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Section 1. Information technology

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CONCEPTUAL MODEL FOR REPAIR SUPPORT FOR BAKERY ENTERPRISE

Abstract: In order to evaluate the behaviour of the decision-making system to determine different strategies for its functioning, a method for designing a model of a real system and conducting experiments on it has been proposed.

The definition of the quantitative component of the repair team is presented, and the conceptual model of the busyness of the repair team of the bakery during the work shift is described.

Keywords: repair team, bakery, model.

Introduction

The technological development of the bakery industry depends in particular on a set of measures that include technical, economic, organisational procedures designed to improve the operability of the bakery. The planning method can improve not only the technological level of the production equipment, but also increase the volume of production, by raising the productivity of labour and ensuring maximum use of fixed assets.

The modern equipment in the bakery has a sufficiently high level of reliability. But during operation the condition of the equipment is constantly under the influence of various factors, operating modes and conditions. This reduces its operational reliability and increases the probability of failures [1].

The use of manufacturing capacities, labour and material resources, planning, incentives and improvement of working conditions – all these actions lead to improvement of internal management system of bakery enterprises.

The authors proposed in [1] a simulation model of the repair team enterprise, 3D model of equipment repair process and model of repair department of bakery, based on simulation software Anylogic, allow us to conclude the effective number of workers in the repair team. But they make it possible to carry out analysis of workload of worker of repair brigade during work shift.

In work [2] authors offer a simulation model of the process of repair service of technological equipment, which is developed in CPN Tools, based on Petri net. The model allows the chief engineer to react promptly to the impact of indicators obtained during the preliminary stages of visualisation and verification of results, and to form the schedule of the department's work leaving the availability of equipment. The disadvantage of the developed model is its focus on the estimation of technical maintenance, which increases the reliability of equipment operation, but doesn't keep records of the equipment that needs re-repairs.

The task of production management in the condition of continuity of labor processes, remains relevant despite the fact that the need to plan and record the work of employees repair department of bakery enterprise, the organization of their working relationships in the team when applying labour standards has been considered by various scientists.

Objects and research methods. The effectiveness of the repair of technical equipment in the holacracy can be determined by the reduction of time spent on repair work, saving parts needed for the repair of equipment elements. With the continuous improvement of the qualifications of workers in the repair department there will be an increase in labour efficiency and savings in wage funds, as well as material resources.

When organizing the work of the repair team to determine its optimal composition, administration must assign to it a certain amount of work and range of equipment, production area.

To quantify the team composition the following formula can be used:

$$W = \frac{L_r}{A_{wt}}, \qquad (1)$$

where

L_r – is amount of labour resources at the site in which repairs are carried out,

A_{wt} – is amount of working time of an employee of the repair department.

In this case, it is necessary to define the amount of work, taking into account the characteristics of technical equipment of technological line of bakery, labour intensity of each stage of work and production plan of the enterprise.

The authors proposed to develop a conceptual model, i.e. an abstract model that defines the cause-and-effect relationships inherent in the studied subject. It is necessary to:

- define the objectives of the simulation;
- form the quality criteria of the system that is being modelled;
- detail the model depiction;
- describe the input/output variables and parameters of the model;
- select functional dependencies that describe the behaviour of variables and parameters;
- describe the constraints;
- describe the conceptual model [4].

The model provides the formation of a request for repair of equipment for one repair team, which creates a queue for repair work. The worker of the team can be free or busy with repair work. If the worker is free, the worker executes the request from the queue. The request for repair is allocated according to the first-in-first-out principle and, after completion, is sent to the quality check of the work done, where, following Bernoulli's principle of the distribution of random variables, it is considered completed or sent for revision to the beginning of the queue of requests awaiting repair. Because it is necessary to fulfil all the repair orders received, the request can be processed the required number of times.

The model shows the workload of the work team during the shift, the number of completed repairs, the number of repairs the team failed to cope with and the number of fixes sent for revision.

Conclusion

In order to create effective models, one of the most important tasks of control system design must be realised. Namely, to identify the many environmental elements that are worth including in a system model that exists or is being built.

The developed model will ensure the reduction of costs of repair team maintenance, optimal use of working time as well as other parameters, connected with maintenance of technical equipment of bakery.

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USING CONTINUOUS INTEGRATION / CONTINUOUS DELIVERY IN DISTANCE LEARNING

Abstract. The article discusses technologies for using CI/CD in distance learning. Research is underway to determine the merits of this approach.

Keywords: distance learning, ci/cd, technical disciplines.

Distance learning is one of the most important and effective areas for the development of education, which encourages students to work independently. With the proper organization of distance learning in all technical disciplines, particular attention should be paid to the establishment of a well-developed laboratory workshop. There are several reasons for relevance. Firstly, it is explained by the epidemiological situation prevailing in our country and around the world and the unwillingness of the participants in the educational process to master modern information technologies for organizing the educational process in a remote form. Secondly, the developed software tools will help teachers simply conduct laboratory work, and students will quickly master the means in which they will be conducted. And in the end, we can talk about optimizing the educational process: a remote format involves the use of Internet technologies and opens up new opportunities for continuing education and learning.

The object of the study is laboratory workshops on the discipline "Distributed Information Processing Systems" (DIPS). The fundamentally proposed approach can be extended to other disciplines of IT areas.

The subject of the study is the method of remote performance of laboratory work on DIPS and modification recommendations of laboratory workshops.

My research aims to improve laboratory work by automating checks in the discipline of DIPS by students using continuous integration/continuous deployment (CI/CD) technologies [1].

The Department of Automation and Computer Engineering uses a testing system of its own development in the educational process, which automates the validation of the operability of program code developed by students. CI/CD can be a good addition to the verification system, as it will reduce the burden on inspections and allow you to test more complex software solutions that require additional services, such as API + DB. A particularly relevant study for undergraduate training.

The main steps I want to highlight to build a CI\CD test of the student's work.

1. Assembly, with compiled languages – compilation, with the interpreted – installation of an interpreter and additional libraries.

2. Modular testing is an optional type of testing, the tests of which can be written by a student. It is optional only because it is not the dominant type of testing in our system, but it can increase the likelihood of detecting conflicts between acceptance testing and the logic of the code itself.

3. Acceptance testing is a set of tests written by a teacher that allows you to verify the success of the student's code. It is the dominant type of testing.

Figure 1. Instructor's sequence of actions

Figure 2. Student Action Sequence

I believe that CI is most suitable for training, since it has fewer "extra" stages. By extra stages, I understand: deployment of the project (Staging), as well as deployment in the industrial environment. They are not required to check the student's code, due to the lack of the need to deploy his project on any servers permanently.

For example, take the discipline "Distributed Information Processing Systems" and the task is to implement CRUD methods in a ready-made teacher template.

```
describe( description: "GET /notes/", specDefinitions: function() {
    it( expectation: "Get All request. Successful test", assertion: function(done :DoneFn ) {
        request.get( uri: base_url + 'notes/all', options: function(error, response, body) {
            expect(response.statusCode).toBe( expected: 200);
            let responseObject = JSON.parse(body);
            expect(responseObject.error).toBeUndefined();
            done();
        });
    });
});
```

Figure 3. Example of acceptance testing

```
name: Node.js CI

on: [push, pull_request]

jobs:
  build:

    runs-on: ubuntu-latest

    strategy:
      matrix:
        node-version: [10.x, 12.x]

    steps:
    - uses: actions/checkout@v2
    - name: Use Node.js ${{ matrix.node-version }}
      uses: actions/setup-node@v1
      with:
        node-version: ${{ matrix.node-version }}
    - run: npm ci
    - run: npm run build --if-present
    - run: npm start & sleep 10 && npm test
```

Figure 4. Basic Workflow Example

The first step is to develop a template using a version control system that has the built-in ability to CI/CD (GitHub, GitLab, Bitbucket) or use a separate platform that uses CI/CD. In the example, I use GitHub. GitHub is a platform that stores various GIT repositories on its many servers. A template is a repository that has written tests and customized automated checks (CI/CD).

The template includes:

- Acceptance testing is developed by the teacher and is the main criterion for evaluating the student's work.
- Configuration of basic workflow with mandatory checks.

The second step is to fork the configured teacher repository and perform lab work in the configured environment.

The third step is to load the completed job and view the report.

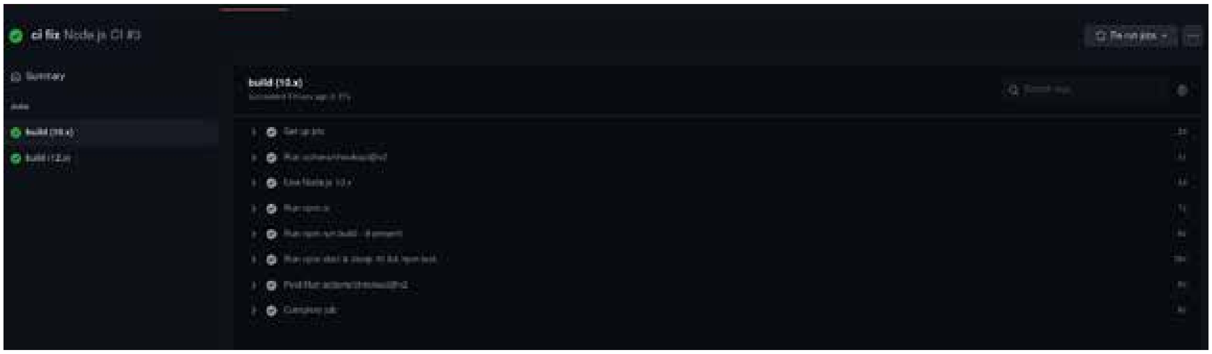

Figure 5. Sample report on passing all tests

The results of the study suggest that the use of CI/CD is an excellent option for testing the laboratory work of students based on the development of complex software components. Automation of the manual manual inspection function of the instructor improves the quality of the remote laboratory workshop.

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Section 2. Chemistry

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MODIFICATION OF POLYVINYL CHLORIDE WITH DIPHENYLAMINE AND STUDY OF THE PHYSICOCHEMICAL PROPERTIES OF THE OBTAINED SORBENT

Abstract. To obtain new sorbents, polyvinyl chloride was synthesized by modification with dissolved diphenylamine in dimethylsulfoxide and dimethylformamides, and the structure of the resulting sorbent was studied by IR spectroscopy. Using IR spectroscopy and elementary analysis, the structure of diphenylamine-modified polyvinyl chloride was determined.

Keywords: polyvinyl chloride, diphenylamine, modification, molecule, sorbent, polymer, membrane, distilled water, dimethyl sulfoxide, dimethylformamide.

Introduction

The bond of sulfur with oxygen (S = O) in the DMSO molecule forms a dipole, ensuring its infinite solubility in water, as well as causing a high solubility of water-soluble substances in DMSO itself. Hydrogen bonds are easily formed between water molecules and DMSO, which are more stable than hydrogen bonds between water molecules. This leads to a decrease in crystal formation when the biomaterial freezes, thereby ensuring cryoprotectiveness [1].

Ion exchange materials are widely used in various fields such as pharmaceuticals, petrochemicals, hydrometallurgy and water treatment. The most important of them are the purification of natural and waste waters from cations, separation and separation of rare and precious metals and biologically active substances [2; 3].

When using ion exchange processes in practice, it is necessary to take into account the kinetic properties of the sorbent, which indicate its porosity. In this case, the study of the phase of termination of mass transfer is necessary to select the optimal process conditions, such as temperature, hydrodynamic parameters, and fractional composition of the resin. In ion exchange resins, sorption is a complex and multistep process, and usually the limiting stages determine the overall rate of the process [4].

The reactions of chemical transformation of PVC have been studied in both homogeneous and heterogeneous processes, in an organic medium and in aqueous solutions, in suspensions, in the swollen state, in a melt, and in solvent/nonsolvent systems [5].

A heterogeneous cation exchange membrane based on polyvinyl chloride-styrene-butadiene-rubber was obtained. To improve the osmotic properties of the membrane, 5% Fe_2NiO_4 was added, and the permeability to divalent ions improved with increasing concentration of the additive. The modified membranes showed a higher permeability for divalent ions than for monovalent ones [6].

The composition of the product obtained in this study was analyzed in an elementary way. This method of analysis is intended for the qualitative and quantitative determination of the elemental composition of liquid, solid and gaseous substances and materials. The elemental composition of a substance must be known to control raw materials used in any production, production, as well as finished products.

In this study, polyvinyl chloride was dissolved in dimethyl sulfoxide and its reaction with diphenylamine was studied to modify it with complexing reactive compounds. Their composition and properties have been determined. The composition of the resulting product was investigated by IR spectral analysis.

These works show the urgency of the problem of obtaining new sorption materials based on polyvinyl chloride.

The aim of this study is to obtain a diphenylamine-modified polyvinyl chloride sorbent and to study its structure by IR spectroscopy and elemental analysis.

Experimental part

Modification of polyvinyl chloride with diphenylamine

6.25 g (0.1 mol) of a solution of polyvinyl chloride and 80 ml of dimethyl sulfoxide were introduced into a three-necked flask equipped with a mechanical stirrer, and 16.9 ml (0.1 mol) of diphenylamine were added dropwise with heating and stirred at 80 °C. Then the temperature was raised to 100–110 °C. After stirring for another 2.5–3 hours at this temperature, a solid resinous mass was formed, which was transferred into porcelain dishes, dried in an oven at a temperature of 55–60 C for 4 hours. The dried polymer was ground into powder, and low molecular weight substances were washed with 5% aqueous potassium hydroxide solution, and then washed with distilled water until the pH value was close to neutral (phenolphthalein indicator). The washed sorbent, which is a gel-like substance of yellow-brown color, was dried in air. Was obtained 16.44 g of a sorbent with a moisture content of 16%. The reaction yield is 84%. The obtained sorption material partially swells in water, does not dissolve in organic solvents.

Research results and their discussion

Samples of the synthesized sorbents, pressed into a pellet with KBr, were investigated by IR spectroscopy using a SHIMADZU IR Fourier spectrometer (Japan) (range 400–4000 cm^{-1}, resolution 4 cm^{-1}). The interpretation of the spectra was carried out using the basic software that implements the automatic measurement of spectra, has a means of graphical display of spectra and their fragments and forms the work with the library of user spectra (Fig. 1).

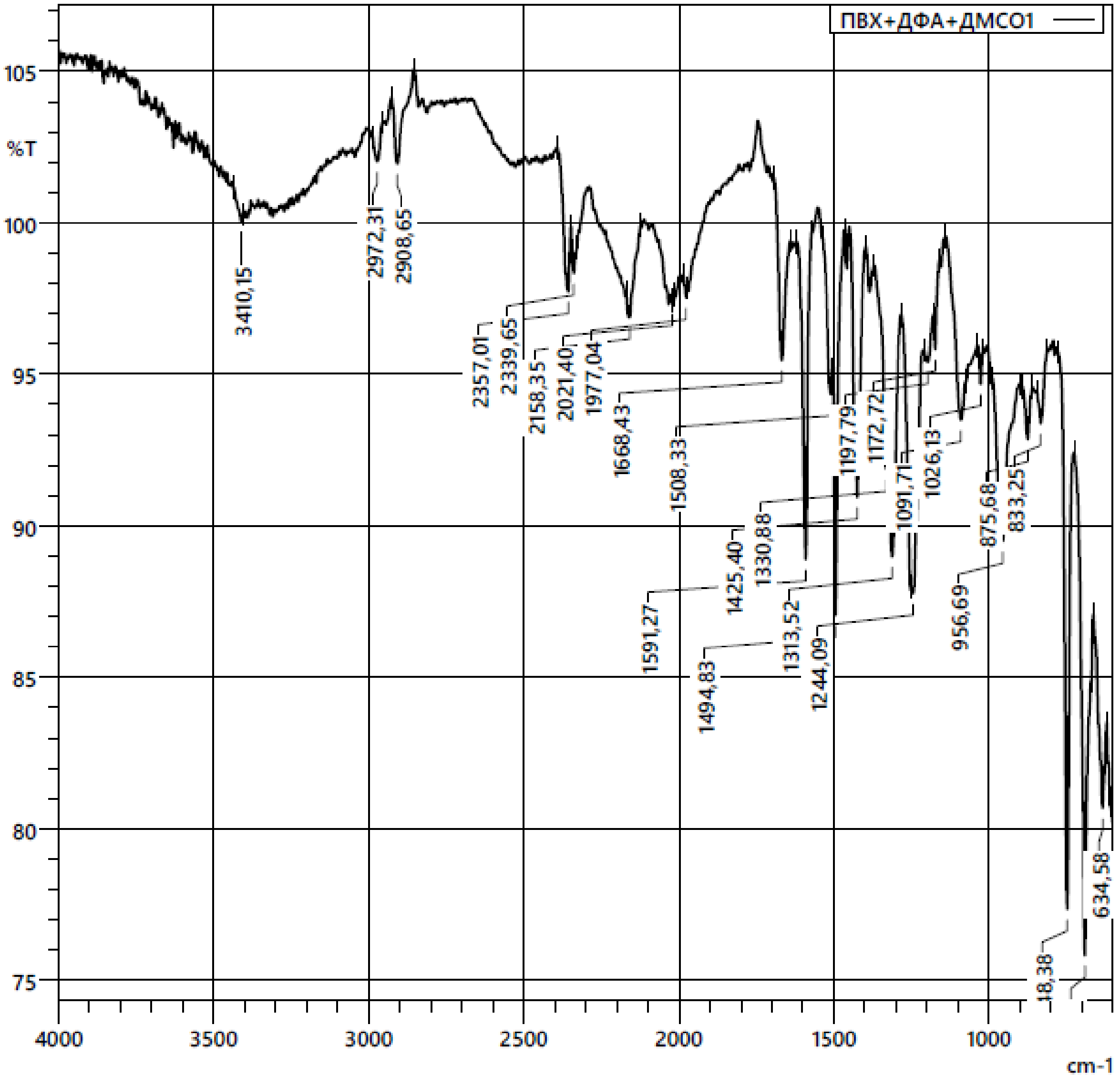


Figure 1. IR spectrum of the synthesized sorbent.

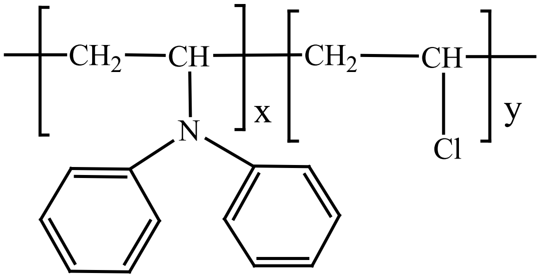
In the IR spectrum of the obtained complexing sorbent, the vibration frequencies were observed in ν (NH) 3410 см$^{-1}$, ν_s (HRC=CH$_2$) 2972 см$^{-1}$, (CH$_2$) 2908 см$^{-1}$, (CH$_2$) + (CN) 1668 см$^{-1}$, δ_s (N-CH$_2$) 1425 см$^{-1}$, ν_s (CH$_2$) 1313 см$^{-1}$, ν (C-OH) 1244 см$^{-1}$, ν (C-O) 1026 см$^{-1}$, ν (POC) 956 см$^{-1}$ areas. And this proves the modification of polyvinyl chloride with diphenylamine.

To confirm the chemical composition of the synthesized sorbent, an elemental analysis was carried out on the basis of the Center for Advanced Technologies of the Ministry of Innovative Development of the Republic of Uzbekistan, the results of which are presented in (Table 1).

Table 1. Results of elemental analysis of the synthesized sorbent (sorbent weight – 60 mg)

Chemical elements in the sorbent	Estimated		Found	
	mg	%	mg	%
Nitrogen	4.3	7.2	4.1	6.83
Carbon	48.46	80.7	48.65	81.08
Hydrogen	4.02	6.7	3.82	6.37
Chlorine	3.22	5.4	3.43	5.72

As follows from the table, the polyvinyl chloride matrix was modified with diphenylamine and a complexing sorbent was obtained. The proposed structure of modified polyvinyl chloride with diphenylamine can be summarized as follows:



Conclusion

As a result of the studies carried out, a technique for obtaining a sorption material by modifying polyvinyl chloride with diphenylamine has been worked out. The chemical composition and the proposed structure of the sorbent were established using the methods of elemental analysis and FTIR spectroscopy.

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THE SYNTHESIS OF PHTHALIMIDOMETHYLIC ETHERS OF ALIPHATIC CARBOXYLIC ACIDS

Abstract. Amidoalkylating reagents containing the phthalimide group are used in the synthesis of difficult to obtain primary amines and complex heterocyclic compounds. These types of amidoalkylating compounds are a suitable reagent for nucleophilic substitution reactions in acidic environments due to their resistance to acids. Reactions of amidoalkylating reagent N-hydroxymethylphthalimides with aliphatic carbonic acids were also carried out in benzene solvent and sulfuric acid catalyst. It was found that the yield of products obtained with N-hydroxymethylphthalimide was lower than the yield of reaction with N-β-hydroxyethylphthalimide. The structure of the obtained compounds was proved by analysis of their IR and NMR^{1}H spectra.

Keywords: N-hydroxymethylphthalimide, haloacetic acid, halogen acetic acid ester, amidoalkylation.

Introduction

Phthalimides are imide derivatives of phthalic anhydride and are widely used in both industry and pharmaceuticals. Phthalimides belong to the group of cyclic imides and have the characteristic chemical properties of two carbonyls bound to common nitrogen. Among cyclic non-aromatic nitrogen heterocycles, phthalimides are an interesting class of compounds that are widely used. Phthalimide contains a functional group of imides and can be considered as nitrogen analogues of anhydrides or diacyl derivatives of ammonia. Such compounds are obtained as a result of various organic synthetic processes [1, 2–4], [2, 2–6].

The chemistry of heterocyclic compounds is one of the most complex branches of organic chemistry. Heterocyclic compounds play an important role in biological processes, and researchers are trying to understand the chemistry of heterocyclic compounds to improve the quality of daily life [3, 1–2]. The structural diversity and biological importance of nitrogen-containing heterocyclic compounds have made them attractive targets for synthesis over many years. The construction of highly structured heterocyclic compounds seems to be important and significant. 5-membered N-heterocycles are of particular interest in the pharmaceutical industry because they are found in the main constituents of several drugs. Among heterocyclic briquettes, phthalimides have special biological significance and have been noted as herbicides, insecticides, anti-inflammatory agents, and antioxidants [4, 1–5]. Typically, in organic synthesis, they are used as starting materials and intermediates for the synthesis of various bioactive compounds. The use of phthalimides as a group to protect primary amines has been extensively studied in the chemical literature, particularly for α-amino acids [5, 1–3]. Modified phthalimides are mainly used as organic building materials in organic synthesis and can be used in the preparation of bioactive compounds, i.e. antibacterial, analgesic, plant growth regulator, as well as in the dye industry [6, 1–4]. Typically, N-phthalimide derivatives are synthesized in many ways using reductions in organic solvents by condensing the amine with phthalic anhydride [2, 2–6]. Due to their favorable photophysical and electrochemical properties, phthalimides undergo various high-efficiency photodecarboxylation reactions [7, 1–5].

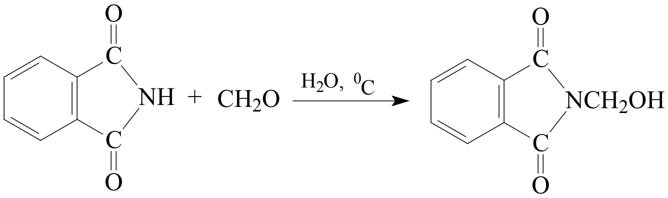
These transformations have been used in the synthesis of biologically active additives as well as macrocyclic compounds. N-acetoxifalimides are multifaceted representatives of imidyl and alkyl radicals by photodecarboxylation and have since been used for various binding reactions [8, 1–5].

It is possible to obtain esters with different biological activity through the amidoalkylation reaction of acids using hydroxyalkylimides, as well as to synthesize heterocyclic compounds with complex structure, in addition, primary amines, which are difficult to obtain [9, 1–4].

Therefore, chemists are particularly interested in the synthesis of esters of halogenic acids containing the phthalimide group and the study of its properties. We also carried out esterification reactions with N- (β-hydroxyethyl) phthalimide and N-methylolphthalimide with monochlorine, mono bromine, mono iodic acid, trifluoric, trichloroacetic acid.

Research methods. In the synthesis of esters, amidoalkylation reactions of acids with methyllfaltalimide, which is occupied by the phthalimide group, were used. The course of the reactions and the purity of the product were checked on thin-layer chromatography. The structure of the obtained new substances was determined using PMR-spectroscopy, IR-, chromato-mass spectrometry.

For the experiments, the primary alcohol was synthesized in the literature according to certain methods:



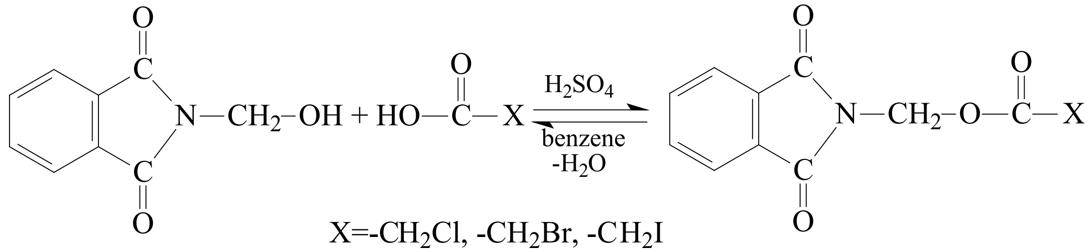
N-Methylolftalimide T$_{melting}$.=136–138 ˚C, Rf = = 0,52 (silulfol system benzene: acetone = 3: 1).

We performed all the reactions in a round-bottomed flask equipped with a reverse cooler mounted on a tripod, a water collector, and a mechanical stirrer. The flask was filled with N- (hydroxymethylphthalimide and carbonic acid (1: 1.1 ratio) benzene as a solvent and a small amount of sulfuric acid as a catalyst. The reaction was carried out by heating in a magnetic stirrer for 4–7 hours (until the calculated amount of water was separated). After the water separation was complete, the reaction mixture was cooled and water was poured over it. The precipitate from the mixture was filtered and separated. The substance was recrystallized.

Monobromoacetic acid phthalimidomethylephir is a white crystalline substance, yield 54%, T$_{melting}$ = 78–80 ˚C, Rf = 0.75 (silulfol, benzene-acetone system 3: 1). IR spectrum sm-1721, 798(d=C-H, ArH), 1496(νC=C, ArH), 3024,3061(νC-H), 1707, 3454 (nas-CO-NH-), 2962(nasCH$_2$), 1749, 1771(n-CH$_2$-COOR), 1169(n–C-O-).NMR^{1}H-spectr δ= 4,47 ppm (2H, N-CH$_2$), δ= 2,9 ppm (2H, 2BrH2), δ= 6,7–7,25 ppm (4H, ArH).

Monochloroacetic acid phthalimidomethylephir is a white crystalline substance, yield 59%,. T$_{melting}$ = 87 ˚C, Rf = 0.81 (silulfol, benzene-acetone system 3: 1). IR spectrum sm^{-1} 711, 726 (d= = C-H, ArH), 1383(νC=C, ArH), 2956(νC-H), 1717, 3488(nas-CO-NH-), 1405(nasCH$_2$), 1717, 1782(n-CH$_2$-COOR), 1138(n–C-O-). YaMR^{1}H-spectr δ= 3,2 ppm (2H, N-CH$_2$), δ= 5,3 ppm (2H, Cl-CH$_2$), δ= 6,70–7,25 ppm (4H, ArH).

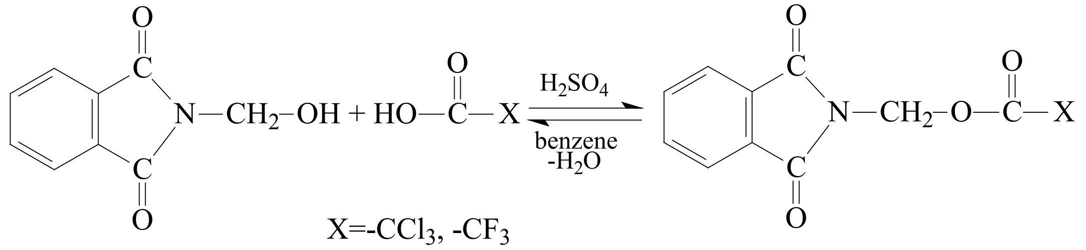
Phthalimidomethylephyric monohydric acid is a light yellow crystalline substance, yield 43%, $T_{melting}$ = 137 °C, Rf = 0.79 (silulfol, benzene-acetone system 3: 1). IR spectrum sm^{-1} 725, 798 (d=C-H, ArH), 1390(νC=C, ArH), 2957(νC-H), 1703, 3437(nas-CO-NH-), 1390(nCH_2), 1703,1770(n-CH_2-COOR), 1247(n–C-O-). PMR^{1}H-spectr δ= 4,47 m.u.da (2H, N-CH_2), δ= 5,37 ppm (2H, J-CH_2), δ= 6,75–7,30 ppm (4H, ArH).



X=$-CH_2Cl$, $-CH_2Br$, $-CH_2I$

Phthalimidomethylephir of trichloroacetic acid is a white crystalline substance, yield 49%, $T_{melting}$= 178 °C, Rf = 0.68 (silulfol, benzene-acetone system 3: 1). IR spectrum sm^{-1} 734,845 (d=C-H, ArH), 1667 (νC=C, ArH), 2963(νC-H), 1704, 3467 (nas-CO-NH-), 1349(nCH_2), 1772 (n-CH_2--COOR), 1165(n–C-O-). NMR^{1}H-spectr δ= =5,01 ppm (2H, N-CH_2), δ= 6,8 ppm (2H, O-CH_2), δ= 6,7–7,3 ppm (4H, ArH).

Phthalimidomethylephir of triphosphoric acid is a white crystalline substance, yield 50%, $T_{melting}$ = =92–93 °C, Rf = 0.84 (silulfol, benzene-acetone system 3: 1). IR spectrum sm^{-1} 712 (d=C-H, ArH), 1706 (νC=C, ArH), 1720, 3485 (nas-CO-NH-), 1304(nCH_2), 1720 (n-CH_2-COOR), 1146,1091(n––C-O-). NMR^{1}H-spectr δ= 4,47 ppm (2H, N-CH_2), δ= 6,73 ppm (2H, O-CH_2), δ= 6,7––7,25 ppm(4H, ArH).



X=$-CCl_3$, $-CF_3$

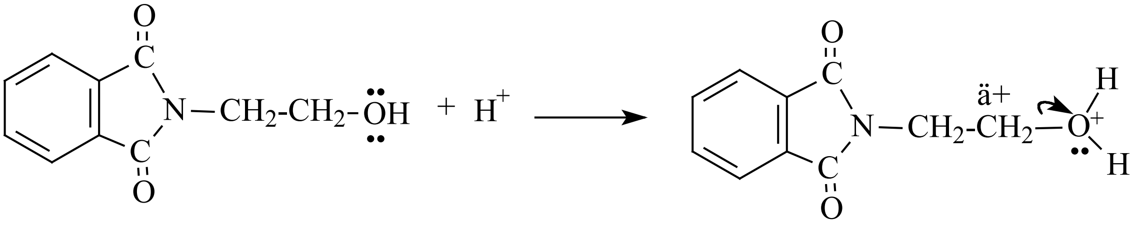
Results and discussion

The substituent nature of carbonic acid is important in the production of carbonic esters. If the substituent has an electron donor property, the positive charge value on the carbon atom of the carboxyl group decreases and O-nucleophilic exchange becomes difficult. We know that monochloroacetic acid reacts more easily than acetic acid. This is due to the increase in the value and acidity of the positive charge of carbon in the carboxyl group when a single hydrogen in acetic acid is substituted for chlorine:

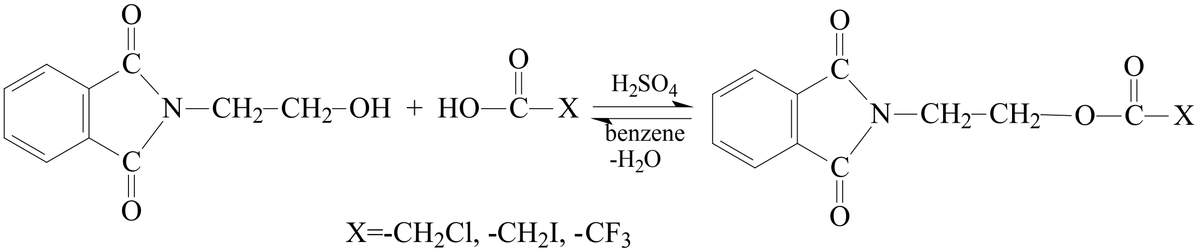
vinegar pKa = 4.76,
capril pKa = 4.88,
chlorinated pKa = 2.86,
dichlorvinegar pKa= 1.29,
triftorvinegar pKa = 0.23,

propion pKa = 4.88,
adipine 1) pKa = 4.42, 2) pKa = 5.28,
brominated vinegar pKa = 2.86,
trichlorvinegar pKa= 0.65,
tribromvinegar pKa = 0.66.

As a result, the penetration of the amidoalkylating reagent is facilitated. This means that in acetic acid held by strong acceptor atoms, o-nucleophil substitution is easier than in other homologues and the yield is higher. As the ether formation is reversible, the release of water from the reaction medium is also important as the equilibrium shifts to the right. The amidoalkylating reagent N-β-hydroxyethylphthalimide can also form oxon complex ions and decrease nucleophilic properties under the influence of large amounts of catalysts or proton solvents, such as primary alcohols:

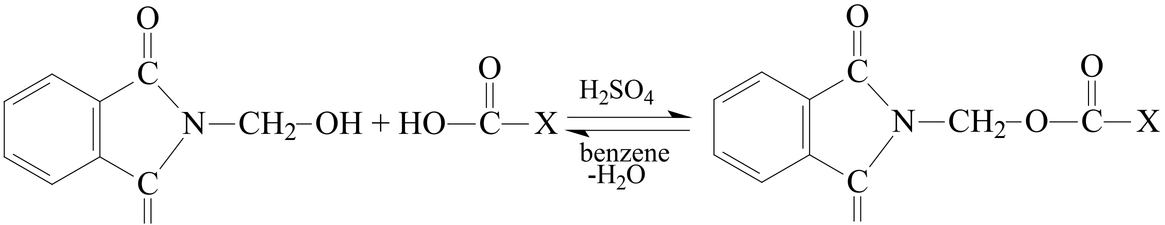


Hence, aproton solvents or solvents that remove water as an azeotropic mixture can be used for the nucleophilic substitution reaction. The use of benzene as a solvent in amidoalkylation reactions with N-β-hydroxyethylphthalimide gives good results. Synthesis of phthalimidoethyl ester of monochloric acetic acid is carried out under the conditions of the reaction of synthesis of β-acetoxyethylphthalimide, the complex ester is formed with 84% yield. If the resulting water is removed from the reaction medium using benzene, the product is found to be 98% productive. The ether yield of the complex formed by the production of monounsaturated acetic acid for the reaction is 82%, and the yield of phthalimidoethyle ether of trifluoric acetic acid is 83% [10, 1–4]:



X=-CH_2Cl, -CH_2I, -CF_3

There is also a slight decrease in the amount of esters formed by the reaction of halogenated acetic acids with N-methylolftalimide (59%, 54%, 43%, 50%, 49%):



X=-CH_2Cl, -CH_2Br, -CH_2I, -CCl_3, -CF_3

As a result of the attraction of the electrons of the methylene group N-methylfthalimide to the two carbonyl groups, the carbon-oxygen bond is weakened and the O-nucleophilic properties are reduced. As a result, it can be assumed that N-methylphthalimide reacts not as a primary alcohol but as a tertiary alcohol. Therefore, the amidoalkylation reaction of halogen acetic acids with N-methylolphthalimide under conditions selected for synchronous bimolecular substitution was somewhat lower. The formation of esters can be considered as independent of the acidity of acetic acid products.

Conclusion

As a result of amidoalkylation reactions of carboxylic acids with N-hydroxymethylphthalimides, phthalimidoalkyl esters of monochlorine, monobromine and monohydric acetic acid and phthalimidoalkyl esters of trifluoric trichloroacetic acid were synthesized. It was shown that the yield of the synthesized esters was formed according to the nature of the reagents and solvent obtained for the esterification reaction. It has also been shown that although N-hydroxymethylphthalimide is a primary alcohol, it reacts with carbonic acids as a tertiary alcohol in its reactions in a benzene solvent.

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