literary translations in development and typological relations between nations.

Keywords: prose, literary connection, problems of typology, comparative-typological analysis, epic genre, types of genre, epic, historical sayings, stories, novelette, novel.

Comparative typological study of Karakalpak prose of XX century is being connected with historical genre of Karakalpak epics, genetic, Literary and typological relations of questions.

Karakalpak heroic dastans (epic poems) such as “Alpamysh”, “Kyryk kiz”, “Edyge”, “Koblan”, and others are parental of the epic genre in Karakalpak Literature.

Theoretically, it is given that myths, saying, legends, fairy tales, elegies, and others are forms of epic genre.

In the theory of Karakalpak Literary Text, we can see hypothesis by doctor of philological sciences, Professor K. Maksetov, in which he mentioned that elegy has epic features and it is depicted as Historical Legend even though it has been included into the list of Folk Literary Texts [1]. Historical Legends, historical ballads, shejire (genetic epic poem) were served as the key element in developing and increasing the nation. There was a traditional style of elegy writing in Karakalpak Literature and moreover we could highlight the followers of this style such as Jiyen Jirau with his work “Poskan El” (The Ruined People), Ajiniyaz work “Bozatau” (the name of district on the territory of Karakalpakstan), Berdakh with his historical works.

Moreover, ballads and poems are types of epic genre. For instance, the works by M. Darybaiv “Aypara” (Aypara), “Shegarada” (At Boarder), J. Aimurzaiv “Gures” (The Fight), “Jumagul” poems, A. Dabilov “Bakhadir” (Brave), S. Nurymbetov “Khanalaslar” (Siblings), T. Jumamutov “Makaria sulu” (Makariya Beauty) were the stages of forming and

developing epic genre in dastans. Researching the historical conformation of XX century's Karakalpak prose is one of the important questions to deal with. Academic M. K. Nurmukhamedov had written doctoral dissertation on the topic “The Ways of developing Karakalpak prose genre”, he depicted all stages of historical development from small to big issues of the genre, furthermore J. Narimbetov defended candidate's dissertation on the theme “Qaraqalpaq romani: oniń qalıplesiwi hám rawajlaniwi” (Karakalpak Novels: formation and development), also we can highlight other works on this field such as candidate dissertations by A. Kojikbaiv on topic “Qaraqalpaq romanında konflikt hám qaharman” (Conflict and Character in Karakalpak Novels), S. Bakhadirova “Xázirgi qaraqalpaq gúrrińleri” (Contemporary Karakalpak Stories), K. Kamalov “Qaraqalpaq povesti: janrdiń evolyutsiyası” (Karakalpak Novelette: evolution of the genre), and also dissertation of doctor of sciences by K. Sultanov “Xázirgi prozaniń rawajlaniw baǵdarları” (Direction of Contemporary Prose Development). In addition to these work, there were done and published a lot of monographs and articles by A. Nasruallaiv, K. Mambetov, S. Axmetov, T. Mambetniyazov, K. Allambergenov, P. Nurjanov etc.

From the list of this given works, M. K. Nurmukhamedov's specified with its deep investigating culture, history, language, and literature of Karakalpak language throughoutly in various aspects. His several scientific books, articles, and works are well-known among linguists, literary critics

and also among people. For instance, we may underline the works such as “Qaraqalpaq a’debiyatiniñ rawajlanıwına Rus adabiyatiniñ ta’siri” (Impact of Russian Literature on development of Karakalpak Literature), “Qaraqalpaq prozasi” (Karakalpak Prose), “Краткий очерк истории каракалпакской литературы” (Brief outline of Karakalpak Literature), “Urisqa shekemgi qaraqalpaq prozasi” (Pre-War Karakalpak Prose), “Каракалпакская проза периода Великой Отечественной войны” (Karakalpak Prose while World War II), “Хазирги Заман қарақалпақ прозаси” (Contemporary Karakalpak Prose), “Каракалпакская советская проза” (Karakalpak Soviet Prose), “О зарождении письменной литературы у полуоседлых и кочевых тюркоязычных народов Средней Азии и Казахстана” (On the birth of written literature in semi-settled and nomadic Turkic-speaking peoples of Central Asia and Kazakhstan), “Из истории русско-каракалпакских культурных связей” (From the history of Russian-Karakalpak cultural relations), “Литературная наука и идеологическая борьба” (Literary Sciences and ideological fight), “Каракалпакская поэзия” (Karakalpak Poetry), “Бердах – великий поэт каракалпакского народа” (Berdakh – an outstanding Karakalpak poet), “Бердах – основоположник каракалпакской литературы” (Berdakh – a founder of Karakalpak Literature), “Пушкин – Оренбург и оренбуржцы” (Pushkin-Oienburg and The Orienburs), “Pushkinnin ertekleri hám Orta Aziya xaliqlariniñ folklori” (Pushkin’s Fairy-Tales and Central Asian People’s Folk) etc.

Especially, the works in researching the prose of Karakalpak literature are currently quite important. The prose of Karakalpak literature which is the main genre of XX century’s Karakalpak literature came to emergence in 1920s. Since that there hasn’t been any scientific works about the history of Karakalpak prose till 1950–60 years. M. K. Nurmukhamedov wrote his doctoral dissertation on historical development of Karakalpak prose and this scientific work was novelty in Karakalpak literature. Secondly, M. K. Nurmukhamedov was the first scientist who carried out research. He made the great job and fulfilled the meaning of Karakalpak prosaic writer’s all satirical articles, essays, novels, stories by giving description of them, he selected and analysed all literary text, criticized, identified strong and weak sights, described plot, theme, point of view, characters, figurative language, gave feedbacks, and also concluded his writings with vary summaries on newspaper articles, reviews, and books. This scientific work includes XX century’s Karakalpak prose during the years 1920–60s. Afterwards, J. Narimbetov, A. Kojikbaiv, S. Bakhadirova, K. Kamalov’s scientific works were about the forms of epic genre such as, story, tale and the emergence of novels in particular period and its importance in the history of Karakalpak literature is mentioned. There

has not been particular research on the issues of typology in the prose of Karakalpak Literature.

The term literary relationship is the process of being acquainted with the national literature and making connections. This process happens when writers start to know and deeply aware about their work and be impressed by each other’s works. In the light of this literary relationship there are developed new literary traditions, new literary forms, works, images and etc.

These relationships have been in various forms. There may be visits, literary decades, weeks, translations, and so on. Karakalpak people were introduced with the literature of Uzbek, Russia, Belorussia, Ukraine, Latvia, Estonia, Azerbaijan, Turkmen, Kazakh, Tatar, Bashkurt by seminars, decades, weeks and literary translations. Their works have been constantly announced in newspapers and journals. Well-known literary translators have done these translations such as, J. Aimurzaiv, T. Jumamutov, I. Yusupov, M. Seitnyazov, K. Seitov, K. Turymbetov etc. Literature scholars K. Maksetov, I. Sagytov, A. Nasruallaiv and others wrote about the importance of literary relationship. Literary relationship enabled poets and writers to develop their works even more. One of the contemporary developers of Karakalpak literature S. Majytov started his career with translation of L. N. Tolstoy’s stories into the Karakalpak language.

Literary relationship is the basis of historical development of national literature. It is known that from ancient times there was historical and cultural relationship between Western Europe and Slavic. In early times, as it is known that Arab, Persian and Turkic literature developed strongly, During VIII–XV centuries proves that literary relationship was the forms of literature field. Information about these facts, we can see in the works of professor K. Mambetov [5] and professor K. Kuranbaev [6], professor K. Maksetov [4]. Academic M. K. Nurmukhamedov investigated the relation of Russian and Karakalpak Literature, and said that this relationship went on through long historical periods [2].

The roots and evidences about relationship of Russian and Karakalpak found in sources of Kiev Rusi (VIII century the end of XII century) and Union of Tribes of Pechenegs (IX–XI centuries) [3, 224]. These materials proves that relations have deep roots from ancient times.

The relationships of Karakalpak Literature of XX century were investigated in some research works by vary scholars. This issue was studied by M. K. Nurmukhamedov on topic “The impact of Russian Literature on origin, forming, and evaluation of Karakalpak Literature”, K. Mambetov “History of Eastern Literature” and “Uzbek and Karakalpak Literary Relationships”, K. Maksetov “Relations of Karakalpak Literature with other neighboring nations Literature”, K. Kurambae “Soul waters soul”, A. Jaksibaev “Issues on Literary

Translation”, B. Kurbanbaev “Berdakh and Uzbek Literature”, G. Kuramboeva “Mirtemur and Karakalpak Literary environment”. The other years, the problems and issues in relationships of Literature were learned and analysed in scientific and practical conferences at World Literature University named after M. Gorkiy in Moscow city [1.].

To continue the list of scholars who studied the relationships of Literature of vary nations we could give the names of V. M. Jirmunskiy, Kh. G. Korogli and etc.

The translation of literary texts has its own important task and it helps to introduce with spiritual wealth of one nation to another, moreover it stimulates the development of national literary process and increase thematical background of the Literature. Introducing with success of the neighboring nations’ culture and literature was the ancient historical aspect in Theory of Literature.

Literary Translation developed as the main element of literary relationships between nations in XX century, almost

the work of translating into Karakalpak the literature of Uzbek, Kazakh, Turkmen writers and poets’ masterpieces started in XX century’s 30 s.

Also all poets and writers themselves worked on translations, it helped to experience, to enlarge the working diapason, to enter new ideas, topic, themes, forms and genres in their creative works. For instance, Hero of Uzbekistan, state poet of Uzbekistan and Karakalpakstan Ibrayim Yusupov translated a lot of masterpieces of world known writers and poets works into native Karakalpak language, such as, A. Pushkin, M. Lermontov, Taras Shevchenko, Shakespeare, O. Khaiyam, Navoiy, Uvaisiy, Byron, Gete, Gwynne, Shailer’s masterpieces.

And also works of famous Karakalpak writers and poets such as Berdakh and Ajiniyaz’s work translated into Uzbek, Kyrgyz, Kazakh languages.

Each national work can be available to other nations through translation, so that literary translation is the most powerful element in Literature.

References:

1. Maksetov K. Karakalpak Folk. Nukus. Education. 1996.
2. Jarimbetov K. Historical development and features of the genre of XIX century Karakalpak Lyrics. Nukus. Education. 2004.
3. Pakhratdinov A., Allambergenov K., Bekberhenova M. History of Karakalpak Literature of XX century. Nukus. Karakalpakstan. 2011.
4. Relationship and interaction of national literature. Moscow. Publisher. ASc. 1963.
5. Nurmukhammedov M. K. History of Russian-Karakalpak national relations. Nukus. – Karakalpakstan. 1977.
6. Nurmukhammedov M. K. History of Russian-Karakalpak national relations. – Vol. II. Nukus. – Karakalpakstan, 1983.– 224 p.
7. Maksetov K. Relationship of Karakalpak Literature with Neighbouring nations Literature. Nukus. – Karakalpakstan. 1987.
8. Mambetov K. Uzbek and Karakalpak Literature’s relationship. Nukus. – Karakalpakstan. 1992.
9. Kurambaev K. Soul waters souls. Nukus. – Karakalpakstan. 1991.

*Mukhitdinova Nadira Abdullaeva,
Ph D., in philology, Head of the department,
the department of "Foreign languages",
Republican Graduate School of Business
and Management named after Abu Raihan Beruni,
Tashkent, Uzbekistan
E-mail: ruhsora_79@mail.ru*

PRINCIPLES OF CREATING DIDACTIC TEXTS FROM THE POINT OF view OF DEVELOPMENT OF INFORMATION TECHNOLOGIES

Abstract: Language is the most important asset of human society. No wonder they say that the main difference between human society and any other community of living organisms is the ability of individuals to communicate with each other. And through communication there is communication (interaction) of thoughts, and hence the process of cognition.

Modern innovations in the field of information technology influence the various activities of our modern life. In the period of intensive development of information technology, especially the computer, the relevance of this topic is the comparison of traditional textbooks with new types of textbooks of a new generation that are displayed on the computer monitor.

Keywords: information technologies, types of texts, paradigmatic, syntagmatic nature.

The development of mankind depends on inventions created in its history. The more significant the invention, the more it affects the development of society. From history it can be concluded that one of the most significant inventions was the invention of writing. The invention of the second signal system – written speech – was a significant step to the development of communication capabilities in addition to the already existing means of communication – oral speech. In their view, the type of civilization is not the least dependent on the type of written speech. For example, the differences of the three ancient civilizations are due to differences in the types of writing – the Chinese ancient civilization, based on hieroglyphic writing; Indian ancient civilization, based on a sound-letter written speech with a graphic marking of vowels and consonants; Mediterranean ancient civilization, based on a sound-letter written speech without graphic marking of vowels and consonants [3]. During a relatively short period of development after the invention of written speech, civilization has reached such horizons that are incomparable with achievements in dozens, and perhaps hundreds of thousands years of mankind development.

Oral speech with its unique opportunities to reflect the thoughts of a person has a number of shortcomings. The most important of these shortcomings were the limitation of the Oral speech in space and time. With the advent of written speech, these restrictions of the Oral speech were removed. Mankind has the opportunity not only to transmit thoughts at a distance, but also in time [1].

The invention of printing was another important invention in the field of information technology. It first appeared

in Europe. Perhaps, for this reason, Europe began to develop faster than any other part of the world in the new history. The same can be said about the development of the science of philology and linguistics [4]. After the invention of printing, humanity in a very short period of time has reached more than it achieved in the same period after the appearance of the handwritten letter.

Now we have the opportunity to use the new big invention in the field of information technology – a computer, E-mail, Internet, etc. Thanks to computer technology, which provides with enormous speed the transfer of huge volumes of information from one point of the globe to any other, today civilized humanity enters a new, information era. And today it is hardly possible to find a theme more fashionable and widely discussed than the modern global information revolution and the changes to which it led and will lead in the future both in society as a whole and for everyone in particular [2, c. 256–266]. Now we are facing a new big invention in the sphere of information technologies, a new means of communication different from both oral and written speech. In this report we'll try to reveal that the text displayed on computer monitor is neither a written speech nor an oral means of communication. It embraces both the features of oral means of communication and a written speech:

A written speech-based didactic texts have both negative and opposite sides.

Here are the main characteristics of written speech-based didactic texts:

- It is unlimited in space;

- It is unlimited in time;
- Paper fixed and can be reproduced at any time and at any place;
- Presented material is of a syntagmatic nature;
- The amount of text is measured by the number of pages;
- Feedback cannot be achieved in the process of text delivery or at the end of it – the presence of a lecturer in this case is obligatory;
- In order to make corrections, the text can be reproduced anytime and anywhere
- The measurements of a text are fixed.

Positive sides of written speech-based didactic texts:

- It is unlimited in space;
- It is unlimited in time;
- Paper fixed and can be reproduced at any time and at any place;
- In order to make corrections, the text can be reproduced anytime and anywhere

Negative sides of written speech-based didactic texts:

- Presented material is of a syntagmatic nature;
- The amount of text is measured by the number of pages;
- Feedback cannot be achieved in the process of text delivery or at the end of it – the presence of a lecturer in this case is obligatory;
- The measurements of a text are fixed.

The main characteristics of a high technology-based didactic text include the following.

Positive sides of high technology-based didactic text:

- It consists of two parts – the first is displayed on the monitor for the student, the second is the text of the software itself, i.e. an algorithm, a set of instructions for the computer without which the first text cannot be displayed on the monitor.
- The text displayed for the student includes the one that has nothing to do with the text of an algorithm and

is displayed on the monitor without the help of the algorithm.

- It also includes the text that can only be displayed according to the commands of an algorithm. The text displayed without the help of an algorithm is usually a content of the didactic text itself, includes instructions for performing exercises, etc. The text displayed according to the instructions of an algorithm is the main part of the didactic text that can be displayed either in a printed way or in graphs, pictures, sound or video film.

- The text of an algorithm is never displayed for the student and the function of this text is to monitor the performance of all regulations mentioned in the instructions of the text.

- The nature of the text is of paradigmatic character; its volume is not limited. This text is fixed and its volume is measured by a number of finished thoughts or ideas.

- The information is easily and fast found; the rules and regulations of the theory are not generalized – they are able to answer the needs of any assignment taken separately.

Negative sides of high technology-based didactic text:

- Not any.

Taking all this into account we have to conclude that the mankind is facing a very big invention which is equal and even more important than the inventions of a written speech and later on printing. We know how fast the nations that used these inventions in everyday life moved forward. High technologies are developing much faster and our nation should take this fact into consideration and do its best to fully use it in all spheres of life including education. Now it is important for all teachers of foreign languages, that is philologists explore all the possibilities of creation of electronic textbooks, without referring to programmers, which will provide an opportunity not only for students but also people to learn languages on their own at any time and in any place.

References:

1. Amirova A., Olhovikov B. A., Rojdestvenskiy Y. V. Essays on the history of linguistics. – M. 1975.
2. Kalandiya I. Saint – Petersburg Philosophical Society. – M. 2005.
3. Olhovikov B. A. General theory of language.– XX century. – M.: “Akademiya”. 2007.
4. Olhovikov B. A. The theory of language and the type of grammatical description in the history of linguistics. – M.: “Nauka”. 1985.

Usmanov Farhad Fakhriddinovich,
Andijan State University
E-mail: ufarhod001@mail.ru

MYTHOLOGICAL AND FOLKLORE CHARACTERS IN THE LINGUISTIC PICTURE OF THE WORLD: THROUGH UZBEK SIMILES

Abstract: The article analyzes the similes, in which mythological and folklore characters in Uzbek are epitomized. The role of Islamic traditions are evaluated in the linguistic picture of the world characteristic of Uzbek nation.

Keywords: anthropocentrism, similes, mythology, religious mythological imagination, worldview, interpretation, epistemological function, axiological function.

The language is a priceless gift to humankind, a requisite of the nation's existence. It has a great potential to describe the human, the nation's mentality, and the world. The 20th century language study was a systematic structured approach [1; 2; 5]. In recent years, attention has been focused on researching the language together with its own subject. Viewing the language as an anthropocentric phenomenon requires the study of the subject with the national culture. As a result of the growing interest in the study of language in connection with national mentality, national culture, and national spirituality in recent years, especially in Russian linguistics, a linguistic network, known as "linguoculturology" has emerged together with the term "linguistic cultureme", linguistic units that carry cultural information [3]. Because they retain fairy tales, legends, traditions, as if they were in conservation [2; 3]. Human beings fundamentally study the world by comparisons. In his day, Aristotle noted that human beings differ from animals through the ability to compare things and phenomena in the realm of external reality, whereby they derive their initial knowledge [4, 20].

Linguistic comparisons form a separate type of comparative tropes. They reflect the nation's centuries-old life experiences and reflect the cultural constants of the nation. Linguo-cultural similes need to be understood as a way of reflecting, promoting and propagating spiritual, aesthetic, ethical and social values [5; 4].

The models being compared are of particular importance in fixed similes. They serve as a special criterion or the ideal way to evaluate spontaneous processes that they deal with. The fact that similes, first and foremost, serve to express attitudes, namely evaluations, makes us regard them as linguistic means that reflect the axiological views of the nation. The formation of the linguistic picture of the nation is primarily influenced by the historical-geographical environment in which it resides, its realities and, of course, its religious-mythological perceptions.

The Russian linguist L. Boyko classifies the models in fixed similes in Russian into several groups such as "human", "flora", "fauna", "tales, artistic, mythological characters" and "others". Based on this classification, models in similes in Uzbek can also be divided into groups such as "human", "nature",

"flora", "fauna", "mythological, artistic and folklore characters", "household realia" and "others".

In this article I would like to discuss the essence of fixed similes, in which mythological, artistic and folklore characters serve as models, and which have a special role in the Uzbek language. This group of similes includes *dev* (the giant ogre), *ajdarho* (the dragon), *the Jannah, jahannam* (the Jahannam), *duzakh* (the hell), *the Kaabah, the angel, shayton* (the devil), *Yajuj and Majuj* (the Gog and Magog), *Eram Garden, the princess, Rustam, Samandar, yalmoghiz* (evil old woman), *alp, Alpomish, Alaka's dog, arvoth* (ghost), *Farhad, As-Sirat, Hatim al-Tai, mirage, alvasti, Anqo eggs*.

Mythology is primarily a compilation of epic poems that reflect the ideas of the primitive nations about the nature, the universe, and the human being. Mythology is a primitive form of culture, which displays a particular cultural phenomenon, showing the picture of the world in human minds [6, 195].

It seems that, on one hand, mythology, religion and artistic mind harmonize with each other. On the other hand, the identification and interpretation of mythological images, folklore and artistic characters in the nation's mentality imply a certain amount of linguocultural knowledge. Such knowledge serves as a basis for interpretation of cultural information.

As a result of the research, a large part of the group "Mythological, Artistic and Folklore Personages" was found to be in close connection with Islamic religion and Islamic ideology. Like in the below given example: *People were in dire plight losing their clothes, becoming as terrifying as yajuj-majuj in legends*. For example, it seems that the basis of the simile "to hit like yajuj-majuj" used to describe a violent attack or destructive actions is in the Quraan. *Until when Gog and Magog are let loose and they swarm from every hill. And when the true promise has drawn near, the eyes of those who disbelieve shall gloat over their eyes: "Woe unto us! We were neglectful of this. No! We were wrongdoers"* (Al-Anbiya', 96-97) Gog and Magog are a tribe with great numbers of people, and their emergence is a sign of the doomsday. They fill the earth with corruption and ruin. And when they will emerge is known to no one except Allah [16].

The simile models refer to the cultural information of national character which was formed over the centuries. This information relies on the literal meaning of the subject, character, and etc, turning into a nationally and culturally conditional image as a result of repetitions in typical situations. It is natural to use the “Jannah” (heaven) that appears in Uzbek linguistic culture as a figurative expression of a beautiful, prosperous place or, its contrast, “Jahannam” (hellfire) for a terrible, darkened place. Naturally, the highest point in the potential hierarchy that can figuratively represent a beautiful or a dark place for Muslim is Jannah or Jahannam (heaven or hell). Thus, the model is, first of all, the ideal sample, measure or type of something. (Uzbek National Encyclopedia-UzNE) [8]. Meanwhile, the views of Sh. Makhmaraimova, who studied the abovesaid as theomorphic metaphors, are remarkable: it is a mechanism that forms the culture of theomorphic metaphor and constitutes the basis of the concept of the universe, determining its constants and having its own “lines” in the world view. The theomorphic metaphor serves the purpose best to distinguish between good and evil and can become an important cognitive mechanism that adds to the experience of the universe [7, 63]. We can say the same thing about similes. Indeed, the only basis for them is the experiment of comparison in the human mind [9, 103]. In this case, the purpose of choosing an appropriate model is to show the standard, the ideal example. In the Holy Qur’an, there are a number of mentions of an immortal world – Jannah – the Heaven for good deeds, and Jahannam – the Hell, a dreadful place is assigned for the wrongdoers:

And give glad tidings to those who believe and do good deeds, for them will be Gardens beneath which rivers flow. Every time they eat fruits, they say: “This is the fruit of which We have been given before.” Verily, they will be given to one another similar fruits. And for them there are pure companions, and they will abide therein forever (Al-Baqarah, 25).

When it is said to be afraid of Allah, pride leads him to commit sins. Only Jahannam will come to him. How awful it is! (Al-Baqarah, 2: 206).

... Whoever earns evil and falls into sin, it is they who are the dwellers of the Fire, and they will abide therein forever. (Al-Baqarah 2: 81).

According to the religious creed, God created the hell to punish the disbelievers and wrongdoers. The Jahannam (the hell) is a terrible hole with flaming fire in it. (UzNE) The fact that the hell is a lexeme denoting a fiery place makes it a fixed simile expressing overheating, burning, and torture: *During the exercise the tank burns like hell (U. Hashimov); You can hardly forget trying to, you can hardly imagine trying to, you feel tortured, and your world is seen as hell (N. Boqi).*

The set model of “Eram’s Gardens” is also used to denote beautiful and cozy places: *The sites, flourishing squares,*

tidy streets like Eram Garden are built to protect public health, not to entertain any person. (A. Fitrat).

Piskand nihoyat hushliqo, hob soya-salqin, dilkusho Bog`i Eramdek jonfizo, serob, seranhor ekan (Furqat).

(Here, the author describes the place called Piskand as a very beautiful, flourishing and cozy site using the simile “like Eram Garden”)

However, Eram Garden comes after the Jannah in the hierarchy of set models to denote beautiful, flourishing places. We can say that the first reason for this is that the paradise is not created by human beings; it is inaccurate and, therefore, ideal; Eram’s garden is created by human beings and therefore can not claim perfection. Shaykh Abdullaziz Mansur describes the Garden of Eram, which is mentioned in Surat al-Fajr, originated from Iram city, with no analogues in other country (verse 7 to 8): *“Iram or Eram is the name of a Noah King of this Dynasty after which a city, a garden, and a tribe was named (tribe of Ad) As the story goes, one of the two sons of Ad, Shaddad, hearing that Allah created an incomparable and impeccable garden in the world beyond, set up an amazing garden in the desert of Adnah (Yemen) to become equal to Him. The garden was built over 300 years. Ad lived for 9,000 years. But he could not enjoy seeing the garden he had built with pride... “[10]*

The Kaabah, angel, devil, which belong to the category of fixed similes are related to the Islamic tradition like the above mentioned lexemes Jannah, Jahannam, or hell. The most holy place is the Ka’bah (Explanatory dictionary of the Uzbek language-EDUL II. 339) [11], an angel is supernatural being, and a maiden is a symbol of purity (EDUL IV, 329), devil is Satan, which is an evil spirit (EDUL IV, 535). It can be said that the leitmotiv (German “leitmotiv”- the focal point, the main meaning) for them is the same: they show the borders of good and evil and the outcome of a person’s attitude to them:

And We have made the Ka’ba as a place of safety for mankind and a place of security. (Al-Baqarah, 125) Poetry was as sacred a place for him as the Ka’ba (N. Karimov).

The Day when the Spirit and the angels are ranged row on row. None shall speak save he whom the Merciful Lord will permit; and he too will speak what is right. (Naba’: 38). That is, on the Doomsday, not only the people, but also Jibreel alaihissalam, the leader of the angels called “the Spirit”, stand in the presence of Allah [12, 357] *I love as beautiful and neat a girl as an angel (U. Hashimov).*

The main tasks of mythology are gnoseological, axiological and regulatory functions [6, 196]. According to the analysis of sources, in Uzbek discipline of perceptions, these three functions co-operate and we can thus observe the evolution of mythological thought through the examples of similes. As a result of the analysis, it was found out that the concepts related to the Islamic religion occupy a great deal in Uzbek similes. That,

Islamic traditions are of great importance in the mentality and national linguistic picture of Uzbek people. This is the reason why the lexical units of the Arabic language have a great place in the mythology of Turkic and Muslim people (68%) [15, 8].

It should be noted that the identification of the similes, roots of which go to mythology, and their correct interpretation involves the knowledge of the religion, culture, folklore, literature and morals of the nation.

References:

1. Nurmonov A. Selected Works. – Vol. 2. – Tashkent, 2012.
2. Maslova V. Linguoculturology. – M.: “Academia”, 2001.
3. Vorobev V. V. Linguoculturology. – M. 2006.
4. Aristotle. Poetics. – Tashkent: New Century Generation, 2004.
5. Boyko L. G. Kulturno markirovannoe sodержanie usTaichiviyh sravneniy russkogo yazyka. A dissertation by Candidate of Philology. – Volgograd, 2009.
6. Fyodorov A. A. Vvedenie v teoriyu i istoriyu kulturey. Slovar. – M.: “Flinta”, 2005.
7. Makhmaraimova Sh. The cognitive aspect of the theomorphic metaphor in the national linguistic picture of the world. Ph. D. dissertation in philological sciences. Qarshi, 2018.
8. National Encyclopedia of Uzbekistan. Tashkent: National Encyclopedia of Uzbekistan, 2008.
9. Usmanov F. The role of similes in the formation of the picture of the world. Uzbek language and literature. 2017. – No. 6.
10. Translation of the meanings of the Holy Qur`an. The author of interpretations and comments: Abdulaziz Mansur. – Tashkent. 2014.
11. The Explanatory dictionary of the Uzbek Language. Consists of 4 volumes. Tashkent: National Encyclopedia of Uzbekistan, 2008.
12. Shaykh Muhammad Sodiq Muhammad Yusuf. Tafsiri Hilal. Part six. – Tashkent: Sharq, 2009.
13. Makhmaraimova Sh. A brief conceptual dictionary of the theomorphic metaphors of the Uzbek language. – Tashkent: publishing house named after Chulpon, 2018.
14. Khudoyberganova D., Andaniyazova D. Tashkent, Explanatory dictionary of poetonims in Uzbek. “Turon zamin ziyoy”, 2016.
15. Sharapov K. Strukturnye i funktsionalno-semanticheskiye osobennosti mifologicheskoy leksiki v yazykah razlichnyh system. Author`s abstract of dissertation. – Dushanbe, 2006.
16. URL: <http://savollar.islom.uz/wparxiv/15662>
17. URL: <https://hadis.uz/term/37>

Section 16. Philosophy

*Arapbaeva Dinara Kurbanovna,
National University of Uzbekistan
named after Mirzo Ulugbek,
independent researcher of "National idea"
department of social sciences. Tashkent, Uzbekistan
E-mail: dilmurod2007@km.ru*

FOLKLORE FIELD AND FUNCTIONAL RELATIONSHIP IN PHYSICAL EDUCATION

Abstract: The article outlines the functional relevance, purpose, harmony, generality and interconnection of folklore art and philosophy in shaping national pride. They also have their own style, means, form and function, that is, the difference between them is manifested in methods and means of expressing national pride.

Keywords: national pride, folklore, folklore art, subjective factor, philosophy, functional affiliation, methods and tools.

Folklore art is literally a social phenomenon that is a model of folklore. In any historical era, folklore has become a way of realizing philosophical reasoning through folk artistic imagery. In particular, directions of influence of folklore on the spirit of personality, social development are included within the object of research subject of a number of subjects. In particular, the main research areas are "Literature", "Theory and History of Literature". In contrast to other disciplines, Social Philosophy considers the development of folklore to be the prerequisite of historical development, the expression of the spirituality of the people. It reflects the peculiarity of the folklore with its folklore characteristic of the phenomenon of the formation of national pride, by analyzing the status of the subjective factor influencing the human mentality and spirituality.

Folklore is a conventional method and tool of the subjective factor of formation of personality and national pride. Accordingly, folklore art reflects the specific stage of social work, which is the formation of the individual's national pride, as well as the historical necessity and dynamic development.

Folklore art is a means of developing idealistic artistic images forming national pride: first, the artistic reflection of a particular national social entity and a subjective factor in the development of society; Second, folklore reveals the characteristics of the particular historical era by heroes' characters; Thirdly, the need for the society to use the "spiritual culture", the increasing awareness of the Internet and the use of folklore, Fourthly, folklore acts as a form of national pride and transformation into the masses; Fifthly, the individuality of folklore genres on national pride defines their functions.

Therefore folklore should be regarded as a component of the spiritual culture of society in terms of its historical background and popularity.

The role of folklore works in the formation of individual national pride is "primitive", "simple" from the point of view of the historical period with relative and conditional character. Because the functional significance of folklore, such as any form of culture, should be evaluated on the basis of the functions of a specific historical period.

It is particularly noteworthy that the folklore has the function of shaping the national pride of personality, its methods and means of transformation into its historical source and mass media. The social lifestyle of humanity, on the one hand, requires the exchange of information between the subjects of the society and, on the other hand, the folklore has made the way of information transformation, and in the life of a particular nation. Humanity has created the necessary conditions, capacities, methods and tools for shaping national pride through the art of folklore. Its results were reflected in the spirituality of society.

The characters of the heroes were divine-legendary (mythological) character during the primitive community, when the oldest forms of folklore began functional differentiation. In particular, "genetic roots of the epic poetry of epic poetry and of particular epics of the epic poetry of the heroic epistles," refer to the system of mythological imagination, especially of people who lived in the Stone Age [1, 15]. However, human understanding of its social essence (especially national identity) has taken place in later periods. As a result

of the development of human legendary thinking, ideal and utopian theories have emerged. In folklore, the social character of a man is reflected by heroes, the daily routine of the spiritual values, the ideals of the future.

In ancient folklore, typical manuscripts of the heroic characters of the folk heroes are portrayed as an object and described in metaphors for the most important humanistic attitudes. The character, courage, patriotism and other positive qualities and qualities of the characters in the folklore content have played an important educational role in shaping its national pride. Folklore art has been inherited from generation to generation through information transformation tools (oral literature). They have a general picture of the spiritual-moral appearance and artistic experience of people living in a particular historical era.

Even in the first forms of folklore, the main purpose of the formation of the spiritual image of a person, in particular, was to educate his proud, his will and his dignity. People have always sought to form national self-consciousness and pride in order to preserve the historical foundations of their spiritual existence, their territorial integrity, and, finally, the identities of their national identities. Therefore, the national pride in the folklore was one of the most important factors of the unification of people on patriotism at all times.

Even in the old tribe and tribal life, the patriotism and the pride of the individual were of social character. Because the national pride of any human being fits into the historical reality of the social existence. In other words, the lifestyle of people living together was dependent on their pride that determined their individual position in that environment. In general, the spiritual image of a person, especially his pride, is the main object and subject of folklore. If folklore is a subjective factor ensuring the connection of a person to socio-spiritual life, the pride of the nation is an objective basis of the formation of folk heroes images. It is in the process of formation of national pride to realize the identity of the person and to show the "I". Indeed, folklore, as a person's national pride, is the result of the need to express human social essence. In this context, the influence of folklore on the formation of national pride is manifested in the expression of the social function of any human being within the norms of morality.

The purpose of folklore's personal pride in regulating ethical norms is to help the individual's social activities to conform to the traditionally well-established morality of the society and to manifest itself. Especially in folklore of Oriental folklore, the issue of upbringing of national pride has always been a priority, promoting spiritual and moral development of the society, spiritual and educational development of the person. The need to regulate the national pride of the person with ethical norms is based on the characteristics of society's historical

development. That is why the expression of national pride in folklore in artistic imagery indicates that humanism has always been in harmony with the interests of society.

Another purpose of folklore within the context of our study is to develop "standardized," universal norms of behavior that govern the social relations of the person, reflecting his feelings of personal pride, his personal experiences in his characters' characters. In other words, the etiological problems of any society are an object of folklore art, with particular emphasis on the ethical content of the person's national pride. At the same time, folklore popularizes and transforms the norms and principles of morality, which regulates the social and political relations of the society, reflecting the national pride of the person in the images of artistic heroes. Indeed, the national pride of being consistent with the moral norms of the society is the main criterion for determining its competence.

The national pride of personality, if it contradicts universal moral norms, reflects egoism and ethno-centristic fanaticism. The art of folklore reflects the ideals of "reproducing" the moral norms of a person in relation to social inclusion. The manifestation of folklore is a pragmatic one, even though the national pride is an ideal form of reality, with the prospect of human practical activity. All genres of folklore art play a major role in the socialization of the person as the main transformers of traditional values and help to avoid the marginalization of the nation's mentality. Because traditional moral and ethical values are shaped by the historical experience of mass behavioral development and have a solid and stable status in determining the mentality of the nation [3, 89].

Folklore's personality is reflected in realistic images, characterized by the fact that heroes are morally and morally exposed by means of effective means. Indeed, the character of folklore heroes who constitute the element of the spiritual world of man is not only the opportunity to realize the ideals of national pride ("materialization"), but also to create ethical foundations for their acceptance by the individual. In the folklore art, "legends and narratives are based on real facts, and fairy tales are based on imaginary and fictional fantasies" [2, 21], but they all interact with the common sense of the individual and nation's pride. In these works, the expression of national pride in the form of the spiritual component of society constitutes their philosophical content. The phenomenon of pride actually manifests the social essence of the person, the meaning of his life, and his national identity.

We see the philosophical content of folklore in understanding and expressing the national pride phenomenon. However, in this regard, the distinctive features of folklore and philosophy are also evident in reflecting the person's "spiritual qualities." That is, when folklore is based on spiritual, emotional-psychological, image-based, metaphors in shaping na-

tional pride, the philosophy differs from its coherence with its ontological and gnoseological aspects. In general, according to its purpose and mission, folklore art and philosophical thinking have a common meaning in the understanding of human spirituality – the social essence, in particular its national pride.

The functional commonality of folklore art and social philosophy in the formation of individual national pride does not exclude their relative independence and individuality. In other words, they have their own style, tools, shapes and functions, that is, the difference between them is manifested in methods and means of expressing national pride. For example, if the folklore is a phenomenon of national pride, the essence of philosophical essence is that the essence of philosophy is defined as the “ideal being” in heroes’ heritage as a unit of ontological and gnoseological aspects, through the apparatus of the general concept of philosophy. More precisely, the national pride, as a special feature of social experience, is: 1) the idealization of the characters of folk art in metaphors, and philosophy, in its true context, the internal contradictions of its development tendency; 2) The influence of folklore on the formation of national rhetoric, its focus on its spiritual world, self-awareness and emotional sentiments, the direction of philosophy focuses on the theoretical-methodological basis of satisfying the spiritual needs of a person based on constructive rationalism, social practice; 3) folklore generally manages the spiritual image of a person, in particular by combining his pride with his ideal images, and philosophy, that he understands the object and subject of the essence of the essence of the person, and the discovery of their interconnected law; 4) Folklore is based on the ideal images, artistic generalizations, philosophy – the reality of realism and the principles of its objective development.

However, they have complemented and enriched each other by shaping the national pride. Accordingly, it is important to achieve a combination of their methods and tools to ensure the functional harmony of folklore art and philosophy in shaping national pride.

In shaping national pride, philosophy is not only theoretical-methodological basis for folklore art, but also folklore, which, in turn, affects the philosophical thinking. Interconnection between folklore art and philosophy: explaining the reality through the artistic expressions of folklore or philosophic interpretation of folklore artistic images, and their gnoseological functional unity. In addition, folklore has differentiated its philosophical approach to forming national pride. That is, folklore art and its various genres do not automatically shape the moral image of a person by applying the philosophical methods mechanically, but also through the characters’ heroes creates a unique philosophical doctrine in the process of

artistic understanding and expression of national pride and is in line with the development of social life.

By transforming the “attributes” of folklore into the subject of philosophical research, their ability to communicate the theoretical knowledge of the phenomenon of national pride and its practical formulation will be evident. The functional analysis of its spirituality structural elements is differential approach to the types of entities to determine the potential, directions of impact of folklore art on the person’s national pride.

Although it is conditional and relative to show the functional significance of folklore in this way, on the one hand, it has the common national pride and common philosophy in the study of the spiritual culture of society (in terms of object and style). On the other hand, the harmony of folklore with other forms of art determines its functional effectiveness.

It does not exclude the functional character of the folklore’s subtlety characteristic of philosophy and philosophy in the formation of national pride, but rather has a significant theoretical and methodological significance with the concretion. In this context, the attitude and analysis of philosophy and folklore arts to the phenomenon of national pride, although there are certain differences, is evident in the context of their goals.

From the point of view of philosophy, it is relative and conditional to express the national pride of folklore genres by means of various means, methods and ideals of artistic expression. However, the conclusions that the spiritual world of a person is evaluated on the basis of the result, not in the content, direction, but also on philosophy and folklore. The philosophical essence of folklore is that the purpose of forming the national pride of the person is to adequately explain the means and outcome.

In general, in the process of forming the national pride of folklore, its purpose and functions are also emphasized first; Secondly, the effectiveness of the folklore on national pride depends upon the artistic-aesthetic expression of the images; Thirdly, the formation of the national pride of personality is the rule of social consciousness, in particular the role of folklore art; Fourthly, the fact that the issue of national pride in the folklore art is the subject of historical necessity; fifth, it is desirable to regard folklore as an important element of the process of socialization. Because of the fact that people are proud of the folklore, the peculiarity and philosophy is one of the compelling and complementary phenomena. Therefore, in the folklore and philosophical literature, the spirituality, in particular the national pride, is not the essence of the divine essence given by God or nature, but to the fact that it understands social existence and self-identity, which determines the mentality or the existence of the nation.

References:

1. Juraev M. Paleo Asian mythological peculiarities and their archeological chlorophyll interpretation // Uzbek language and literature.– T.: 2006.– No. 5.– P. 15–21.
2. Imomov K. Classification of Uzbek folk tales // Uzbek language and literature.– T.: 1999.– No. 1 – P. 21–26.
3. Rassadina T. A. Traditional values: to the question of concept. Bulletin of the Moscow State University, Ser. 18. Sociology and Political Science.– M.: 2004. – No. 3.– P. 80–96.

*Mamatkulov Shuhrat,
Independent researcher of the TSEU
E-mail: sht_diyorbek@mail.ru*

SOME ISSUES INCREASING OF SOCIAL ACTIVITY OF YOUTH OF UZBEKISTAN

Abstract: Today, the concept of “social activity” is discussed in the wider scientific community. In this article we are talking about government policies increasing social activity of youth.

Keywords: Youth, public policy, youth social activity, innovation, projects, traditions, values.

Youth is played a leading force of society, the future of our state. Under the leadership of the First President of the Republic of Uzbekistan I. Karimov in our country removed special attention to youth policy as a priority of national importance. Every year we increase the social activity of the youth of our region, it achieves significant results in all spheres.

The effectiveness of positive Patriotic attitudes of the young generation is reflected in the interest in the history of the Motherland, its historical heritage, which is reflected in the formation of the youth a sense of belonging for its future. The researchers emphasize that national identity associated of the youth with the spiritual identity of the nation, customs and traditions, national independence of Uzbekistan, a rich and meaningful history of the people, a great heritage of ancestors, native language and culture.

The education of young people is a complex process. In this case it is necessary to ensure continuity of work coordination and improvement of the approaches of education in accordance with national interests and current requirements. In the era of globalization and intensification of information exchange cannot be limited to the achievements and be given the indifference, this leads to a regress.

As noted by Islam Karimov, we always had and an aware that the state and society, which do not pay due attention to careful preserving, enriching and multiplying its historical, cultural and intellectual heritage, as well as educating the younger generation on the basis of universal and national values, do not set a goal-the formation of a harmoniously developed, independently thinking person, having their views, their choices, their civic stance, – such the state and society are doomed to be on the sidelines of history. According to many researchers, social participation is the ability of a person to produce socially significant transformation in the socio-cultural environment based on the assignment of material wealth and spiritual culture, manifested in the works, volitional acts and communication, where the essential characteristic activity of a person is an active attitude of man, expressed in his ideological adherence to principles, consistency in defending their views, the unity of words and deeds.

According to Russian researcher V.L. Marduhaeva social activity can be seen as a set of methods, procedures aimed

at changing social conditions in accordance with the needs, interests, goals and ideas for the nomination and implementation of social innovations, the formation of the necessary social qualities.

Of particular interest is determination of criteria of social activity. Various authors have singled out these criteria on the basis of the creative approach of the individual in carrying out activities, time, initiative and independence, responsibility, the criterion of intensity. The most important criterion of social activity of the personality is the motivation to self-development, accepting the other and promoting other people in their activities.

It should be particularly noted that the basis of all our achievements are primarily growing consciousness and outlook, firm faith in the future, social activism and civic position of our people, especially our rising youth, which actually becomes pivotal force of the society. This attitude to life creates a solid and reliable foundation for the present and the future of our country. Effectiveness of creative work contributes to a comprehensive support young people in Uzbekistan, the introduction of a carefully developed system of training of young scientists striving for scientific search and has a new way of thinking.

In many scientific literatures indicated that the criterion of social activity usually considered intense activity of a teenager, namely:

- participation of the subject in various activities and readiness at a high level to achieve the goal;
- the manifestation of personal qualities in activity;
- social significance of the material or spiritual product, obtained as a result of the activities.

On the one hand, young people are one of the least interested in social and political activities of the population, and on the other hand, young people do not want to remain indifferent to society, and seeks to show their social activity.

In social activity it is possible to allocate following types:

- political activity – form, implemented in the sphere of political activities;
- civic activity – the activity (form of activity), aimed at solution of social problems, change, power, manifestation of civil qualities;

- cultural activity – form providing the creation, development, preservation, dissemination and further development of spiritual and material values;
- creative activity – a form that generates something qualitatively new and different uniqueness, originality and significance;
- labor activity form, manifested in the implementation of intellectual and physical potential of the workforce in the course of employment;
- communication activity – form, aimed at finding the contacts necessary for the implementation of activities;
- business activity – intensive activities in the field of profession and position, the term “business activity” is most commonly used in the areas of management, economic and economic activities. From the presence of people with a business depends on the success of the enterprise, the organization of the event.

The criterion of social activity usually considered intense activity. Are usually three activities:

1. The participation of the subject in various activities and readiness at a high level to achieve the goal;
2. The manifestation of personal qualities in activity;
3. Social significance of the material or spiritual product, obtained as a result of the activities.
4. In General, the program of additional measures aimed at realization of the state youth policy in 2016 in the Republic of Uzbekistan, is a continuation of the reforms in the education of harmoniously developed young generation in line with the noble goals and aspirations of the people.

This program identifies such important measures as the formation of immunity to ideological threats in the process of improving the legal culture of young people, their education, and individuals with a firm attitude, broad outlook and

profound knowledge as well as social protection of youth, creation of conditions for mastering modern professions, employment and attraction towards entrepreneurship, etc. The state program is planned to expand the scope of work to support talented young people, realization of their creative and intellectual potential, wide involvement to physical culture and sports, promotion among the young generation a healthy lifestyle, prevention of delinquency and crime among minors, the protection of the consciousness of the youth from the negative impact of harmful ideas, its upbringing in the spirit of religious tolerance and ethnic harmony.

The most important task is the deep training of the youth, increase of its spiritual life, adoption in the hearts and minds of young people the feelings of love of country, devotion to ideas of independence, respect for national traditions and values. It is important that in the current context of globalization, the actual importance of such issues as the strengthening in students a healthy *outlook*, to inculcate in them the ability to confront the various spiritual and ideological attacks.

Representatives of youth of Uzbekistan actively participate in the project “My business idea”, “the Young businessman – the backbone of the country”, “My contribution to the development of the Motherland” aimed at attracting young people, particularly graduates of professional colleges in small business and private entrepreneurship. In 2015 to support entrepreneurial projects of graduates of secondary special, professional educational institutions, commercial banks allocated more than 17 billion sums of loans.

Today the social activity of young people is growing, increasing her sense of belonging to hold in our country reforms. Such events play an important role in the upbringing of the young generation in the spirit of devotion to the Homeland and respect for national values; shield it from the effects of “mass culture” and other negative phenomena.

References:

1. The Constitution off The Republic of Uzbekistan.– T. “Uzbekistan”. 2013.
2. The Law off The Republic of Uzbekistan. On state youth policy. 2016. URL: <http://www.lex.uz>.
3. Zubok Yu. a. Social regulation under conditions of uncertainty. Theoretical and applied problems in the study of youth [Text] / Yu. a. Zubok V.I. Chuprov.– M.: Academia, 2008.
4. Kostrikin A.B. Social work with young people and to increase social activity of youth // Second international psycho-social Congress: proceedings. 14–15 may 2009. SPb.: Spbgipsr, 2010.– P. 10–13.
5. Kupreychenko A. B. the Problem of defining and measuring social activity // Psychology of personality. Proceedings of the IV all-Russian scientific conference [Text] / A. B. Kupreychenko.– M.: Logos, 2012.
6. Tojiboeva H. Pedagogical bases of development of socially-active personality. Tojiboeva // Theory and practice of education in modern world: materials of II Intern. scientific. Conf. (Saint-Petersburg, November 2012).– SPb.: Renome, 2012.

*Mansurov Abdulla Sayfullayevich,
researcher, the faculty of social sciences
National University of Uzbekistan
E-mail: lider8304@list.ru*

TERRORISM AS A SOCIAL PHENOMENON AND ITS MODELING OPPORTUNITIES

Abstract: in this article, the essence of terrorism as a social phenomenon. In the context of globalization, the phenomenon of religious processes and the phenomenon of terrorism was analyzed socially. Today, terrorism has been modeled as complex event and offered models.

Keywords: terrorism, religious extremism, modeling, general stability, general instability.

Under globalization, mankind is facing new threats. At the same time, the most dangerous threat to peace and security is not only international violence, conflict, ecology, but also violence against civilians, first of all, in terrorism.

Religious extremism and terrorism are not only a threat to some of the countries or regions, but also to the whole world, and the fight against it is the most important task of all mankind.

Terrorism and the struggle against it can also be prevented by scientific analysis by predicting its near-future attacks. The problem of religious extremism is becoming a global problem. According to V. Shvedov, "Confrontation virus is becoming more and more dynamic and inter-religious relations are shifting to a global problem [5; 9].

At the current stage of society's development, the growing trend of terrorism as a socio-political phenomenon poses a serious concern. Terrorist movements are becoming global and organized terrorist warfare and organizational character. He is in serious danger of his cruelty, openness and staging.

The risk of becoming a victim of a terrorist attack or psychological pressure by terrorists is an unhealthy phenomenon, regardless of age, gender, ethnicity, or social status.

As a result of the sharp increase in terrorist activity, the issue of combating terrorism in the twentieth and early 21st centuries was prompted, the need to develop theoretical and methodological foundations for the study of terrorism, as well as a comprehensive approach to studying the problems of combating this phenomenon is being developed. However, it does not explicitly reveal its nature as a phenomenon.

The consequences of terrorism also cause the deformation of public consciousness to eradicate moral and material values. Terrorist attacks occur in a society where change is taking place and is reflected in the rise of ethnic and religious tolerance.

There are some problems that need to be solved in the fight against terrorism. Today it is necessary to take measures in accordance with the globalization process of terrorism and to develop its theoretical models. Of course, the modeling of social processes is of paramount importance. In order to

prevent the emergence of religious conflicts, first of all, it is necessary to examine their origins.

All of this has made society aware of the need for social knowledge about the dynamics of the "terrorist" phenomenon, as well as the need to expand conceptual approaches to reduce threats. This is because the function is characterized by the following: "problem (threat, threat, risk) – answer – outcome – outcome – to correct answer"; as a source of the dynamics of processes and mechanisms for ensuring global and regional security. Developing the factors that determine the origin of terrorism and the strategy for their elimination are now in the forefront.

Terrorism cannot be called a new phenomenon. At the moment, we can distinguish four stages of the historical development of terrorism:

1. Individual, where violence is manifested for the sake of the idea;
2. Group, the distinctive feature of which is the struggle for power;
3. Interstate, which defines world wars and the confrontation of different ideologies;
4. Modern or international, in which terrorism itself became a legal ideology for different countries, and an organizational structure was created that encompasses state and non-state entities [2, 79].

Thus, there was a need to combat the terrorist ideology in front of society, among other things. Therefore, it is important today to take measures to prevent and suppress the "first and foremost possible integration of the state, society and human activities into the implementation of Uzbekistan's security strategy".

The purpose of these measures is the first step in the study of the conditions and factors of human, community and state threats, threats and challenges, and the elimination of social, economic, political, cultural and ecological reasons.

As we have already noted, today any strategy that meets the challenges and challenges of the fight against terrorism is not current at this time. First, there is a need for preventive measures to help the government reduce its potential. But we

must not forget that terrorism is a multidimensional social phenomenon. Therefore, the prophylactic process is not only an analysis of the key social factors that may arise, but also the socioeconomic analysis of the factors such as the most vulnerable, the threats, the threats and the lifestyle of the people, should be justified. Because of the peculiarity and multi factorial nature of the investigated event, it cannot be checked in any way and in holistic manner, we have chosen the modeling method to determine the regulatory impact that can be substantially restricted to the extreme forms of law. The method is the creation and subsequent discovery of an auxiliary system (model) that reflects the structure of the object under study, and the modified mechanisms provide reliable predictions and recommendations.

This process can be carried out by research, such as modeling the role. The reason for this is that the calculated model based on the sociological analysis of the phenomenon being studied and the computational experiments carried out with it help to assess the impact of the initial factors on the simulated phenomenon. Even if some aspects of the event are considered to be insignificant in building a mathematical model, this will allow it to be fully expressed, often because of the complexity of social phenomena, by means of an oral model. In addition, the use of mathematical hardware in modeling contributes to weak, significant interactions between system elements.

It should be noted that this method provides an opportunity to experience terrorism research, allowing them to identify the basic control parameters of the model and, by analyzing them, to optimize the management of the optimal control for use in managing policies to reduce terrorist threats the mystery.

That is why we fully share the points of view. V. N. Kuznetsov, A. Mikhanlov and V. Shvedovsky [3] in relation to that; that for the investigation of terrorism in order to prevent or reduce threats, its occurrence is optimal, a modeling method that helps to reproduce the integrity of the object under study.

The model allows selection of factors, their classification more purposefully: It introduces order into the studied area, freeing the cognitive field from minor factors, and also, having a flexible cognitive structure, allows to correlate the seed situation.

At present, any strategy based on the fight against terrorism does not produce any results. Generally, after the terrorist acts take place, the desire to get rid of terrorism begins. We know that terrorism is a very influential social phenomenon. In preventing terrorism, it is important not only to focus on the analysis of social factors, but also the social analysis of the formation of the smallest non-essential factors.

In the modeling of terrorism, we can observe the four types of conflicts affecting the level of terrorism. The simplest

way to describe the terrorist attacks is to study the age-old state and society as a group of three. The first two classes X and U are active participants of this conflict and Z can be neutral or indifferent to this contradiction.

1. $X + Y > Z$ General instability;
2. $X + Y < Z$ General stability;
3. Transition from 1 to 2 transition to sustainability instability;
4. Transition from instability to 2 to 1.

There are two basic ways to terrorize terrorism:

1. Concerned with endogenous sources of terrorist activity in Uzbekistan.
2. Exogenous resources in Uzbekistan that cause terrorist activity.

Terrorism and religious conflicts can be objectively evaluated by using the modeling methodology. Propagation of evolutionary evolution of religious conflicts necessitates a rigorous scientific approach, thorough analysis of its past and present.

Another difficulty in regulating religious conflicts is its chronicity and easy provocation, connected with a person's inner conscience, freedom of thought and emotional world. According to some analysts, the elimination of religious conflicts by armed forces is seen as one of the most effective models. For example, the Balkan crisis, the Mountainous Garabagh problem, the Afghan conflict, the Kurdish problem in Turkey, or the war in Chechnya. The First President of the Republic of Uzbekistan, I. A. Karimov, in many lectures states that these problems should be resolved through political negotiations. Specifically, when he talked about the Afghan problem, he said that for more than 30 years, the armed forces have no positive solution and that strategic action should be radically changed. The initiative of the Group 6 + 3 has a significant role in addressing the Afghan problem.

Another model of resolving religious conflicts is tolerance and mutual understanding. For example, in India-Pakistan example we will see that.

Another model of religious conflicts is the formation of a stable economic system in the country. The countries of the world need to encourage their citizens to be a form of social consciousness that propagates religion for the sake of goodness and goodness, and that those who hide it should act as believers and act on behalf of religion. After all, the first President of the Republic of Uzbekistan I. A. Karimov has shown the role of religion in social life through the idea that "religion is a continuation of enjoying the highest spiritual moral and spiritual values of the population, historical and cultural heritage" [4, 44].

The reasons for the events of September 11, 2001 in the United States of America, Paris on November 13, 2015, and

the March 22, 2016 events in Brussels, and the anticipation of the danger, led to the awakening of the world public opinion. The point here is that it is impossible to predict when and where the terrorist acts will take place, and in some cases, the nature of the terrorist acts will not be fully understood. Improving security in the developing world requires further improvements. The attacks in Western Europe and the United States have led to provocations against Islam and its believers.

Thus, the model and calculation experiments have proven to be highly effective in using complex modeling techniques for complex social phenomena such as terrorism. One of the main advantages of this method is the study of the dynamics of various social processes, as well as their forecasting, is solving practical problems, the detection of the optimal management influence for the use of administrative policies can be effective in preventing terrorist crimes will give.

References:

1. Shvedov V. Religion and policy. *International life*. 1992. – No. 5. – 59 p.
2. Viktorov A. Sh. Theoretical and methodological basis of sociological study of modern terrorism and security (geopolitical, sociocultural, ethnonational humanitarian aspects of analysis) / *Fundamentals of Sociology of Terrorism*. – M., 2008. – 79 p.
3. Kovalyov V. F., Maslov D. I., Mihaylova A. I., Shhvedovskiy V. A. *Mathematic modeling of ethnopolitic conflict* || *Mathematic modeling*. Release 8. – M., 2002.
4. Karimov I. A. *Uzbekistan on the threshold of the twenty-first century: Challenges to stability and progress*. – T., “Uzbekistan” 1997. – 44 p.

Section 17. Chemistry

Aghayev Akbar Ali,
Ph.D., in Chemistry, professor
Head of Petrochemistry and chemical engineering department,
Sumgait State University, Republic of Azerbaijan

Gadjieva Xejale Amiraslan,
postdoctoral student of Petrochemistry
and chemical engineering department, Sumgait State University

Abushova Zijafet Baxram,
assistant professor of Petrochemistry
and chemical engineering department, Sumgait State University

Shirinov Panax Maqomed,
candidate for a degree of Petrochemistry
and chemical engineering department, Sumgait State University
E-mail: irapon.sdu@mail.ru

ALKILATION OF 4-METHYLPHENOL WITH 1- AND 2- PROPANOLS OVER PALLADIUM-CONTAINING ZEOLITE

Abstract: The article describes comparative alkylation of 4-methylphenol with 1- and 2-propanol over palladium-containing high silica zeolite. It reveals the possibility of highly selective (90.5–96.5%) synthesis of a mixture of 2-propyl-4-methylphenol and 2,6-dipropyl-4-methylphenol with 1-propanol and the preparation of a mixture of 2-isopropyl-4-methylphenol and 2,6-diisopropyl-4-methylphenol, with a total selectivity of 89.0–94.0%, for 4-methylphenol and 2-propanol reaction.

Keywords: 4-methylphenol, 1-propanol, 2-propanol, palladium-containing zeolite, alkylation, 2-propyl-4-methylphenol, 2-isopropyl-4-methylphenol, selectivity, yield.

Phenol alkylation with propanols and propene over various catalysts (1–3) have a number of significant drawbacks: low selectivity and low yield of individual propyl- (isopropyl) phenol isomers, a complex mixture of the produced alkylphenols, which requires additional separation cycles, as well as low stability of the catalysts, and complexity of technology and increase in investment costs as a result. Methylphenols catalytic alkylation with propanols over ferrite catalysts leads to more favourable results (4).

This report presents the results of a study of 4-methylphenol with 1- and 2-propanol over zeolite catalysts.

10 cm³ of studied zeolite catalyst was loaded into the continuous flow reactor. The temperature of the reactor rose in a stream of hydrogen at a rate of 200 °C/hour to 450 °C. At this temperature, the catalyst was regenerated and activated for 3 hours. After that, the temperature was lowered to the reaction temperature and a mixture of cresol and propanol

was loaded. All reagents were preheated in the steam chamber to the desired temperature before being put into the reactor. Experiments were conducted for 1 hour.

The study of liquid products was performed by gas-liquid chromatography (GLC), on a Chrom-5 chromatograph with a flame ionization detector. Apiezon-M deposited on chromatone-N was chosen as the liquid phase. The analysis was conducted with the temperature rate of 8 °C/min. within the range of 80–220 °C, helium was used as a carrier gas; its consumption rate was 60 ml/min.

Proton MR spectra of propyl and isopropyl cresol derivatives were recorded using Bruker AV-300 (300 MHz, H²NMR), country of origin: Germany.

High-silica zeolites are obtained by the crystallization of organic and inorganic silica gels under hydrothermal synthesis conditions at elevated temperatures (150–180 °C). Hydrogen catalysts were obtained by ion exchange with a three and

fourfold excess of ammonium nitrate, followed by calcination at 500 °C. In order to increase the degree of decatising and decrease the number of stages, ion exchange was performed under hydrothermal conditions at 220 °C. The nitrile content in the obtained samples ranged from 1.5–4.25% of the volume capacity. Before the experiments, the catalysts were activated in a stream of air and then hydrogen for 5 hours at 450 °C. Palladium was introduced by ion exchange between the zeolite and the aqueous solution of $[\text{Pd}(\text{NH}_3)_4]\text{Cl}_2$. The palladium content was 0.1–2.0% wt. of the dry weight of the zeolite.

The table shows the comparative results of 4-methylphenol alkylation with 1- and 2-propanol over Pd/H-ZSM-5. It can be seen that the main resultants of 4-methylphenol alkylation with 1-propanol are 4-methylphenol propyl ether, 2-propyl-4-methylphenol and 2.6-dipropyl-4-methylphenol. The total selectivity of these resultants in the feedstock decreases by increasing the partial pressure of the alcohol.

With a twofold molar excess of 4-methylphenol in the feedstock, the total selectivity of these resultants equals 96.5%, and at a molar ratio of 4-methylphenol/1-propanol = 0.5/1, it equals 90.5%. The molar ratio of the starting components in the feedstock has a significant effect on the composition of the alkylated resultants. A change in the 4-methylphenol/1-propanol molar ratio from 1/0.5 to 0.5/1 reduces the selectivity of the formation of 2-propyl-4-methylphenol from 88.5% to 71.0% and leads to an increase in the yield of 2.6-dipropyl-4-methylphenol per reacted 4-methylphenol from 6.0 to 15.0%, and the selectivity of the formation of 4-methylphenol propyl ether varies only slightly. Similar dependence is observed in the case of 4-methylphenol alkylation with 2-propanol. Unlike the previous reaction, 4-methylphenol isopropyl

ether does not form and the main resultants are 2-isopropyl-4-methylphenol and 2.6-diisopropyl-4-methylphenol.

With an increase in the molar fraction of alcohol in the feedstock, the total selectivity of 2-isopropyl-4-methylphenol and 2.6-diisopropyl-4-methylphenol decreases first by 2.5%, and then by another 1.5% and equals 89.0% (at a molar ratio of 4-methylphenol/2-propanol = 0.5/1). In this case, a substantial change is observed in the composition of mono- and diisopropyl-4-methylphenols. In a two-fold molar excess of cresol in the feedstock, the selectivity for the formation of 2-isopropyl-4-methylphenol and 2.6-diisopropyl-4-methylphenol are 89.0 and 5.0%, respectively. The increase in the partial pressure of the alcohol in the feedstock doubles the yields of mono- and diisopropyl-4-methylphenols per reacted p-Cresol as follows: the yield of 2-isopropyl-4-methylphenol decreases to 70.0%, and the yield of 2.6-diisopropyl-4-methylphenol increases to 19.0%.

When comparing parameters of the alcohol alkylation in the feedstock, it doubles the yields of mono- and diisopropyl-4-methylphenols per reacted p-Cresol as follows: the yield of 2-isopropyl-4-methylphenol decreases to 70.0%, and the yield of 2.6-diisopropyl-4-methylphenol increases to 19.0%.

It can be seen that 4-methylphenol 1- and 2-propanol, in 1-propanol alkylation, the original cresol has deeper changes than 2-propanol alkylation, namely, the conversion of 4-methylphenol is higher by 8.0–13.0%. However, when comparing the selectivity of the basic mono- C_3 -derivatives formation of 4-methylphenol, there is a slight advantage in reaction of p-Cresol with 1-propanol. The yields of 2-propyl-4-methylphenol and 2-isopropyl-4-methylphenol, calculated by the missed 4-methylphenol, are respectively 37.1–48.7% and 29.4–39.5%.

Table 1. – Results of 4-methylphenol alkylation with 1- and 2-propanol over Pd/H-ZSM-5 Reaction occurs at: t:350 °C, ν – 0.8 h⁻¹

Name	4-methylphenol – 1-propanol			4-methylphenol – 2-propanol		
	1/0.5	1/1	0.5/1	1/0.5	1/1	0.5/1
Cresol/propanol molar ratio	1/0.5	1/1	0.5/1	1/0.5	1/1	0.5/1
Conversion of 4-methylphenol	41.0	58.0	65.5	33.0	45.0	56.5
The yield of resultants per reacted 4-methylphenol,%						
4-methylphenol propyl (isopropyl) ether	2.0	4.0	4.0	–	–	–
2-propyl-4-methylphenol	90.5	84.0	72.5	–	–	–
2.6-dipropyl-4-methylphenol	4.0	6.0	14.0	–	–	–
2-isopropyl-4-methylphenol	–	–	–	89.0	82.5	70.0
2.6-diisopropyl-4-methylphenol	–	–	–	5.0	9.0	19.0

It should be noted that in addition to the above basic resultants of these reactions, the formation of small amounts of other resultants such as dipropyl or diisopropyl ether, 3-propyl-4-methylphenol or 3-isopropylphenol, can be observed. Apparently, under the conditions of the alkylation process,

partial intermolecular dehydration of the alcohol and isomerization of the obtained C_3 -derivatives of p-Cresol take place.

In summary, it has been shown that palladium-containing high-silica zeolite in the alkylation of 4-methylphenol with 1- and 2-propanol have sufficient activity and selectivity.

Over this catalyst, higher conversion of 4-methylphenol is observed when interacting with 1-propanol by 8.0–13.0% relative to 2-propanol. The yields of 2-propyl-4-methylphenol and 2-isopropyl-4-methylphenol per p-Cresol are 37.1–48.7% and 29.4–39.5% respectively.

Список литературы:

1. Velu S. M., Swamy C. S. Alkylation of phenol with 1-propanol and 2-propanol over catalysts derived from hydrotalcite like anionic clays // *Catalysis letter* 1996. 40. – P. 256–272.
2. Yadav Ganapati D., Salgaonkar Sanket S. Selectivity engineering of 2,6-diisopropyl phenol in isopropylation of phenol $Cs_{2.5}H_{0.5}PW_{12}O_{40}$ / K-10 Clay // *Ind. And Eng.Chem. Res.* 2005. – 44. – No. 6. – P. 1706–1715.
3. Zvi Rappoport. The chemistry of functional groups. The chemistry of phenols. Part 2 *An. Inter. Science* 2003. – 1629 p.
4. Тагиев Д. Б., Агаева Н. А., Назарова М. К. Каталитическое алкилирование крезолов пропанолом-1 // *ЖПХ*, 2013. – 86. – No. 8. – С. 1278–1281.

Maryaskin Yuriy Borisovich,
Sc.D., associate professor,
Dnepr Chemical-Engineering University, Ukraine
E-mail: iryna190856@gmail.com

Derman Stanislav Evgenyevich,
Engineer, Electrochemist, Metal coating shop foreman
Hamat Group Ltd., Israel
E-mail: stanislav.derman@gmail.com

RELATION OF SURFACE-ACTIVE AGENT SOLUTIONS' SURFACE AND VOLUME PROPERTIES

Abstract: An assumption has been made and some data have been provided bearing evidence of the interconnection between volume and surface properties of surface-active agent solutions.

Keywords: adsorption, micelle, surface-active agent, critical micelle formation concentration, surface tension, micelle formation, adsorption capability.

The main colloidal surface-active agent (SAA) properties stipulating the wide practical implementation thereof are the adsorption capacity on the phase interface surfaces and those of micellization in the solution volume.

A significant number of works has been dedicated to the adsorption thermodynamics and micellization [1; 2; 3; 4]. However, in general, the relation between these processes has not been considered in these works.

Further to Shishkovsky adsorption equation, the surface-active agent adsorption goes along with the decreasing of free surface energy on the border of the phase interface.

$$-\Delta\sigma = \sigma_0 - \sigma = A_\infty RT \ln(1+KC), \quad (1)$$

whereas, $\Delta\sigma$ – a change of specific free surface energy (surface tension) with the SAA adsorption on the border of the phase interface; σ_0 , σ – surface tensions of pure (water) solvent and SAA solution, accordingly; A_∞ – limiting adsorption value; R – gas constant; T – temperature; K – adsorption balance constant; C – SAA concentration in the solution.

It follows from (1) that the solution surface tension decreases as the surface-active agent decreases. This dependency will be observed up to reaching the so-called critical micellization concentration (C_k). When reaching this concentration, the surface tension reaches the constant value, i.e. C_k is the limiting surface-active agent concentration to which the equation (1) will be applicable.

Subsequently, considering that the KC_k value $\gg 1$, the equation (1), will make:

$$-\Delta\sigma_k = \sigma_0 - \sigma_k = A_\infty (RT \ln K + RT \ln C_k), \quad (2)$$

whereas, σ_k – SAA solution surface tension when reaching the critical micellization concentration.

At the same time, when reaching C_k , the intense micellization [2, 16] is observed in the SAA solution volume. Further to [4, 846; 5, 342], the Gibbs standard energy change during

micellization calculated for one SAA mol is related with the critical micellization concentration by the equation as follows:

$$\Delta G_{mic}^0 = RT \ln C_k', \quad (3)$$

whereas, ΔG_{mic}^0 – a change of Gibbs standard energy during micellization.

The dependency between the adsorption balance constant and Gibbs standard energy change during the adsorption [5, 146] will be described by the expression as follows:

$$\Delta G_{ads}^0 = -RT \ln K. \quad (4)$$

whereas, ΔG_{ads}^0 – Gibbs energy change during one SAA mol adsorption.

It follows from (2), (3), (4):

$$-\Delta\sigma_k = A_\infty (\Delta G_{mic}^0 - \Delta G_{ads}^0), \quad (5)$$

It is seen from (5) that the surface tension decreasing reached during SAA concentration in the solution equal C_k will be determined by simultaneous progress of two processes: adsorption and micellization. Considering that all the values located in the right side of this equation are constant, the constant value will also get the surface tension value reached during the critical micellization concentration.

For quantitative evaluation of values involved in (5), we used the data provided in [6, 241–257] pursuant to decreasing of the surface tension in the molecular SAA solutions. C_k values were defined by the brake of the curve of dependency σ on $\ln C$ [5, 339]; further to the graph $\Delta\sigma = f(\ln C)$ the limiting adsorption (by the inclination of line) and the adsorption balance constant (by the leg cut off by the line on the axis of the ordinates at $\ln C = 0$) were calculated; further to C_k and K values by the equations (3) and (4) ΔG_{mic}^0 and ΔG_{ads}^0 values were defined.

The received data are provided in (tables 1, 2). From these tables it is seen that hydrocarbon chain growth in homologous rows of non-ionic compounds leads to an increase A_∞ , reduction of surface tension and Gibbs free energy during

adsorption and micellization of one SAA mol. In all cases, when reaching C_k , the reduction of ΔG_{ads}^0 will be more significant, than ΔG_{mic}^0 .

Usually, it is assumed that with C_k , the adsorption process will be reaching its balance state and only the aggregation of SAA parts in micelle will be possible further on. However, it is known that in some cases, when SAA concentration is increased further on, the spherical micelle destruction will start, and this will be accompanied by decreasing of the surface tension again, i.e. the adsorption and micellization processes mutually make an impact on each other and are in dynamic balance.

Probably, this impact may be explained as follows: When the SAA concentrations in the solution are low, the latter parts easily reach the phase interface borders and they are adsorbed on it. The relation between isobaric – isothermal potential during adsorption and surface-active component chemical potential considering the area of the phase interface border is described by the equation [5, 47]:

$$G_{ads} = \sigma_s + \mu_{ads} n_{ads} \quad (6)$$

whereas, G_{ads} – Gibbs free surface energy during adsorption, σ_s – solution surface tension; s – phase interface border surface area; μ_{ads} – surface-active agent chemical potential during adsorption; n_{ads} – adsorbed surface-active agent molar quantity.

As the SAA concentration grows, the probability of collision of surface-active agents in the solution volume increases with their following aggregation (micellization) and, accordingly, reaching the solution surface by the SAA parts and their adsorption on the phase interface border will be more difficult. In other words, the adsorption process may be affected by the similar kinetic factor as delivering the SAA to the phase interface border. Probably, under the influence of the above factors, during occurrence of C_k there will be the state whereas the rates of adsorption and desorption will become equal. Further on, in spite that the adsorption related to one SAA mol is more advantageous in terms of energy than the micellization, predominantly the second process will be occurring.

According to [7, 145], the micellar structure may be considered as the system composed of many nanoparticles distributed in the liquid environment. Thermodynamic of the system composed of N equal spherical nanoparticles (micelle) having the average SAA molar number in each micelle equal n_{mic} is described in [8, 24–26].

In the initial approximation (out of consideration of a possible charge on the surface of micelle, the solution chemical potential change) the Gibbs energy with micellization equals:

$$G_{mic} = (\mu_{mic} n_{mic} + W) N. \quad (7)$$

whereas, μ_{mic} – the chemical potential of surface-active agent during micellization; W – value provided for nanoparticle and characterized as a process of interphase border formation (in this case, the micelle interface border – solution).

It is possible to assume that C_k is the concentration during which the adsorption processes' free energies and micellizations are equal to one another, i.e. $G_{ads} = G_{mic}$. It follows from (6), (7):

$$\sigma_s + \mu_{ads} n_{ads} = (\mu_{mic} n_{mic} + W) N. \quad (8)$$

If we take the phase interface border area as one, then it follows from (8):

$$\sigma_s = (\mu_{mic} n_{mic} + W) N - \mu_{ads} n_{ads} \quad (9)$$

Further to [8, 26]:

$$W = f \sigma_0 A_0 \quad (10)$$

Whereas σ_0 – concentrated phase surface tension (micelle), A_0 – its surface area, f – constant rate, depending on the surface shape.

It is seen in (9), (10) that the surface tension value reached during the SAA concentration equal to the critical micellization concentration depends not only on the quantity of adsorbed SAA, but also on the quantity in micelle thereof (and therefore, on its surface area) and on the micelle quantity in the solution volume.

The joint analysis of the above data retrieved at two temperatures will lead to the results which at first glance contradict the adsorption process theoretical concept. For example, it is known that the adsorption – exothermic process accompanied by the heat emission.

$$\Delta G_{ads} = \Delta H_{ads} - T \Delta S_{ads} \quad (11)$$

whereas ΔH , ΔS_{ads} – adsorption enthalpy and entropy change ($\Delta G_{ads} < 0$, $\Delta S_{ads} < 0$, which is possible when $\Delta H_{ads} < 0$, i.e. the exothermic process).

For exothermic processes the temperature growth will lead to the reduction of the process balance constant. However, the data provided in Table 3 point that this regularity is observed not in all cases.

Using the received data during processing the adsorption balance constant value reference data pursuant to isobar equation [5, 146] the process enthalpies were calculated (Table 3). The same table provides the micellization heat values (ΔH_{mic}), calculated by C_k values [9, 155–156].

It is seen from the data provided that unlike the adsorption, the micellization will always be accompanied by the heat emission. Even having the same quantity of SAA involved in these processes, this is enough in most cases, so that the total heat effect is less than zero, i.e. with the adsorption the heat emitted as a result of the micellization will be absorbed. Considering that the quantity of SAA involved in micellization is higher than that of involved in adsorption, such an effect will be more significant. Probably the received results are the indirect proof of the above assumption that the adsorption and micellization processes are interconnected and this is reflected in the system thermodynamic characteristics.

It is known that the use of SAA in various technological processes, particularly in the process of cleaning of surfaces from contaminations is related to the adsorption capacity thereof. At the same time, it is noted that SAA with equal adsorption characteristics often have various cleaning effect.

One of the possible reasons of this mismatch is based on the above-mentioned impact of the micellar structures on the adsorption process. The authors intend to dedicate their next work to further examination of this impact.

Table 1. – Values: $\Delta\sigma_{\kappa}$, A_{∞} , ΔG_M^0 , ΔG_{ads}^0 for molecular SAA (T = 298 K)

Formula	$\Delta\sigma_{\kappa} * 10^3$, J/m ²	$A_{\infty} * 10^6$, mol/m ²	$\Delta G_M^0 * 10^{-3}$, J/mol	$\Delta G_{ads}^0 * 10^{-3}$, J/mol
1	2	3	4	5
C ₈ H ₁₇ O(C ₂ H ₄ O) ₃ H	-35.2	1.94	-24.57	-41.08
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₃ H	-41.2	2.66	-28.77	-44.23
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₃ H	-41.5	3.15	-37.41	-50.58
C ₈ H ₁₇ O(C ₂ H ₄ O) ₆ H	-31.5	1.74	-22.08	-40.23
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₆ H	-34.6	2.14	-27.52	-43.69
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₆ H	-37.2	2.83	-36.32	-49.48
C ₈ H ₁₇ O(C ₂ H ₄ O) ₈ H	-29.7	1.61	-20.61	-38.00
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₈ H	-34.9	2.18	-34.24	-50.25
C ₁₄ H ₂₉ O(C ₂ H ₄ O) ₈ H	-37.7	2.87	-41.77	-54.92
C ₈ H ₁₇ O(C ₂ H ₄ O) ₁₀ H	-28.0	1.29	-20.56	-42.23
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₁₀ H	-29.9	1.82	-27.52	-43.98
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₁₀ H	-33.1	1.82	-30.60	-48.82
C ₁₄ H ₂₉ O(C ₂ H ₄ O) ₁₀ H	-36.6	2.26	-41.40	-57.59
C ₈ H ₁₇ O(C ₂ H ₄ O) ₁₂ H	-27.0	1.37	-19.44	-39.11
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₁₂ H	-28.8	1.70	-27.80	-44.74
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₁₂ H	-32.5	1.90	-33.51	-50.61
C ₁₄ H ₂₉ O(C ₂ H ₄ O) ₁₂ H	-35.4	2.46	-40.04	-54.43
C ₈ H ₁₇ O(C ₂ H ₄ O) ₁₄ H	-26.4	1.21	-18.56	-40.36
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₁₄ H	-31.0	1.82	-32.48	-49.54
C ₁₄ H ₂₉ O(C ₂ H ₄ O) ₁₄ H	-34.3	2.30	-39.44	-54.34

Table 2. – Values: $\Delta\sigma_{\kappa}$, A_{∞} , ΔG_M^0 , ΔG_{ads}^0 for molecular SAA (T = 288 K)

Formula	$\Delta\sigma_{\kappa} * 10^3$, J/m ²	$A_{\infty} * 10^6$, mol/m ²	$\Delta G_M^0 * 10^{-3}$, J/mol	$\Delta G_{ads}^0 * 10^{-3}$, J/mol
1	2	3	4	5
C ₈ H ₁₇ O(C ₂ H ₄ O) ₃ H	-31.4	2.09	-21.10	-35.90
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₃ H	-36.3	2.51	-26.84	-43.87
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₃ H	-37.4	3.76	-34.46	-45.47
C ₈ H ₁₇ O(C ₂ H ₄ O) ₆ H	-27.1	1.67	-20.10	-40.09
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₆ H	-30.9	2.09	-25.41	-43.56
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₆ H	-32.3	2.51	-32.06	-47.86
C ₈ H ₁₇ O(C ₂ H ₄ O) ₈ H	-29.1	1.67	-18.93	-35.30
C ₁₂ H ₂₅ O(C ₂ H ₄ O) ₈ H	-31.2	2.09	-31.41	-49.30
C ₁₄ H ₂₉ O(C ₂ H ₄ O) ₈ H	-33.0	3.34	-37.49	-49.95
C ₈ H ₁₇ O(C ₂ H ₄ O) ₁₀ H	-27.1	1.25	-17.63	-44.68
C ₁₀ H ₂₁ O(C ₂ H ₄ O) ₁₀ H	-27.8	1.25	-25.17	-50.26

1	2	3	4	5
$C_{12}H_{25}O(C_2H_4O)_{10}H$	-30.0	2.09	-30.62	-44.99
$C_{14}H_{29}O(C_2H_4O)_{10}H$	-32.5	2.09	-37.14	-58.87
$C_8H_{17}O(C_2H_4O)_{12}H$	-26.8	1.25	-17.51	-42.29
$C_{10}H_{21}O(C_2H_4O)_{12}H$	-26.8	1.67	-24.87	-41.88
$C_{12}H_{25}O(C_2H_4O)_{12}H$	-29.7	2.09	-29.19	-44.51
$C_{14}H_{29}O(C_2H_4O)_{12}H$	-31.7	2.51	-37.03	-50.26
$C_8H_{17}O(C_2H_4O)_{14}H$	-26.6	1.25	-17.30	-39.01
$C_{12}H_{25}O(C_2H_4O)_{14}H$	-29.2	1.67	-29.47	-51.45
$C_{14}H_{29}O(C_2H_4O)_{14}H$	-30.9	2.09	-36.73	-52.17

Table 3. – Values: $\ln K_{equ}$, C_k , ΔH_{ads} и ΔH_{mic} for molecular SAA

Formula	m	$\ln K_{equ}$		$C_k \cdot 10^6$, mol.shr.		D	D
		288K	298K	288K	298K		
1	2	3	4	5	6	7	8
$C_8H_{17}O(C_2H_4O)_mH$	3	15	16.6	148	99.5	114.1	-28.4
	6	16.76	16.25	226	134.8	-36.4	-36.9
	8	14.75	15.35	371	243	42.8	-30.2
	10	18.67	17.06	644	248	-114.8	-68.2
	12	17.67	15.8	680	389	-133.4	-39.9
	14	16.3	16.3	745	556	0	-20.9
$C_{10}H_{21}O(C_2H_4O)_mH$	3	18.33	17.86	13.4	9.0	-33.5	-28.9
	6	18.2	17.65	24.5	14.9	-39.2	-35.5
	10	21	20.3	27.0	14.9	-49.9	-42.5
	12	17.5	18.08	30.5	13.3	41.4	-59.3
$C_{12}H_{25}O(C_2H_4O)_mH$	3	19	20.44	0.558	0.275	102.7	-50.5
	6	20	19.98	1.52	0.427	-1.4	-90.7
	8	20.6	20.3	2.0	0.988	-21.4	-50.4
	10	18.8	19.72	2.27	1.14	65.6	-49.2
	12	18.6	20.44	2.60	1.33	131.2	-47.9
	14	21.5	20.02	4.47	2.01	-105.5	-57.1
$C_{14}H_{29}O(C_2H_4O)_mH$	8	20.87	22.18	0.157	0.0473	93.4	-85.7
	10	24.60	23.78	0.182	0.0549	-58.5	-85.6
	12	21	21.98	0.191	0.0952	69.9	-49.7
	14	21.8	21.95	0.216	0.129	10.7	-36.8

References:

1. Adamson A., Physical Chemistry of Surfaces – M. “Mir”, 1979.– 379 p.
2. Micellization, solubilization and microemulsion. Edited by K. Mitella.– M. “Mir”, 1980.– 598 p.
3. Shinoda K., Nakagawa T., Tamamusi B., Isemura T.– Colloidal surface-active agents.– M. “Mir”, 1966.– 320 p.
4. Volkov V.A. The impact of molecule structure on the micellization in surface-active agents' solutions // Colloid Journal. 1975.– Vol. XXXVII – No. 5.– P. 845–852.
5. Frolov Y. G. Colloid chemistry course – M. Chemistry, 1989.– 464 p.
6. Surface-active agents and cleaners. Reference book edited by A. A. Abramzon.– M. Giperoks, 1993.– 270 p.

7. Rusanov A. I. Nano thermodynamics: Chemical approach // Ros. Chem. J., 2006.– T.L.– No. 2.– P. 145–151.
8. Pavlov V. A. Nano thermodynamics differences from the classical thermodynamics // Vestnik of St. Perersburg University, 2010.– Ser. 4. publication 1.– P. 24–28.
9. Colloid chemistry laboratory researches and tasks Edited by. Y. G. Frolov.– M. Chemistry, 1986.– 216 p.
10. Rebinder P. A. SAA solution surface and volume properties' relation. In the collection book: Colloid chemistry success.– M. Science, 1973.– P. 9–29.
11. Maryasin Y. B., Danilov F. I. Releation between colloid-chemical properties and hydrophile-lipophilic balance of the surface-active agents.– Chemistry and chemical technology issues. 2004.– No. 3.– P. 136–140.
12. Lin I. J. Marszall L. Partition of HLB coefficient and effective chain length of surface-active agents // Progress in Colloid and Polymer Sciences / 1978.– Vol. 63.– P. 99–104.
13. Hill T. L. Thermodynamics of Small Systems.– New York: Benjamin, 1963.– Part 1.– 171 p.
14. Ono S., Kondo S. Moleular theory of the surface tension.– M. IL, 1963.– 292 p.

*Sherquzyev Doniyor Shermamatovich,
Namangan Institute of Engineering and Technology,
Namangan city, Uzbekistan*

*Shirinov Shavkat Davlatovich,
Tashkent Scientific Research Institute of Chemical Technology,
Tashkent town, district Shurbazar, Uzbekistan*

*Yusupov Muzaffar Orifjonovich,
Namangan Institute of Engineering and Technology,
Namangan city, Uzbekistan*

*Asqarova Oydin,
Namangan Institute of Engineering and Technology,
Namangan city, Uzbekistan
E-mail: doniyor_8184@mail.ru*

HYDROGEL PRODUCTION OF NEW GENERATION BASED ON LOCAL RAW MATERIALS

Abstract: The article explains information on the synthesis of new macromolecular hydrogels based on HYPAN and CMC (Carboxymethylcellulose) with new sewing agents, looked through synthesized products and determined their structure by various physico-chemical and physicomachanical methods, shows the making and developing of industrial production of import-substituting products from local raw materials and industrial wastes to saturate the domestic market.

The resulted hydrogels are used where there is not enough water, in places where the earth is rich in salts, to save mineral fertilizer, in perfumery and other spheres for complete or partial solution of the problems.

Keywords: hydrogel, cellulose, starch, HYPAN, CMC, polyphosphate.

1. Introduction

The creation of hydrogel by scientists prompted the necessity of receiving guaranteed harvests under any weather conditions and in all regions of the Earth, as the population of the world began to increase sharply after World War II, but the size of the cultivated land remained the same. The only way to feed people was to increase the yields and development of unsuitable lands, namely, steppes, semi-deserts, deserts and even sandstones. The rapid development of organic chemistry and the synthesis of new compounds played a decisive role in this sphere. Chemists of Germany, France, England, America have resulted great successes. Having modern chemical production and powerful science, these countries created first commercial samples of hydrogel, and realized and put into production and started to produce in thousands of tons. Wherein, a double problem was solved in the best hydrogel samples. This, on the one hand, hydrogel participated in the structuring of soil, and on the other hand it fertilized the soil on account of digestible compounds with potassium which are part of the hydrogel. So in the German hydrogel consist of 21% potassium compounds. Such a joint combination of useful attributes of the hydrogel makes it possible to obtain a guaranteed yield increase on amount of 30–60% annually in large areas and in different climatic zones [1–7].

Currently, more attention is being paid to the environment and among others German scientists go a few steps ahead of the rest. The Germans created the world's first potassium polyacrylate cross-linked hydrogel. This is a nonacrylamide hydrogel – Shtokosorb 660 series, generally which has no restrictions of dose to the soil application. The rest of the countries, including France, produce a hydrogel which consists of acrylamide and potassium acrylate, which correspond to the quality and ecology of the Shtokosorb 500 series, had produced before 2011. Above mentioned product's composition not more than 0.02% acrylamide and 0.06% acrylic acid. Fully in compliance with the EU directive 93/112 / EC. Nowadays, Germany and France are considered the world's largest producers of hydrogels for agriculture.

In 2010, according to the appeal of the leadership of the Republic of Tatarstan, work began on developing a technology for the production of a new generation of polymer superabsorbents (hydrogels) with a special modification for agriculture and forestry, vegetable growing, crop production and other related areas.

In summer, 2011 was obtained the first pilot batch of superabsorbent (hydrogel) "Akvasin" and this date is to be considered as the birthday of a new product.

Superabsorbent “Akvasin” is a granule of a cross-linked copolymer of potassium and ammonium salts of acrylic acid, which is developed specially on modification (Agro) for safe and effective introduction into the soil. Distinctive features of the modification (Agro) is a rapid and voluminous absorption of moisture (several minutes up to 400 times its weight), a full yield of moisture to plants (up to 95%), reduced product consumption, the ability to absorb mineralized water, a universal combination of different granule sizes for wide use.

2. Materials and methods

In the State Unitary Enterprise of Tashkent Scientific Research Institute of Chemical Technology (SUE TSRICHT)

were synthesized more than 15 kinds of hydrogels based on HYPAN (hydrolyzed polyacrylonitrile), K-4 (hydrolyzed polyacrylamide) PAA (polyacrylamide), CMC (carboxymethyl cellulose), starch, cellulose, Polyphosphate, which lead to the formation of a reticular spatial structure possessing high water-absorbing properties [8–9, 13]. The resulting hydrogels are able to absorb more than 300–350 g of water per 1 g of hydrogel.

2.1. Experimental set up

The fig1. shows the comparative kinetics of swelling in distilled water of some types of local hydrogels and French hydrogels (AKVASORB3005)

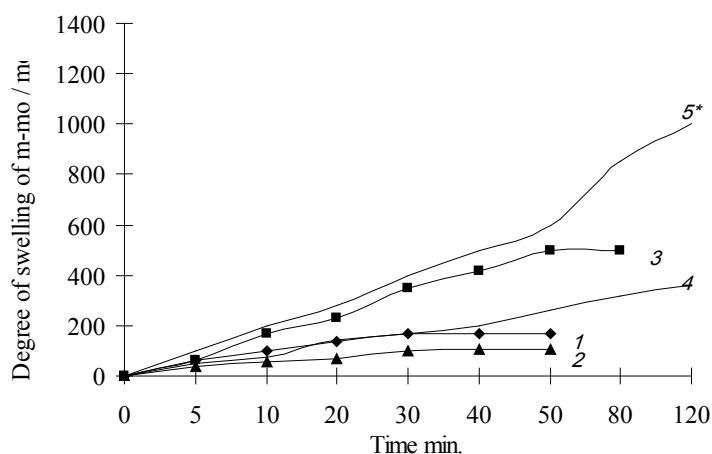


Figure 1. Kinetics of swelling of various hydrogels: 1 – French Hydrogel (AKVASORB3005); 2 – HYPAN1; 3 – HYPAN+E; 4 – HIPAN+F; 5* – K-4+EHGA

When the hydrogel begins grinding to 0.2 mm, the degree of swelling reaches 350 in 30 minutes, the hydrogel with an average grinding fraction from 0.2 mm to 1.0 mm swells to 350 in 50 minutes, and hydrogel particles more than 1.0

mm reach a swelling degree 320 only after 60 minutes. It can be concluded that in small fractions of hydrogel, the swelling time reaches a maximum twice as fast as particles with granules of more than 1.0 mm.

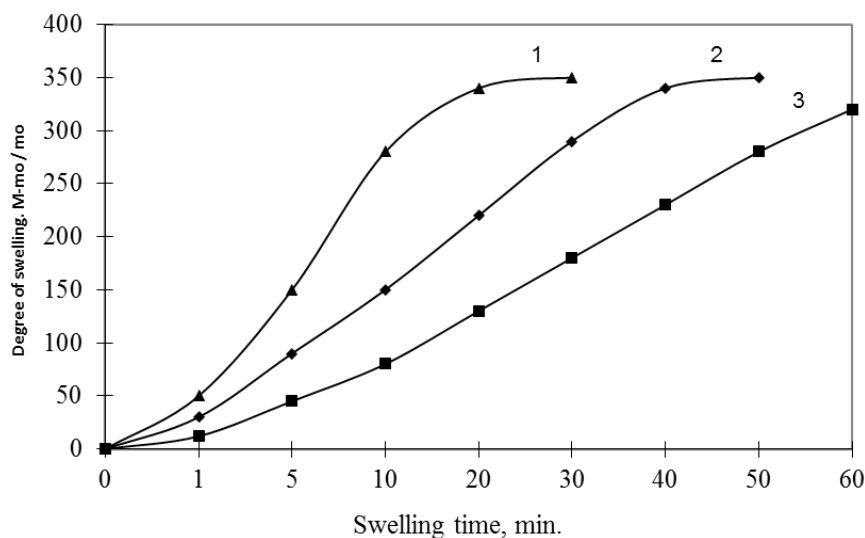


Figure 2. Dependence of swelling hydrogel on time: 1 – Fine fraction up to 0.2 mm. 2 – Average fraction, from 0.2 mm. Up to 1.0. 3 – Large fraction, granular form – more than 1.0 mm

When hydrogel is dried at a temperature 45–50 °C at a weight of 50 g., in the first three days of drying, the moisture loss was respectively 30; 35; 20g. This shows that in hot climatic conditions it is possible to keep moisture in the ground by hydrogels [10–13].

3. Results and discussion

At present, the State Unitary Enterprise of Tashkent Scientific Research Institute of Chemical Technology and Namangan Institute of Engineering and Technology are carrying out a joint innovation project on the theme of “Technology for the introduction of highly swellable hydrogels for the economical use of water.”

On July 15, 2018, highly swellable hydrogels were tested and introduced on the farm “Ahror Abror Anvarbek”, which were developed by the scientific collaborators of Tashkent Scientific Research Institute of Chemical Technology together with the staff of the Namangan Institute of Engineering and Technology and Inter-polymer LLC. Highly swellable hydrogels are used for the economical use of water and use as mineral fertilizers in the soil. This development highly reduces the flow of water during irrigation, and also reduces the consumption of mineral fertilizers in the soil.

As a result of the tests, obtained the following results.

Table 1. – Indicators of highly swellable hydrogels in soil

Indicators	Areas where hydrogel was not used	Area where the hydrogel was used	Difference in indicators	Saved resources (UZS)
1	2	3	4	5
Land area ha.	1	1	no	no
Natural conditions Rain Heat Humidity Wind	The natural resources in both areas are the same	The natural resources in both areas are the same	no	no
Sort and type of sowing	Cotton – kind of «6524»	Cotton – kind of «6524»	no	no
Sowing time	At the same time	At the same time	no	no
The amount of used hydrogel (kg)	not	60	60	1800000
Hydrogel using time and the method of use	not	On July 15, in 2016, before flowering and together with mineral fertilizers	not	Using does not require additional capital expenses
Number of agricultural cycles	9 times	7 times	2 times	
Number of used mineral fertilizers (kg)	1000	800	200	
Number of soil irrigation	4 times 10000 cub.m.	3 times 7500 cub.m.	1 time 2500 cub.m.	
No need to irrigate in the second cycle of spring wheat sowing	1 time 2500 cub.m.	not	1 time 2500 cub.m.	
Markings in the stems of cotton and their average height (cm)	69–91	97–120	28–29	
Root system of cotton (cm)	24–32	37–46	13–14	
Stems of cotton obtained from 1 hectare	2	4	2	800000
Flower persistence of cotton (%)	40–50	more than 80	40	
Number of boxes	14–21	37–59	23–38	
Cotton condition in stress during heat and drought (%)	100	Not noticeably	100	
Average fertility (m / g)	30	50–54	26	

1	2	3	4	5
Hydrogel saving in the following years (kg) in the 2 nd year-10 kg, in the 3rd year –20 kg less used	Not	10	10	300000
Capital expenses for each crop area (UZS)	2207500	1652500	555000	
Profit from each sowing area (UZS)	1692500	5237500– 180000=3437500	1745000	
Productivity			1745000	

Developed by scientific staff of State Unitary Enterprise of Tashkent Scientific Research Institute of Chemical Technology (SUE TSTRICHT) together with staff of Namangan Engineering and Technology Institute and Inter-polymer LLC, high-swellable hydrogels are used as an economical use of water and mineral fertilizers in the soil [14–17]. The results showed that the use of high swellable hydrogels on an area of 2500 cubic meters, if the second time the area is used for sowing, then the savings will be 5000 cubic meters. Water, 200 kg of mineral fertilizers, the moisture of soil is maintained at the proper level and the agro technical processing of soil is reduced by half (fuel, wages, depreciation, transport). These

items of expenditure are also reduced, and in one season, you can save 10 kg hydrogel. The profit from hydrogel in the normal regime will amount to 1.745.000 thousand UZS.

4. Conclusion

As a result of the research, the data showed that the high-swellable hydrogel, developed by State Unitary Enterprise of Tashkent Scientific Research Institute of Chemical Technology, and Namangan Engineering and Technology Institute, saves water and mineral fertilizers, saves soil from salinization, reduces agrotechnical measures, and also conserves soil from drought, increases fertility, and teaches us how reasonable and frugal use of above mentioned factors.

References:

1. Feldshtein M. M., Yakubovich V. S., Roskina L. P., Daurova T. T. Polymer covering for the treatment of wounds and burns. In: The Results of Science and Technology. Chemistry of macromolecular compounds. Ed. N.A. Plate. – M., VINITI, (1981), – V. 16. – P. 120–152.
2. Sorokin A. Ya., Kuznetsov V. A., Shemyakin N. O. Telephine sorbent on the basis of polyvinyl alcohol / Thesis speech VII symposium. “Synthetic polymers of medical purpose”. – Minsk, 1985. – P. 92–93.
3. Bekturov E. A. Polymer Electrolytes, Hydrogels, Complexes and Catalysts. – Almaty, 2007. – P. 140–143.
4. Sperling L. Kh. Interpenetrating polymer networks and jointing materials. – New York, 1981.
5. Gupta N., Srivastava A. K. Interpenetrating grids: a review of synthesis and properties. Polyim. Int. 1994. – 35 (2). – P. 109–118.
6. Sperling L. H. // Multiphase macromolecular systems. Modern themes in polymer science. Ed. Kulbertson B. M. – New York, 1999.
7. Khudaibergenov S. E., Bimendina L. A., Zhumadilova Zh. T. // Polymers. 2000. – V. 11.
8. Eshbiev T. N., Djalilov A. T., Kadirov T. J. “The results of investigating the sorbid properties and morphological structure of cured polymers” – Chemistry and chemical technology. – teh. magazine 3 – Issue. 2007. – P. 34–36.
9. Eshburiev T. N., Rusiev R. R., Kodirov T. J. Synthesis of hydroxyl and nitrogen-containing polymers and their application in the treatment of metal ions from standard solutions / Chemical technology control and management, – Tashkent, 2006. – No. 4. – P. 16–20.
10. Fayozova D. “Synthesis and study of hydrogels based on polyacrylonitrile”. Chemistry and Chemical Technology Science and Technology Journal 3, 2007. – P. 37–40.
11. Samigov N. A., Arslanov I. K., Jalilov A. T. Hydrogel as a water-bounding additive in a carbamide composition // High technologies and prospects of integration of education, science and production. – Tashkent, 2006. – Vol. 1. – P. 228–230.
12. Pat. RUz № 377 (1993). Means of obtaining polymer hydrogels // Nabiev G. G., Kaprilova G. B., Erkinov A. S., Dzhililov A. T.
13. Sherkuziev D. Sh., Mirboltieva N. Synthesis of hydrogels based on industrial waste // “The role of innovation in improving cotton gin and textile and light industry technologies”. Namangan, 2015. – P. 25–26. – May, – P. 539–541.
14. Sherkuziev D., Qurbanov N., Juraboev F. // Application of high swelling polymer hydrocarbons on cotton fields. Materials of the republican scientific-practical conference “Actual issues of production of import-substituting products based on the use of local raw materials in Fergana valley regions”. 2017. – April 27–28. – P. 254–255.

15. Shirinov Sh., Sherkukiev D. Sh., Qurbonov N. M., Jalilov A. T. // Development of technology for obtaining water-saving polymer hydrogels in Uzbekistan. Fargana Polytechnic, scientific journal – Fargana, 2017.– Vol. 21.– No. 2.– P. 116–120.
16. Sherukuziev D. Sh., Yusupov M., Juraboev F. // Use of hydrogel to save water resources. “Actual problems in physical and chemical polymeric composites, technological constructive materials”. International conference. – July 12–13. 2017. – Namangan, Uzbekistan.– P. 91–93.
17. Sherkuziev D. Sh., Kodirkhonov J. M., Shermamatov E. A., Qurbanov N. M. // Obtaining hydrogels based on local raw materials. “Actual problems in physical and chemical polymeric composites, technological constructive materials”. International Conference. July 12–13. 2017. Namangan, Uzbekistan.– P. 96–99.

Section 18. Economics

Voronina Evgeniya Vasilyevna,
candidate of economics, associate professor
of management and Business Department
Surgut State University
E-mail: ugene_v@mail.ru

Zavedeev Egor Vladimirovich,
candidate of economics, associate professor
of management and Business Department
E-mail: zavedeev@mail.ru

TERRITORIAL-PRODUCTION CLUSTERS AS A BASIS FOR BALANCED INNOVATIVE REGIONAL DEVELOPMENT

The article is written with financial support from Russian Foundation for Basic Research (project No.: 18-410-860009).

Abstract: the article considers the role of territorial production clusters in the socio-economic development of the regions at the present stage. The varieties of clusters are considered, their brief characteristic is given. It is concluded that the cluster approach is the basis of a balanced regional development, the purpose of which is to improve the quality of life of the population.

Keywords: cluster, socio-economic development of the regions, balanced development.

Adopted as a strategy in 2008, the Concept of Long-Term Socio-Economic Development of the Russian Federation [1] has established the transition to innovative economy (from the commodity economy). Key aspects of the new economy include: “formation of a new social development mechanism”, “strike a balance of entrepreneurial freedom”, “social justice and national competitiveness”.

One of the long-term development concept goals is the transition to a new model of the spatial development of the Russian economy, including the following most significant, from our point of view, aspects:

- creation of territorial-production cluster network to develop full competitive capacities of regions (at least 6–8), focused on high-tech industries in priority sectors of the economy;
- reduction in living standards inequality of population of the Russian Federation.

The approach adopted is not exactly new in the international strategic planning practices of socio-economic development, but its implementation in the Russian Federation lead to the widespread introduction of the cluster concept into the documents of strategic territorial planning for the period up to 2030, whereas before, the term “cluster” was associated with the development of selected territorial complexes.

One definition of the term “cluster” is contained in Federal Law No. 116-FZ of July 22, 2005 “On Special Economic Zones in the Russian Federation” [2]. It defines cluster as a set of special economic zones of one type or several types which is determined by the Government of the Russian Federation and which control is exercised of one managing company.

The Concept of Long-Term Socio-Economic Development of the Russian Federation [1] states that after 2012, economic development hubs will play an important role in regional development. Those hubs will be predominantly composed of various types of clusters:

- tourism and recreational – areas with unique natural resources and natural landscapes, rich historical and cultural heritage;
- petrochemical – areas rich with mineral resources, primarily oil and gas, resources used in modern technologies;
- territorial-production – areas of transport, heavy, chemical, agricultural, power engineering and instrument making, production of medical equipment, metallurgy and chemistry;
- energy industry – areas with hydroelectric power plants;
- forest industry – areas of Siberia rich with forest resources.

It is important to note that the legislation makes reasonable decision to not stop using the commodity sector of the domestic economy. It specifies that natural resources should be used to implement innovations in the regions [1].

One of the new legislative documents in the field of cluster policy implementation is the RF Government Decree No. 779 of July 31, 2015 “On Industrial Clusters and Specialized Organizations of Industrial Clusters”. The document defines the purpose of creating an industrial cluster as a set of industrial objects producing manufactured goods and connected on the territorial proximity basis and functional dependence, located on the constituent territory of the Russian Federation or several constituent territories of the Russian Federation [3].

In our opinion, this interpretation of the goal completely ignores the synergistic nature of cluster effects per each region, that implements cluster policy of socio-economic development, supported by international practices that indicate its relatively high social and economic viability.

We agree with the author of [4] that the main advantages of cluster-based economy include:

- improved efficiency of investment, investment management (on the sectoral and (or) territorial principle);

- increased innovative potential of each sector (as well as related sectors) and (or) territory;
- promotion of entrepreneurial activity;
- possibility of targeted benefits provision;
- increased competitiveness;
- development of the region and its management;
- employment generation.

In previous articles [5; 6 for example], the authors considered issues and features of the socio-economic development of territories with sector-specific economy on the example of the Khanty-Mansiysk Autonomous District – Yugra (hereinafter referred to as “KMAD – Yugra”) as significant from the point of view of its contribution to the industrial sector of the Russian economy. Let us take a closer look at the implementation of the cluster approach in the strategy papers of the KMAD – Yugra.

The strategy of socio-economic development of the KMAD – Yugra – 2030 intends to use the cluster development paradigm for the purpose of implementing the principle of marketing thinking [7]. The innovative scenario of socio-economic development is based on a gradual decrease of the share of oil and gas sector in the economy.

Table 1. – Strategic focus of territorial production cluster development of the KMAD – Yugra

Cluster	Description, strategic focus
Medical	Includes medical facilities, medical institutions of higher education, specialized medical centres; small enterprises (palliative care centres, medical equipment production enterprises). Evolves into intersectoral technological cluster of healthcare (or biomedical cluster) as related industries integrate into the cluster (medical tourism, health-resort treatment, production of medicines, dietary supplements and other biotechnological products manufactured using wild plants and agricultural raw materials, etc.).
Oil and gas procession, and forest industry	Increases the complexity of advances processing of raw materials and the production of final consumer products. Emergence of wooden housing after its reimagination, implementation of innovative technologies and design solutions. Includes possible emergence of a mining cluster based on mineral processing.
Oil and gas extraction	Modernization of oil and gas production, modernization of the oil service industry, development of domestic technologies for the development of tight resources, new technologies for oil and gas production and geological exploration. Prevention of productivity losses through the use of modern mining technologies.
Science and innovation	The total of innovative components of other clusters is created on the basis of existing research institutes, universities, support and development of science and innovation cluster in the autonomous district (including existing and planned: science park, industrial estates, innovation and educational complex, Quantoriums – science parks for children).
Agribusiness and tourism	Long-term formation after 2030. Inclusion of individual agribusiness enterprises (biotechnological and organic food production) and tourism (health-resort facilities) into the emerging intersectoral biomedical cluster (technological cluster of healthcare) without forming specialized sectoral clusters.

Based on data in [5]

Historically, the development of the industrial sector of the KMAD – Yugra is determined by the dynamics of oil

production: the share of mineral production in the industrial output in 2016 is 81%, in 2017 – slightly less than 80%, in

January-March 2018–79.6%. Beyond that, the share of petroleum production for this period is 10%, 12.3% and 12.7%, respectively [8; 9; 10]. This data indicates lack of decrease in the share of the oil and gas sector in the regional economy, but the share of the petroleum production is increasing at insignificant rates, which should be considered as a positive development.

The most effective for generating innovations are intersectoral clusters.

In order to implement the cluster strategy in the district in the field of industrial policy and innovation development, the cluster definition in the document [7] is “the form of territorial organization of economic activity in which the institutional environment (demand, level of competition, a system of related and auxiliary production, a system of material and intangible resources) provides competitive advantages for a certain type of economic activity”. On that basis, the defining feature of the cluster is the territorial concentration of economic activity.

Presently, the Strategy [7] has declared the formation of the following eight territorial and sectoral clusters: oil and gas extraction; oil and gas procession; forest industry; mining industry; science and innovation; tourism and recreational; medical; agribusiness. A brief description of the strategic direction of territorial production cluster development of the KMAD – Yugra is presented in the (Table).

In summary, means of regional cluster policies implementation aimed at the development of full competitive capacities of the regions are defined as the focus of regional policy. Considering that the strategic goal of the socio-economic development of the territory is to improve the quality of life of the population, the cluster approach should be considered as the basis for balanced regional development and viewed as a combination of economic growth, competitiveness, and environmental safety.

References:

1. О Концепции долгосрочного социально-экономического развития Российской Федерации на период до 2020 года [Электронный ресурс]: Распоряжение Правительства РФ от 17.11.2008 № 1662-р (ред. от 28.09.2018) // Справочно-правовая система КонсультантПлюс (дата обращения 06.12.2018).
2. Об особых экономических зонах в Российской Федерации: Федеральный закон от 22.07.2005 № 116-ФЗ (ред. от 18.07.2017) [Электронный ресурс] // Справочно-правовая система КонсультантПлюс (дата обращения 06.12.2018).
3. О промышленных кластерах и специализированных организациях промышленных кластеров: Постановление Правительства РФ от 31.07.2015 № 779 (ред. от 02.08.2018) [Электронный ресурс] // Справочно-правовая система КонсультантПлюс (дата обращения 06.12.2018).
4. Соколов Ю. Интеграция как условие воспроизводства промышленного капитала // Экономист. 2006.– No. 8.– С. 21–28.
5. Воронина Е. В. Нефтегазодобывающий стратегический кластер социально-экономического развития ХМАО – Югры: состояние, развитие, налогообложение, перспективы // International Innovation Research: сб. статей VI Межд. науч.-практ. конф. / Под общ. ред. Г. Ю. Гуляева.– Пенза: МЦНС «Наука и просвещение». 2017.– С. 126–131.
6. Заведеев Е. В., Овчарова Н. И. Развитие лесопромышленного комплекса как одно из направлений диверсификации экономики Ханты-Мансийского автономного округа – Югры // Вестник Сургутского государственного университета. 2016.– No. 2 (12).– С. 36–47.
7. Стратегия социально-экономического развития Ханты-Мансийского автономного округа – Югры до 2030 года: распоряжение Правительства Ханты-Мансийского автономного округа – Югры от 22.03.2013 года № 101-рп (в ред. распоряжения Правительства ХМАО – Югры от 09.06.2017 № 339-рп) [Электронный ресурс] URL: <https://depeconom.admhmao.ru/deyatelnost/sotsialno-ekonomicheskoe-razvitie/strategiya-sotsialno-ekonomicheskogo-razvitiya-okruga/297873/strategiya-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry-do-2020-g> (дата обращения 06.12.2018).
8. Итоги социально-экономического развития Ханты-Мансийского автономного округа – Югры за 2016 год [Электронный ресурс] URL: <https://depeconom.admhmao.ru/deyatelnost/sotsialno-ekonomicheskoe-razvitie/itogi-razvitiya-okruga/itogi-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry/2016-god/736141/itogi-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry-za-yanvar-dekabr-2016-goda> (дата обращения 06.12.2018).
9. Итоги социально-экономического развития Ханты-Мансийского автономного округа – Югры за 2017 год [Электронный ресурс] URL: <https://depeconom.admhmao.ru/deyatelnost/sotsialno-ekonomicheskoe-razvitie/itogi-razvitiya-okruga/itogi-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry-za-yanvar-dekabr-2017-goda>

yugry/2017-god/1152487/predvaritelnye-itogi-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry-za-yanvar-dekabr-2017-goda (дата обращения 06.12.2018).

10. Итоги социально-экономического развития Ханты-Мансийского автономного округа – Югры за январь-март 2018 года [Электронный ресурс] URL: <https://depeconom.admhmao.ru/deyatelnost/sotsialno-ekonomicheskoe-razvitie/itogi-razvitiya-okruga/itogi-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry/2018-god/1577748/itogi-sotsialno-ekonomicheskogo-razvitiya-khanty-mansiyskogo-avtonomnogo-okruga-yugry-yanvar-mart-2018> (дата обращения 06.12.2018).

*Gaybullaev Feruz,
candidate (PhD) of economics, doctoral degree student
of the Institute of Forecasting and Macroeconomic Research
at the Ministry of Economy of the Republic of Uzbekistan
E-mail: F. Gaybullaev2@ifmr.uz*

RESOURCE SAVING IS THE PRINCIPAL GOAL IN DEVELOPING THE INNOVATIVE STRATEGY OF LONG-TERM DEVELOPMENT OF THE NATIONAL ECONOMY OF UZBEKISTAN

Abstract: The article addresses the goals and objectives of the Long-term Development Strategy with general principles of building it, as well as the specific features of their implementation as applicable to the problems and priorities of development of the national economy of Uzbekistan. The necessity of transition to a resource-saving model of sustainable development and expansion of productive employment, focused on the introduction of new technologies and innovations, is substantiated.

Keywords: resource saving, long-term development strategy, innovative technologies, development priorities, prospective technology platforms.

One of the key reserves for growth of production efficiency and increasing its competitiveness is modernization of state institutions and management technologies.

The resolutions adopted by the Government of the Republic of Uzbekistan and other regulatory documents have set the task of improving the system of organization of economy management, phased reduction of government regulation, introduction of market mechanisms of macroregulation, formation of an effective competitive environment.

In this regard, for the purposes of improvement of the structure of the Cabinet of Ministers of the Republic of Uzbekistan in accordance with the requirements of deepening economic reforms and dynamic socio-economic development of the country, the Resolution of the President of the Republic of Uzbekistan dated 12 June 2017 No. PP-3051 about Additional Actions for Improvement of the Executive Structure of the Cabinet of Ministers of the Republic of Uzbekistan was issued, which reflects the activities for creation of a qualitatively new, modern and effectively functioning system of the Uzbekistan government [1].

At the same time, liberalization of the economy and the management system aimed at improving the efficiency of macroregulation, creating competition and other prerequisites for formation of the demand for innovative products and technologies, brings the risks of loss of economy manageability, especially if the taken actions are not sufficiently thought-out, justified, coordinated and are premature. Solving the problem of combining the provision of economy manageability as a whole with expansion of opportunities for self-regulation of economic entities based on operation of market mechanisms is impossible without transition to new methods of planning and managing the economy based on the principles of strategic planning and

forecasting [2]. The determinant structure for the strategic plans is the Long-term Development Strategy (LDS).

In the framework of the concept of administrative reform approved by the Government of the Republic on 21 September 2017, it is envisaged to “create a system of strategic planning allowing to form future models of innovative development of the top-priority fields and sectors based on long-term scenarios of enhancing the country’s intellectual and technological potential, including that realized by the way of legislative definition of the notions of “short-term”, “medium-term” and “long-term” development program. It is the creation of a strategic planning system that is determined as the most important direction of innovative development of Uzbekistan [3].

Many sectoral and regional development programs for medium-term and long-term future have been recently developed and adopted in the Republic. However, the absence of national strategy determining the country’s most important development priorities for the next 15–20 years does not allow to harmonize the parameters of individual target programs within a uniform approach to solving the problem of increasing the competitiveness of the national economy and sustainability of its development. It’s not a coincidence that that many of the target programs and investment projects adopted in previous years showed their inefficiency, that negatively affected the investment climate and attractiveness of the country for foreign investors [4].

The long-term development strategy is the key tool for rational addressing the issue of selection of priority areas for economic development for long-term future based on a system of scientifically justified apprehensions about the future and alternative ways of development. In the recent time, in the conditions of growing globalization and instability of the

world economy development, the role of long-term planning and forecasting is steadily growing. The international organizations such as the World Bank, the International Monetary Fund, the United Nations, the Asian Development Bank, the NATO as the basis of their reports constantly use the tool of long-term forecasting [5]. In addition, not only the developed countries [6], but also the developing ones, started to use such a tool in formulation of their strategies. For example, China has long-term development forecasts for the periods till 2020, 2030 and 2050 with the emphasis on solving the problems of economic development in general, science, technology and innovation.

What is the practical need for this document? The strategy should provide all the participants of economic activity with the answer to the two key questions:

1. What do we want to achieve in the next 15–20 years (a vision of the position of the national economy in the future global world)?

2. How to achieve the set goals within the framework of strict resource constraints, taking into account the increasing risks and challenges of long-term development?

The opportunity to obtain convincing answers to these questions is largely determined by the principles underlying the Strategy. Analysis of the world experience shows that the key principles are following:

- the principle of systemacity, integrity of the strategy, comprehensive approach to solving the problem of sustainable development;

- the principle of using the advanced world experience applicable for the Republic in substantiation of the model, priorities, reserves and sources of development;

- the principle of succession of steps (stages) in achieving the set goal, switching the priorities in the choice of sources (factors) of development during transition from one stage to another;

- the principle of realism of the proposed ways, actions and mechanisms to achieve the benchmark targets, based on a convincing evidence base for selection of new sources of economic growth, formation of the conditions and mechanisms for realization of the existing reserves for development of the national economy.

The following describes the approaches to implementation of these principles in the process of developing the national development strategy (NDS) of Uzbekistan 2035.

The principle of systemacity and integrity of the strategy is based on the need to develop the NDS, taking into account the following interrelated factors:

- focus on long-term development goals (informal and formal in the system of indicators of the Sustainable Development Goals (SDG) of Uzbekistan till 2030);

- consideration of the global scientific and technological development and future, most probable trends of development of the world economy;
- consideration of new challenges, barriers, risks and objective limitations of sustainable development, having long-term nature;
- consideration of the potential of existing factors (sources) of economic growth and unused current and future competitive advantages of the national economy (corridors of opportunities, development reserves);
- connecting the proposed ways, development models, actions and mechanisms for its implementation with the prospects of development of the global economy, the expected risks and other factors considered above.

By the present time, the expert community has established a steady apprehension of the long-term development goal of Uzbekistan — raising the level and quality of life of the population to the social standards that are characteristic for the countries in the upper segment of the medium-developed countries of the world. At the same time, it should be ensured the development of the potential for sustainable development, the preservation and, in some areas, the improvement of environmental parameters. Separate target indicators for the long-term period are reflected in the UN document “Uzbekistan SDG 2035”, which is currently at the final stage of discussion and approval.

The more difficult problem is consideration of the trends of world development and selection of national priorities of scientific and technological progress for the next 10–15 years. The range of current scientific researches and technological developments is extremely wide and can include several hundred basic technologies [7]. As in any forecast, for many of them there is a high degree of uncertainty, especially for the timing of introduction of new discoveries and inventions into commercial operation and the stated characteristics of new innovative products and technologies. In view of extremely limited capabilities of the Republic in developing new, or adapting the advanced foreign technologies, the cost of mistake in choosing scientific and technological priorities becomes especially high.

It is the same difficult to also predict the prospects of the world economy development, especially development of the countries in the post-Soviet space, where the main foreign trade flows of Uzbekistan pass. In these conditions, the starting point for the mutual coordination of all these factors should be a *new model of economic development of Uzbekistan, based on resource saving, expanding the sustainable employment and introducing new innovative technologies.*

Why should resource saving become the priority number one for the next 10–15 years? First of all, during this period the country, while maintaining the achieved economy growth

rate at 5–6% and moderate progress in the field of resource efficiency, will inevitably face the *new challenge* — *increasing shortage of natural and mineral resources* — energy, water, land, minerals. Eliminating this deficiency by increasing the recovery of raw materials in the conditions of depletion of explored resources and the increase in the cost of their recovery at new fields or the expansion of its importation does not provide a complete solution of the problem. So, in order to increase electricity production, it is necessary either to enlarge natural gas and coal production, by implementing new capital-intensive investment projects with negative consequences for the environment and sustainable development, or to reduce natural gas exportation. In the first case, there will be an additional need for new equipment and foreign currency resources. In the second case, foreign currency earnings and the ability of purchasing such equipment would be reduced. As a result, the development of the economy in the framework of a capital-intensive resource-based economy leads the country to a dead end: the load on natural capital increases, its vulnerability from external shocks increases, imbalances in the labor market increase, and the development of non-resource-based sectors of the economy slows down.

Resource saving is essential for raising the *competitiveness of the national economy*. In the conditions when the energy intensity of the national economy is 3.5–4 times higher than the world's average figure, it is difficult to rely on the growth of exportation of processed products, especially in the conditions of rising global demand and prices for energy resources, which negatively affect the cost of production and price competitiveness.

Without resource saving, it's impossible to expand the investment potential of development with orientation on domestic sources of financing. The cause-and-effect relationships arising here can be presented as: **Resource saving saving** → **Reduction of costs** → **Growth of profit and investment potential** → **Investments in new sectors and innovative production**. At the same time, the Republic has significant non-utilized reserves of production costs reduction, which lie in the plane of modernizing the used technologies, strengthening the institutional system, and increasing the efficiency of state administration.

The transition to *digital economy and the introduction of innovative technologies* in material-intensive industries and production field create new windows of opportunities for saving energy, water, land resources, more efficient use of budget funds. For this purpose, it is necessary to speed up the process of introducing new information technologies, low-cost and high-speed data processing networks, integrated databases of energy consumers, farms, land cadastres, water users, taxpayers, etc. Integrated databases on incomes and expenditures

of citizens will significantly improve the addressing of social benefits, effectiveness of the use of limited budget funds. The introduction of modern computer systems in the educational process will positively affect the quality of education, will allow to improve the quality of training and the objectiveness of the assessment of professional competencies.

The *long-term sectoral scientific and technological forecasts* should be another point of bearing for development of the Strategy, with an emphasis on those activities in which the highest potential of comparative advantages and the sustainability of development of the national economy are concentrated. As applicable to the national economy, these are the innovative technologies for production of renewable energy sources, smart energy networks, recycling of mining wastes and production of new building materials with improved properties, production of new energy-efficient types of electric motors and equipment for pumping and water distribution stations, for bioorganic processing of wastes, breeding new varieties of farming plants and species of animals adapted to the expected climatic changes, etc.

At the same time, the state should support not only, and not so much, the investment projects of particular companies in various industries and sectors of economy, but also the projects of development of *prospective technology platforms*, which promotion corresponds to the strategic development priorities and ensures the use of hidden competitive advantages as new sources of growth. For example, if the introduction of water-saving technologies is determined as a priority, then the state should support not only manufacturers of new generation equipment for water supply and treatment, its distribution, irrigation systems, water control, metering, etc., but also the designers of such equipment (laboratories, engineering centers), consumers of new technologies (farms and industrial enterprises), educational institutions, particular university departments and centers of advanced training of specialists capable to develop and operate this equipment.

Along with the above said, there are a number of other issues that arise in the process of working on the strategy:

- how to organize development and updating of such Strategy, to address the interests of business, the state and investors in it?
- how to correctly build the sequence of steps (stages) in achieving the set goal, switching the priorities in the choice of sources (factors) of development during transition from one stage to another?
- what methods should be used in this case? etc.

The limited framework of the article does not allow to touch on these problems. However, there is no doubt of the need to develop as a top priority and adopt the *Law on Strategic Planning* aimed at creating all regulatory, organizational, methodological,

informational, personnel conditions and prerequisites, which allow to form an effective model of future development of the country based on scientific approaches with emphasis to increasing the economy sustainability, growth of living standards of the population, new sources of economic growth and the most important priorities of macroeconomic regulation.

The law will allow to clearly outline the circle of participants in development of the Strategy, determine their rights and obligations, the procedure of creating the necessary organizational and methodological conditions and prerequisites for developing long-term forecasts in coordination with medium-term indicative plans, sectoral and regional development strategies.

References:

1. Resolution of the President of the Republic of Uzbekistan dated 12 June 2017 No. PP-3051 about the Additional Actions for Improvement of the Executive Structure of the Cabinet of Ministers of the Republic of Uzbekistan.
2. Chepel S. "Indicative Planning: a Modern Term or a Prospective Way of Innovative Renewal of the Existing System of Economic Management". "Market, Money and Credit", – Tashkent, – No. 2. 2018.
3. Decree of the President of the Republic of Uzbekistan. "On Formation of the Ministry of Innovative Development of the Republic of Uzbekistan", approved by the Decree of the President of the Republic of Uzbekistan dated 29 November 2017. No. UP-5264.
4. See "Instead of Annual Investment Programs, State Development Programs will Appear that are Designed for Long Term Future" – Tashkent, 19 December 2017. Sputnik, 09:50.
5. Papers of the international organizations: Global Environment Outlook, Global Economic Prospects, Global Development Finance, World Energy Outlook, Prognostic Studies (with large volumes of statistical data), Asian Development Outlook, Multiple Futures Project – Navigating towards 2030: Findings and Recommendations.
6. For example, in USA: Global Trends, Mapping Global Future and Global Governance, Topical and global trends forecasts on security and defense, situation in the world economy, public health service and education, ecology etc. BEC: The World in 2025: Rising Asia and Socio-Ecological Transition, Forecast 2030.
7. The Forecast of Scientific and Technological Development of Russia till 2030 was prepared in the context of 800 technologies in 10 promising fields ("Information and Communication Technologies"; "Biotechnologies"; "Medicine and Healthcare"; "New Materials and Nanotechnologies"; "Rational Use of Natural Resources"; "Transport and Space Systems"; "Energy Efficiency and energy Saving", etc.– see Forecast of Scientific and Technological Development of Russia: 2030/ edited by L. M. Gokhberg.– Moscow: Ministry of Education and Science of the Russian Federation, National Research University "Higher School of Economics" 2014).

Makasarashvili Tamar,
Ph D., in Economics, professor
Gori State Teaching University, Georgia
E-mail: tmakasarashvili@gmail.com

Giguashvili Giuli,
Ph D., in Economics, professor
Gori State Teaching University, Georgia
E-mail: giuligiguashvili@gmail.com

Khorguashvili Tea,
Ph D., in Economics, professor
Gori State Teaching University, Georgia
E-mail: tkhorguashvili@yahoo.com

PROBLEMS OF THE FORMATION INNOVATIVE ECONOMY IN GEORGIA

Abstract: Development of innovations and technologies is one of the driving forces to develop country's competitiveness and improve economic prosperity. Despite the real existence of innovative potential, the share of innovative enterprises is quite low in Georgia; the institutional opportunity of introduction and implementation innovations is low in the regions. The urgent task is working out the country's innovative development strategy and state program of its realization, that will respond to the global challenges.

Keywords: Innovations, innovation economics, innovation infrastructure.

Georgia aspires to become a country based on European values and to make political and economic integration with it. One of the most important prerequisites for our country's future economic progress and further deepening of the European integration process is to move the focus on innovative development and facilitate the formation of the relevant system in both state and regional, local or sectoral context.

In order to promote the sphere of innovation and technology and to create ecosystem of innovations, in 2014, under the subordination of the Ministry of Economy and Sustainable Development was created LEPL "Innovation and Technology Agency", which promotes commercialization of innovations and stimulates the use of innovations. Since its establishment, the Agency has implemented legal reform in the sphere of innovation, created and developed infrastructure of innovations, established international cooperation for the development innovations, technologies and researches; It has implemented many educational events supporting innovations and entrepreneurship etc [1].

Later, according to the Decree № 32 of Georgian Government of February 3, 2015 was created and functions "Research and Innovation Council" its main function is promoting development of economics based on the knowledge and innovation in the country, development of information society, turning of the intelligent products and innovations into the main export product, entering in all spheres information and communication technologies and innovations [2].

Determining the level of innovative development and working out of the appropriate measurement system is impossible without the existence of indicators system. According to Doctor of Economic Sciences, Professor Ramaz Abesadze, such methods are not available in Georgia yet and it may include: Indicators of innovative development of: 1) Country; 2) Region and; 3) enterprises [3].

With the opinions of separate experts, innovative climate in Georgia is unfavorable. Innovative infrastructure is weak; In the country, the state and private sector spending on research and development is low; The innovation market is limited; Despite the real existence of innovative potential, the share of innovative enterprises is quite low in the country; The institutional opportunity of introduction and implementation innovations is low in the regions.

Only a small part of Georgian companies try to offer innovation to the customers and to improve existing products. We consider it expedient for companies to conduct periodic polls to understand the consumers' opinion: what they like, which innovations do they like, etc. It is necessary, that innovative ideas must be based on analysis and researches of various statistical data.

The necessary condition for activating innovative activities in the country is the creation and development of the national model of innovative ecosystem. Four main models of the national innovative system are allocated in economic literature:

1. “Euro Atlantic” (EU countries: Germany, France, Italy, Finland, Great Britain and others).
2. “East Asian” (Japan, Taiwan, Hong Kong, South Korea and others).
3. “Alternative” (Chile, Turkey, Thailand, Portugal and others).
4. “Triple Spiral” (USA, a number of European Countries) [4].

With our opinion, Georgian model of innovative ecosystem, which is in the process of formation, is more suited to the “alternative” model, because in the conditions of small financing, innovative ideas are generated mainly in technoparks and innovative laboratories. According to the information of Georgian Innovations and Technologies Agency (GITA), the following infrastructure supporting innovations has been created and operated throughout the country: Two Techno Parks (in Tbilisi and Zugdidi), Three Innovations Center, Three Innovations Laboratory, twenty-two Industrial Laboratories, by the end of October 2018 opens the third Techno Park (in Telavi), the foundation was laid to the construction of the fourth Techno Park (in Kaspi). Within the framework of the program startup Georgia, 20 startups were financed by 100000 GEL [5].

On 22.06.2016 was adopted Georgian Law, „about innovations” [6], this law aims creation and perfection ecosystem of national innovation necessary for socio-economic development of Georgia, construction of the economy based on knowledge

and innovations in the country, promoting the use of technologies in Georgia, which are created in other states, promotion of the introduction and export of intellectual property and technologies created in Georgia, entering of the advanced technologies in all spheres of science and economics in order to increase competitiveness of these spheres. The mentioned Law was prepared by the authorship of the LEPL Georgian Agency of Innovation and Technology of the Ministry of Economy and Sustainable Development of Georgia and it is the main legal framework in the sphere of innovations. The Innovation Agency still continues working on legal reforms and in the nearest future new legislative initiatives will be represented, which take into account creating mechanisms of venture investment funds and public financing (so called crowd funding) in Georgia.

In the long term in order to facilitate the development of innovative processes, Georgian Government has developed a socio-economic development strategy 2020 [7], according to which the Georgian Government determined priority directions, where development of innovations and technologies is one of the driving forces to develop country’s competitiveness and improve economic prosperity. In the strategy it is presumed extension of the introduction progressive technologies by companies, strengthening of the communication between science and business, achieving satisfactory level of innovation and ultimately increasing of the competitiveness of local production. Our Government has the following objectives for the development of innovation and technologies: [8].

Table 1.– Goals for development innovation and technologies

Indicator	Basic	2018	2020
The country’s position according to the economy index based on the knowledge	68	55	45
Position according to the index of global innovations	73	65	60
The total productivity of factors,%	2,7	3,0	3,2
Position according to the of index of innovations capabilities	44	40	36
Position according to the index of global information technologies	65	58	50

The question arises: How realistic are these goals when the role of small and medium business in the country is small and programmed financing of the state budget is not oriented on innovations?

In the recent years, agreements concluded with the EU and other important activities serve for Georgia’s coming under the unified space of European innovation policy and deepening cooperation with Europe, among them are: Eastern Partnership (EAP), a Deep and Comprehensive Free Trade Area (DCFTA) agreement, the Association Agreement and Brussels Agreement of April 29, 2016 ratified by the Georgian parliament on December 22, 2016 “About Georgia’s participation in the European Union Program “Horizont 2020 – Research and Innovation Framework

Program (2014–2020)” between Georgia and the European Union” [9].

In addition, on March 28, 2016, the Government of Georgia and the International Bank for Reconstruction and Development (IBRD) signed a five-year (2016–2021 year) loan agreement for allocating \$40 million USD to Georgia for the purpose of implementing the National Innovations Ecosystem (GENIE) project. The main goal of the project GENIE is to increase the innovative activities of firms and physical persons working in Georgia and to ensure their participation in digital economy. To achieve the mentioned, it is planned and it is actively going on formation of the regional and community centers of innovations, increasing the access to the internet for socially vulner-

able families and small businesses, developing digital and electronic literacy skills and capacities for entrepreneurs, ensuring the access to financing for high-technological and innovative startups. As a result, according to the innovation and technology agency, Georgia has advanced in global index rating of innovations. According to the data of 2018, our country is on 59th place, compared to the previous year the indicator has improved with 9 levels. Georgia is on the first place in global index rating of innovations in the region [10].

Thus, with the assistance of the EU and the state support in Georgia, some steps have been already taken for the formation national innovation system, we think it is necessary continuation of the targeted and consistent state policy, the state must provide political and economic stability in order to create a suitable environment for innovative policy. It is necessary to take effective measures for the integration Georgian science and education system into a unified European space. The urgent task is working out the country's innovative development strategy and state program of its realization, that will respond to the global challenges.

References:

1. Georgian Innovations and Technologies Agency, URL: <https://gita.gov.ge/geo/ecosystem>
2. Legislative Herald of Georgia. URL: <https://www.matsne.gov.ge/ka/document/view/2712487>
3. Ramaz besadze. State Regulation Problems of the Formation Innovative Economics in Georgia, TSU Paata Gugushvili Institute of Economics Collection of International Scientific Conference Materials – Structural and Innovative Problems of Economic Development – June 23–24, 2017.– P. 11, 14.
4. Datunashvili Lina, the role of the state in the development of the innovative system of EU countries. URL: https://www.researchgate.net/publication/318497532_sakhelmtsipos_rol_i_evrokavshiris_kveqnebis_inovatsiuri_sistemis_ganvitarbash_i
5. Technopark Georgia. URL: <https://www.facebook.com/TechParkGeorgia/posts/1495045793936649>
6. The Legislative Herald of Georgia. URL: <https://www.matsne.gov.ge/ka/document/view/3322328>
7. Georgian Innovation Strategy “Innovative Georgia 2020”. URL: <https://idfi.ge/public/upload/IDFI/2020/Qashibadze2.pdf>
8. Decree of Georgian Government, about the approval socio-economic development strategy “Georgia 2020” of Georgia and some activities connecting to it” – No. 40. 17.06. 2014.
9. Ministry of Education and Science of Georgia. URL: <http://www.mes.gov.ge/content.php?id=6888&lang=geo>, 27.12.2016
10. Agency of Innovations and Technologies of Georgia. URL: <https://gita.gov.ge/geo/static/31/genie>

Hamad Mattar Alrawi,
MBA Student, University of Fujairah,
Sheikha Abdullah Mohammed,
MBA Student, University of Fujairah,
Fermin G. Castillo, Jr. (Post-Doc)
Associate Professor, MBA Program
University of Fujairah, United Arab Emirates
E-mail: fermin@uof.ac.ae

THE IMPORTANCE OF EMPLOYEE ATTITUDE TOWARDS JOB SATISFACTION: HOW IT AFFECTS EMPLOYEE TURNOVER?

Abstract: This research study is an attempt regarding the level of job satisfaction and employee attitude.

A worker attitude towards work is directly linked to the job satisfaction; a worker who is satisfied with his job performs better and excels at what he does. It is therefore imperative for a company to understand the attitude of its workers and measure the job satisfaction of its employees, as job satisfaction is essential for productivity. The result of the research study will help companies to evaluate attitudes and job satisfaction as to job turnover. In conclusion, the work condition, work load and nature of work is more important than attitude alone.

Keywords: attitudes, job satisfaction, organization, job turnover, behavior.

1. Introduction

Employee attitudes towards work is very important now a days as its end result that leads to job satisfaction. There are many theories that focus on personal characteristics and attitude that explain job satisfaction. The importance of attitude in understanding psychological phenomenon was given formal recognition early in the history of social psychology. From the time of the concept's entry in to the language of psychology until now, interest in attitude has been strong and growing. However, over the years attitudes have been studied with differing emphasis and methods. It is necessary to be precise in defining attitudes, because the variety of published definitions and descriptions is almost endless. Attitude may be defined in two ways, Conceptual and Operational. There is difference in the conceptual definition of the term attitude, and divergent points of view regarding the concept of attitude have developed. "Attitude is a mental and neural state of readiness organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related".

Job Satisfaction:

The term job satisfaction to an individual's general attitude towards his or her job. A person with a high level of job satisfaction holds positive attitudes about their job, while a person who is dissatisfied with his or her job holds negative attitudes about the job. When people speak of employee attitudes, more often mean job satisfaction.

According to (Robbins, S., 2004) [1] Job satisfaction has an effect on an individual's satisfaction with life. If an employee does not get satisfaction in their work, they may seek for

satisfaction in other work unrelated areas. This provides fulfillment and balance in their life. He or she may also be content with work as it relates with those work unrelated areas. Job dissatisfaction may also cause an employee to quit.

Determinants of Job Satisfaction:

While analyzing various determinants of job satisfaction, we have to keep in mind that all individuals do not receive the same degree of satisfaction though they perform the same job in the same job environment and at the same time. Therefore, it appears that besides the nature of job and job environment, there are individual variables which affect job satisfaction. Thus all those factors which provide a fit among individual variables, nature of job and situational variables determine the degree of job satisfaction.

Attitude

An attitude is a hypothetical construct that represents an individual's degree of like or dislike for an item. Attitudes are generally positive or negative views of a person, place, thing, or event— this is often referred to as the attitude object. People can also be conflicted or ambivalent toward an object, meaning that they simultaneously possess both positive and negative attitudes toward the item in question. Attitudes are judgments.

Attitudes and Consistency:

Research has generally concluded that people seek consistency among their attitudes and between their attitudes and their behavior. This means that individuals seek to reconcile divergent attitudes and align their attitudes and behavior so that they appear rational and consistent. When there is an

consistency, forces are initiated to return the individual to an equilibrium state.

Components of Attitude:

There are three types of components:

- Cognitive component.
- Affective component.
- Behavioral component.

Cognitive Component:

The beliefs and information that the individual has about the object are the cognitive component of attitude. Here it makes little difference if the information is correct or incorrect.

Affective Component:

Affective components include the feelings of a person about an object. These feelings could be positive, negative or neutral. While a customer service representative displays positive feelings, a police officer or a bill collector would exhibit negative feelings. Similarly, while discharging administrative duties public servants are required to show neutral feelings.

Behavioral Component: These components of attitude consist of a tendency of an individual to behave in a particular way towards an object. Only this component of attitude is visible as the other two can only be inferred.

Cognitive Dissonance Theory:

This theory sought to explain the linkage between attitudes and behavior. Dissonance means an inconsistency. Cognitive dissonance refers to any incompatibility that an individual might perceive between two or more of his or her attitudes, or between his or her behavior and attitudes.

Self-Perception Theory:

Self-perception theory as developed by psychologist Daryl Bem (1967) [2][3], therefore, argues that attitudes are used, after the fact, to make sense out of an action that has already occurred rather than as devices that precede and guide action. And contrary to cognitive dissonance theory, attitudes are just casual verbal statements. When people are asked about their attitudes, and they don't have strong convictions or feelings, self-perception theory says they tend to create plausible answers. Self-perception theory has been well supported. Although the traditional attitude-behavior relationship is generally positive, the behavior-attitude relationship is stronger. This is particularly true when attitudes are vague and ambiguous. When you have had few experiences regarding an attitude issue or given little previous thought to it, you will tend to infer your attitudes from your behavior. However, when your attitudes have been established for a while and are well defined, those attitudes are likely to guide your behavior.

2. Background of the Study

Robbins and Judge (2016) [4] defined attitudes as evaluative statements and they can be either favorable or unfavorable

concerning objects, people, or events. Therefore, they reflect how one feels about something. The favorable statements may provide positive effects regarding the concerned object, person or event whereas unfavorable statement may provide negative effects. An attitude is a positive or negative feeling or mental state of readiness, learned and organized through experience that exerts specific influence on a person's response to people, objects and situations. This definition of attitude has certain implications for managers. First, attitudes are learned. Second, attitudes define one's predispositions toward given aspects of the world. Third, attitudes provide emotional basis of one's interpersonal relations and identification with others. And fourth, attitudes are organized and are closed to the core of personality. Some attitudes are persistent and enduring; yet, like each of the psychological variables, attitudes are subject to change (Fishbein and Ajzen, 1975)[5].

Objectives

- To understand the employees' attitude towards the job.
- To make suggestions to improve the attitude of the employees to the management.
- To study the attitude of the employees towards their work.
- To know the reasons for the employees' positive attitude towards the job.
- To know the reasons for the employees' negative attitude towards the job.

3. Methodology of the Research Study

The research study uses survey questionnaire, observation and interview in order to extract further information. The questionnaire was pre-test in order to arrive for the desired goals of the study. Simple random sampling was used so it will be easier to get the desired sample size. There are 30 respondents in the study from various work departments. The questions on job satisfaction and quality of their job was asked accordingly. To further validate their answers, observation and interview was done accordingly. In a survey, people from different background thought that very few out of a population (1-3%) would think that job satisfaction and attitude have some relations. Current theories focus on personal characteristics and attitude to explain job satisfaction on organization. In a survey, people from different background thought that very few out of a population (1-3%) would think that job satisfaction and attitude have some relations. The respondents of the research study are employees working at Fujairah Municipality, United Arab Emirates.

4. Evaluation and discussion

Based from the study the following are assessments:

Surveys are a common method of measuring job satisfaction. A survey can assess satisfaction in the areas of pay, promotion, supervision, tasks and coworkers.

Interviewing employees as a method of measuring job satisfaction is mostly useful in organizations that have positive relationships with employees and believe the problem is too sophisticated to be understood with a survey.

Monitoring performance targets is a method of measuring job satisfaction that requires a business to be an active observer. With this method, researcher monitors participant's satisfaction by using standard criteria.

5. Presentation of the Research Study

Most of the participants are aged between 25 to 37. This numbers shows that most of the respondents are young and they are not worked for long period. This shows that many of the employed are the next generation of employees.

- From the personal interview and observation, we can conclude that common attitudes are Optimism, Pessimism, Confident, Realistic, Positive Attitude, Negative Attitude, Doubt, and Neutral Attitude. So we can find out that there are many attitudes in different people. Educational Qualification Of Respondents shows that most of them earned bachelor's degree as minimum. We found that 80% of the respondents are worked for an average of 10 years and highly satisfied. Rest of the 20% is neutral about satisfaction of the work load/assignment.
- From the analysis we found that 60% of respondents are satisfied with their work load. Also word load is not a big issue for young people as they flexible in any of the work movements.
- The study shows that 93% of the respondents are highly satisfied in terms of working hours, 5% of the respondents are satisfied on working hours, and only 2% of respondents are neither satisfied nor dissatisfied on working hours.
- In terms of Job Security of the Respondents: The study shows that 80% of the respondents are highly satisfied of acceptance of job security while only 20% of the respondents are neutral on job security.
- Quality of work life: The study shows that 92% of the respondents are highly satisfied of acceptance of quality of work life and only 8% of the respondents are not satisfied on quality of work life.

Social Role

Our social behavior affects our work. This is in regard to introverts and extroverts. An introvert will not easily socialize with people. This affects their performance in a situation that needs teamwork. Teamwork requires all individuals to communicate with each other. If employees cannot work well together, it affects productivity. A company that encourages teamwork experiences higher productivity. Extroverts are aggressive people and some people may try to avoid them.

Relationships in the work place affects attitudes and productivity. If employees have a close relationship with each other, employees will work well together and their attitudes improve which will lead to productivity. An improvement in attitude improves job productivity and satisfaction as end result. One of the important part is the transition between employee engagement to empowerment. [6] [7]

Culture

The differences in culture affects people's attitude or one way to another. Different cultures have different practice as well values. Some cultures do not allow their employees to work for certain amounts of hours. This may affect an individual if a transfer occurs and they get to a work situation that encourages more working hours. From study we found that organization culture also a main part of job satisfaction. This serve as the personality of the organization on employee view their persona.

Observation and Interview with the Employees (their responses)

1. We found that most of the young respondents are satisfied with their job.
2. There are different attitudes of employees in any organization.
3. Most of the respondents have higher qualification and qualified for the position.
4. There is no direct relation between attitude and job satisfaction but job satisfaction is less than the attitude of worker will change.
5. Long hour work does not affect the attitude or there is no relation in long hour work frustration.
6. Job security can be one of the components of job satisfaction.
7. Quality of work life is highly means the job satisfaction is high. And work life balance can be maintained this will improve the job satisfaction of a worker.
8. Job satisfaction is mainly effected by salary, work load, work time, work life balance organization culture.

6. Suggestions/recommendation

Based from our overall research study which includes follow up interview we can suggest the following information to be taken care in managing employee welfare and well-being. If working environment is good, then we can see employees who are happy to serve the general public. Giving reward and recognition is something that organization must provide to boost the morale of the employees. Another thing, employees needs to be involved in decision making as they believe they have to be part of it in general. In terms of professional development, training should be given to all so they can assess their skills to the next level. Training will help employees to be effective and efficient in their work as end result. Better

service to the public is always their paramount concern. Another issue that was raised is about the overtime with any reason. Still the working condition of the employee is their major concern however the management already working on better ways to improve for employees and its customers. Upgrading of offices, furniture, computer facility will also increase job satisfaction as employees and customers will definitely benefit on this move. It may cut the budget but its impact to the services to public is reasonable and justify. Public service is about public trust therefore they have to work for the people they are serving with.

7. Conclusion

When we relate job satisfaction and attitude we can find that there is no direct relation between them. The duty of management and the employee in improving worker's attitude is debatable. Some may argue that it is up to the employee to ensure that they attain job satisfaction from their work, as they are the only ones in control of their attitude and performance. The management's style of leading plays a huge role in worker attitude and job production. Empowerment is one factor that can motivate better productivity. If the management gives an employee opportunity to work according to their own standards, preferred that these standards measure up to those of the company, job productivity will increase. It is also possible

to say that all the responsibility is entirely the managements. They decide on the nature of the environment in which the employee works.

The management holds the power to control employee salary, off time and promotion. External factors such as the environment, social situations, and culture also affect worker attitude and job satisfaction. In my opinion, it is up to both the parties to decide on worker attitude and job satisfaction. So job satisfaction will decide the employee's attitude towards job. Job Security is a potential tool for the motivation of the employees which in this study shows that, the employees have a negative attitude towards it. The management may make the employees understand that they are the partners of the business and the employees' organization life depends up on the constructive contributions made by them. Therefore, the management may formulate strategies based on the Workers' Participation in Management dialogue or prepare a tailor-made guideline. We can conclude that there is no direct relation between attitude and job satisfaction but sometimes job satisfaction will decide the attitude of a worker. As a person attitude will not define the job satisfaction. It's the output and contribution that matters the most. Employee turnover will be less if the management take care of its people and value them as the greatest assets.

References:

1. Robbins S. *The Truth of Managing People*, 3rd edition. 2012. ISBN-10: 0133090442 FT Press.
2. Bem, D. J. Self-Perception: An Alternative Interpretation of Cognitive Dissonance Phenomena. *Psychological Review*. P. 74, 1967. 183–200.
3. Bem, D. J. Self-Perception Theory. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*. Vol. 6, P. 1–62. 1972. New York: Academic Press.
4. Robbins, S. & Judge, T. *Organizational Behavior*, 17th edition. 2016.
5. Fishbein, M., & Ajzen, I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley. 1975.
6. Beach, D. *The Management of People at Work*, 4th Edition, MacMillan & Co., NY, USA. 1980.
7. Hitt, M., Colella, A., Miller, C. *Organizational Behavior* 3rd edition. ISBN-13: 978-0470528532, Wiley & Sons. 2010.

Section 19. Science of law

*Polishchuk Viktoriia,
postgraduate student, the Faculty of Law,
University of Economics and Law "KROK", Kyiv
E-mail: vikapolov@gmail.com*

THE INSTITUTION OF COMPLIANCE OFFICER FOR THE IMPLEMENTATION OF ANTI-CORRUPTION PROGRAM AS ONE OF THE ANTI-CORRUPTION MECHANISMS IN UKRAINE

Abstract: The article explores the role of Compliance Officer for the implementation of the Anti-Corruption Program in the mechanism of preventing and combating corruption in Ukraine. The purpose of the article is to analyze the role of the institution of Compliance Officer for the implementation Anti-Corruption Program as one of the effective elements of the anti-corruption mechanism in the fight against corruption Ukraine. It has been found that the institution of Compliance Officer for the implementation of the Anti-Corruption Program requires proper legal and legislative support.

Keywords: Compliance Officer, Anti-corruption program, corruption, prevention, anti-corruption legislation, public authorities, mechanisms.

Introduction

The problem of fighting against corruption is one of the most relevant and vital for the state today. In the modern globalized world, respect for precepts of anti-corruption law provides competitive advantage. State authorities and local government, the state companies, which adhere to anti-corruption policy, are more attractive for workers and for the society.

Since 2014 the institution of Compliance Officer for the implementation of Anti-corruption program, created for the implementation of the Anti-corruption program and providing anti-corruption policy in public authorities, local government and in the state enterprises, became one of the strategic elements in the anti-corruption policy mechanism in Ukraine. It is regulated by the Law of Ukraine "On Prevention of Corruption", dated October 14, 2014 [1].

Approach to understanding the anti-corruption mechanism as the system of relevant activities is widespread. So, E. Nevmerzhijsky defines a concept of the anti-corruption mechanism as the system of political, institutional, social and economic, cultural and legal measures which society and the state apply in anti-corruption. The author considers this system of mechanisms in overcoming corruption as a set of relevant activities, according to their distribution into those levels which identify with certain subjects of overcoming corruption (starting with the President, down to media and structures of the state and public control) [2, p. 8].

The functional purpose for the Institution of Compliance Officer for the implementation of Anti-corruption program is to help bring to reality the organizing potential, which the prevention and counteraction system has as the social phenomenon; the Institute brings this system to a dynamic state. It means that, within this mechanism, a certain activity has to be carried out according to the established rules within application of the corresponding anti-corruption methods.

Quite fairly, D. Mashlyakevich points out in his thesis that, in general, activity of all anti-corruption subjects consists of many functions. Their accurate and full definition represents an important scientific task. Content of functions is defined by the object of their influence, meaning that the nature of operated objects determines the detailed content of subjective functions [3, p. 172].

Among the factors promoting emergence of corruption, are the insufficient integrity levels of state representatives and of those authorized by the state. Ukrainian society lacks criticism in their attitude toward cases of corruption; there is also common perception in people that corruption is one of the main means in achieving the desirable result. As one of the anti-corruption mechanisms, the Institution of Compliance Officer for the implementation of Anti-corruption program forms an anti-corruption policy, and is the main herald for anti-corruption being the phenomenon in the state authority.

Effective and real formation of the Institution of Compliance Officer for the implementation of Anti-corruption

program in the state authorities would definitely provide appropriate implementation of anti-corruption legislation at the national level, as well as locally.

However, the question of granting to the Compliance Officer for the implementation of Anti-corruption full rights for drawing up protocols within the organization where s/he is employed, remains unresolved to this day. The Compliance Officer has to have the right to transfer administrative reports and protocols to the law enforcement authorities. Protocols are usually presented to trial in agreement with prosecutor's office, as the prosecutor's office holds the state prosecution during the corresponding procedures in court in case of any administrative offenses.

In Ukraine, two state bodies are allowed to make protocols: the National Agency for Prevention of Corruption and the National Police of Ukraine. From the very beginning it was supposed that the National Agency for Prevention of Corruption will be the effective authority with local territorial divisions. To date, two years of work are completed; however they prove this work being not only inefficient but even harmful. The divisions of National Police of Ukraine are not able to cope with drawing up an excessive number of administrative protocols and reports.

At the legislative level, the Compliance Officer for the implementation of Anti-corruption program needs to be granted the full right to act – without the power of attorney – on behalf of an enterprise when informing the law-enforcement authorities about corruption or about any other offenses [4, p. 239]. As of today, it is rather difficult for the Compliance Officer to carry out his activity without this right. The Compliance Officer remains under constant pressure by the environment of the given organization where s/he is authorized to perform functions on anti-corruption program implementation. This is despite explanations of the National Agency for Prevention of Corruption provisions, which in many cases are only declarative – such as: workers' unwillingness to declare their income, nepotism, the conflict of interests and attempts to hide it, tender operations and giving preference to the certain interested companies.

It would be expedient to grant to the Compliance Officer the right to introduce the written petition to release the person(s) from a post when the person(s) are involved in corruption actions; furthermore, it would be obligatory to make corresponding changes to the current legislation. At the legislative level, it proves worthwhile to forbid applying pressure upon the Compliance Officer's actions from any side whilst conducting service checks, having implemented in the current legislation the punitive measures for applying any such pressure upon actions of the Compliance Officer. First of all, it is about the team of employees and about management of the

Compliance Officer, as there is no legislative responsibility whatsoever for applying the abovementioned pressure upon Compliance Officer.

For instance, employers in the legal department addressed the Head of the state enterprise by writing the letter with request to oblige the Compliance Officer to change the decision in regards to office investigation on corruption actions of a certain individual.

The Ukrainian legislation does not specify whatsoever the forbiddance of abovementioned actions and the like – which means such actions are allowed. As of today, the current legislation does not provide and does not guarantee to the Compliance Officer for the implementation of Anti-corruption program any personal protection or safety, any rights or freedoms; there is absolutely no protection provided for his/her family members.

I offer recommendations concerning The Institute of The Compliance Officer for the Implementation of Anti-corruption program as one of the key elements in the anti-corruption mechanism at the state level:

1. Independence of The Compliance Officer for the Implementation of Anti-corruption program; also their independence in decision-making; the ban on making influence and/or applying pressure upon The Compliance Officer.

2. To expand the powers and functions of The Compliance Officer and his/her Representatives; granting them rights to issue independent administrative protocols and reports taken into consideration the large workload and low efficiency of the Ukrainian law-enforcement system.

3. To effectively strengthen and increase the efficiency of The Institute of the Compliance Officer on Anti-corruption. The State must legally provide personal protection for The Compliance Officer, having provided him/her with guarantees and safe environment for the implementation of his/her immediate duties in revealing and counteracting corruption.

4. To introduce The Compliance Officer's position in the supreme government offices and authorities: at the Cabinet of Ministries of Ukraine, at the Administration of the President of Ukraine, and in the Ukrainian Parliament.

5. To eliminate The Compliance Officer's submission directly to the Head; to provide complete independence of The Compliance Officer from his/her Head or manager. The appointment to the post of the Compliance Officer on the Implementation of Anti-corruption program should be done not by the Head but only by National Agency for Prevention of Corruption.

6. To settle the remuneration for The Compliance Officer on the Implementation of Anti-corruption program with taking into consideration all risks and dangers of their position.

7. To grant to The Compliance Officer on the Implementation of Anti-corruption program the right to act without

the power of attorney on behalf of the public authority or enterprise where he/she is employed whilst informing the law enforcement agencies about corruption or about any offenses.

Conclusions

Introducing The Institute of the Compliance Officer on the Implementation of Anti-corruption program has to provide an impulse to positive changes in de-corrupting the whole Ukrainian society. At the state level, clarifying the aspects of an organizational and legal anti-corruption mechanism allows to note that the most difficult questions remaining are those

connected with development, improvement and the implementation of its realization instruments. However, political will of the country leaders, according to resolving anti-corruption issues, in introducing the position The Compliance Officer on the Implementation of Anti-corruption program in supreme state authorities, in particular, at the Cabinet of Ministries of Ukraine, at the Verkhovna Rada of Ukraine and at the Administration of The President of Ukraine, have to become primary steps of the state on the way of overcoming corruption.

References:

1. On Prevention of Corruption: Law of Ukraine dated October 14, 2014 – No. 1700 // Bulletin of the Verkhovna Rada of Ukraine, 2014.– No. 49.– Art. 2056.
2. Nevmerzhitsky E. Corruption as a socio-political phenomenon: Manuscript. Thesis for Doctor in Political Science degree in speciality 23.00.02 / E. Nevmerzhitsky.– I. Kuras Institute of Political and Ethnic-National Studies of the National Academy of Sciences of Ukraine, Kyiv, 2009.– 8 p.
3. Mashlyakevich D. Strategies for prevention and counteraction of corruption in Ukraine: [monograph] / D. Mashlyakevich, A. Litvinov.– Kharkiv: “In fact”, 2016.– 260 p.
4. Polishchuk V. Establishment and Development of the Institution of Compliance Officer for the Implementation of Anti-Corruption Program in Ukraine // International Scientific Journal “Diplomacy and Law”, 2018.– No. 1. (4).– 239 p.

Contents

Section 1. Biotechnology	3
<i>Tashmukhamedova Shokhista Sabirovna, Kadirova Zukhra Abrarovna, Madjidova Rano Khabibulla qizi, Shovkatova Gulchekhra Abdullaevna</i> RECEIVING DRY EXTRACT FROM THE PLANT OF <i>PHYSALIS</i> <i>ALKEKENGII</i> AND DETERMINATION OF CONTENT OF FLAVONOIDS.....	3
Section 2. Geography	7
<i>Kamalov Bakhodir Asamovich, Koriyev Mirzokhid Rustamjonovich</i> ORGANIZATION OF GARDENS WITHOUT IRRIGATION ON THE ADYRS OF THE NORTHEASTERN PART OF THE FERGANA VALLEY	7
<i>Karakulov Nurbol Maidanovich, Nugmanova Arofat Abduxamitovna, Bayqabilov Xusnuddin Mardanovich, Abduraimova Xurshida Gurgunbayevna</i> THE METHODOLOGY OF ORGANIZING AND FULLFILING THE COURSE WORK OF STUDENTS ON THE SUBJECT OF “NATURAL GEOGRAPHY OF CONTINENTS AND OCEANES”	11
<i>Hoshimov Azamat Naziraliyevich, Isakov Valijan Yunosovich</i> GEO-ECOLOGICAL CONDITION OF THE CONE REMOVAL OF THE SOKH RIVER AND ITS CHANGES AS A RESULT OF THE HUMAN FACTOR.	14
Section 3. Demography	17
<i>Tojievva Zulhumor Nazarovna, Sabirova Muazzam Shuhratbek qizi, Saipov Ulugbek Muratovich</i> REPRODUCTION OF THE POPULATION IN THE REPUBLIC OF UZBEKISTAN AND ITS TERRITORIAL DIVISIONS.....	17
Section 4. Study of art	20
<i>Muradzadeh Leyla Rauf, Aliyeva Ulkar Sabir</i> USE OF “SEGAM” MUGHAM ON FAIG NAGHIYEV’S “ASHIGAM” CHORAL MINIATURE	20
<i>Hayitov Jakhongir Shodmonovich</i> SPREAD OF NEW TYPES OF CORPS IN TURKISTAN CONTINENT AT THE END OF THE 19 th – AT THE BEGINNING OF THE 20 th CENTURIES	24
<i>Hakimov Abdumukhtor Abduxalimovich</i> MIGRATION PROCESSES IN THE BRONZE AGE IN SOUTHERN CENTRAL ASIA AND URBAN CULTURE	27
Section 6. Information technology	30
<i>Khamdamov Utkir Rakhmatillaevich, Mukhiddinov Mukhriddin Nuriddin ugli, Mukhamedaminov Aziz Odiljon ugli, Djuraev Oybek Nuruddinovich</i> A NOVEL METHOD FOR EXTRACTING TEXT FROM NATURAL SCENE IMAGES AND TTS.....	30
Section 7. Materials Science	34
<i>Narov Rustam Alixanovich</i> THE EFFECT OF AFR-3M AND MARA ADDITIVES ON TECHNOLOGICAL AND TECHNICAL PROPERTIES OF CONCRETE	34

<i>Narov R. A.</i>	
CONCRETE WITH FILLING AGENT AND ACETONE-FORMALDEHYDE RESIN ADDITIVE	37
Section 8. Machinery construction	40
<i>Ermatorov Ziyadulla Dosmatovich, Duniyashin Nikolay Sergeevich</i>	
DEVELOPMENT OF ELECTRODES FOR SHIELDED METAL ARC WELDING BASED ON THE CLASSIFICATION OF THE COATING CHARGE COMPONENTS	40
Section 9. Pedagogy	42
<i>Poghosyan Shushan</i>	
LEARNING-ORIENTED AUGMENTED REALITY TECHNOLOGY	42
Section 10. Political science	47
<i>Lokhishvili Giorgi, Jijeishvili Ketii</i>	
THE RUSSO-AMERICAN INTERESTS IN THE 2008 WAR	47
Section 11. Agricultural sciences	52
<i>Avakyan Elmira Rubenovna, Dzhamirze Ruslan Ramazanovich</i>	
PRODUCTIVITY OF PLANTS DIFFERENT BY TYPE OF C3-C4 PHOTOSYNTHESIS	52
<i>Khamidov Muxamadxon, Jurayev Umid, Kadirov Zayniddin, Saksonov Umidjon</i>	
REDUCTION OF MINERALIZATION OF COLLECTOR-DRAINAGE WATER BY THE BIOLOGICAL METHOD AND USE OF THEM IN THE IRRIGATED AGRICULTURE	55
<i>Ruzmetov Rasul, Azatova Gulasal, Atajonova Mukhayyo</i>	
PROGNOSIS OF THE DISTRIBUTION OF PESTS AND INSECTS IN THE AGRICULTURAL PLANTS	58
Section 12. Technical sciences	62
<i>Khasanov A. S., Berdiyarov Bakhriddin Tilovkabulovich</i>	
RESEARCH OF EDUCATION AND PREVENTION OF FERRITE AND SILICATES OF ZINC WHEN ROASTING SULPHIDIC ZINC CONCENTRATES IN FURNACES OF THE BOILING LAYER	62
<i>Matkarimov Sokhibjon Turdaliyevich</i>	
EXTRACTION IRON AND ITS COMPOUNDS FROM STEEL-SMELTING SLAGS SC “UZBEKSTEEL” BY USING GRAVITATION METHODS	67
<i>Astanakulov Komil, Ochildiyev Otabek</i>	
RESEARCH THE LENGTH OF DIVIDER-GUIDE OF THE CEREAL COMBINE HARVESTER’S HEADER FOR ADAPTATION TO HARVEST THE SUNFLOWER	71
<i>Ravshanov Suvankul, Kholmuminov Abdulfatto,</i>	
<i>Musaev Khasan, Baltabayev Ulugbek, Ismatova Shaxnoza</i>	
EFFECT OF WATER-SORPTION PROPERTIES OF WHEAT GRAINS ON HYDROTHERMAL TREATMENT PROCESS	74
<i>Sayfiddinov Sadridin</i>	
TRANSFER OF HEAT THROUGH PROTECTIVE OPERATED WALL STRUCTURES AND THEIR THERMOPHYSICAL CALCULATION FOR ENERGY EFFICIENCY	79
<i>Salyamova Klara Djabbarovna, Rumi Dinara Fuadovna, Turdikulov Khusanboy Xudoynazarovich</i>	
ANALYSIS OF SEISMIC STABILITY OF RETAINING EARTH STRUCTURES WITH ACCOUNT OF DISSIPATIVE PROPERTIES OF SOIL	81

<i>Toshmatov Davlatjon Abduraufovich, Yusupov Farhod Maxkamovich, Baymatova Gulnoza Achedovna</i>	
PROCESSING OF OIL SLUDGE FOR THE CONSTRUCTION OF INTERFIELD ROADS.....	85
<i>Fayziev Khomitkhan, Rakhimov Sherzod Abduvakhobjonovich, Baymatov Shakhridin Khushvaktovich</i>	
CALCULATION OF UNSTEADY FILTRATION IN EARTH DAMS BY THE FINITE DIFFERENCE METHOD	89
<i>Khasanov Bakhrom Bakhodirovich</i>	
CUBE AND PRISMATIC STRENGTH CHARACTERISTIC LIGHTWEIGHT CONCRETE ON POROUS AGGREGATES.....	93
<i>Kholiqulov Doniyor, Samadov Alisher, Boltaev Olmos, Akhtamov Fozil</i>	
THE RESULTS OF LABORATORY RESEARCH PROCESSING OF ZINC CAKE ZINC PLANT JSC “ALMALYK MMC”	96
<i>Yusupov Hamza Ibadovich,</i>	
COMPLEX SYSTEM OF QUALITY MANAGEMENT IN PROJECT DESIGN.....	100
<i>Yusupov Kh.I.</i>	
QUALITY INDICES OF CONSTRUCTION PRODUCTS	102
Section 13. Transport	105
<i>Kurbanov Janibek Fayzullayevich, Kolesnikov I. K., Ortikov M. S.</i>	
DIFFECTION METHODS IN PIPELINE EXAMINATION	105
Section 14. Physics.....	108
<i>Polvonov Bakhtiyor Zaylobidinovich, Nasirov Mardon, Mirzayev Valijon, Raziqov Jurabek</i>	
SPECTRUM OF THE SHORT CIRCUIT PHOTO CURRENT OF <i>CdTe, CdTe: In</i> PHOTOLOLATIC FILMS DEPENDING ON THE TEMPERATURE	105
<i>Rasulov Voxob Rustamovich, Rasulov Rustam Yavkachovich, Karimov Ibrohim Nabiyevich, Abduxoliqov Akmaljon, Sultanov Ravshan Rustamovich</i>	
TWO QUANTUM ABSORPTION OF POLARIZED RADIATION IN n-GaP.....	111
<i>Tursunbaev Bakhodir Hanazarovich, Dadamuhamedov Turgun</i>	
ATOM SIZE.....	114
Section 15. Philology.....	116
<i>Bekbergenova Mariya Dosbergenovna</i>	
COMPARATIVE TYPOLOGICAL STUDY OF ISSUES IN KARAKALPAK PROSE OF THE XX CENTURY	116
<i>Mukhitdinova Nadira Abdullaeva</i>	
PRINCIPLES OF CREATING DIDACTIC TEXTS FROM THE POINT OF view OF DEVELOPMENT OF INFORMATION TECHNOLOGIES	119
<i>Usmanov Farhad Fakhriddinovich</i>	
MYTHOLOGICAL AND FOLKLORE CHARACTERS IN THE LINGUISTIC PICTURE OF THE WORLD: THROUGH UZBEK SIMILES	121

Section 16. Philosophy	124
<i>Arapbaeva Dinara Kurbanovna</i>	
FOLKLORE FIELD AND FUNCTIONAL RELATIONSHIP IN PHYSICAL EDUCATION.....	124
<i>Mamatkulov Shuhrat</i>	
SOME ISSUES INCREASING OF SOCIAL ACTIVITY OF YOUTH OF UZBEKISTAN.....	128
<i>Mansurov Abdulla Sayfullayevich</i>	
TERRORISM AS A SOCIAL PHENOMENON AND ITS MODELING OPPORTUNITIES	130
Section 17. Chemistry	133
<i>Aghayev Akbar Ali, Gadjieva Xejale Amiraslan, Abushova Zijafet Baxram, Shirinov Panax Maqomed</i>	
ALKYLATION OF 4-METHYLPHENOL WITH 1- AND 2- PROPANOLS OVER PALLADIUM-CONTAINING ZEOLITE	133
<i>Maryaskin Yuriy Borisovich, Derman Stanislav Evgenyevich</i>	
RELATION OF SURFACE-ACTIVE AGENT SOLUTIONS' SURFACE AND VOLUME PROPERTIES.....	136
<i>Sherquzyev Doniyor Shermamatovich, Shirinov Shavkat Davlatovich, Yusupov Muzaffar Orifjonovich, Asqarova Oydin</i>	
HYDROGEL PRODUCTION OF NEW GENERATION BASED ON LOCAL RAW MATERIALS	141
Section 18. Economics	146
<i>Voronina Evgeniya Vasilyevna, Zavedeev Egor Vladimirovich</i>	
TERRITORIAL-PRODUCTION CLUSTERS AS A BASIS FOR BALANCED INNOVATIVE REGIONAL DEVELOPMENT	146
<i>Gaybullaev Feruz</i>	
RESOURCE SAVING IS THE PRINCIPAL GOAL IN DEVELOPING THE INNOVATIVE STRATEGY OF LONG-TERM DEVELOPMENT OF THE NATIONAL ECONOMY OF UZBEKISTAN	150
<i>Makasarashvili Tamar, Giguashvili Giuli, Khorguashvili Tea</i>	
PROBLEMS OF THE FORMATION INNOVATIVE ECONOMY IN GEORGIA	154
<i>Hamad Mattar Alrawi, Sheikha Abdullah Mohammed, Fermin G. Castillo</i>	
THE IMPORTANCE OF EMPLOYEE ATTITUDE TOWARDS JOB SATISFACTION: HOW IT AFFECTS EMPLOYEE TURNOVER?	157
Section 19. Science of law	161
<i>Polishchuk Viktoriia</i>	
THE INSTITUTION OF COMPLIANCE OFFICER FOR THE IMPLEMENTATION OF ANTI-CORRUPTION PROGRAM AS ONE OF THE ANTI-CORRUPTION MECHANISMS IN UKRAINE.....	161

