Section 4. Chemistry

https://doi.org/10.29013/AJT-23-3.4-23-26

Juraev Xasan Baxromovich,
PhD student
of the Jizzakh State Pedagogical University. Uzbekistan,
Yakhshieva Zuhra Ziyatovna,
Doctor of Chemical Sciences, Professor
of Jizzakh State Pedagogical University. Uzbekistan

REGULATION OF POLLUTANTS IN WATER FACILITIES

Abstract. Pollution of water systems with various ecotoxicants and other pollutants, especially heavy metals, is one of the most difficult problems of environmental protection. Identification of the distribution of pollutants on the surface of the earth from sources of pollution, meteorological features of the region, in particular, from the direction of the wind, geochemical factors and landscape conditions, in general, is one of the tasks of analysts.

Keywords: heavy metals, lead, tin, ecotoxicants, colorimetric method, water pollution.

Information about the content of ecotoxicants in natural systems, their composition, features of territorial distribution, stability and the impact on physicochemical and physiological-biochemical properties in plant and animal organisms, as well as on biological activities, chemical composition and physical characteristics of waters is necessary and important a prerequisite for the development of modern analytical methods and a set of science-based measures to protect living organisms and optimize the conditions and parameters of nature management.

Of the elements known in nature, more than 20 metals are considered potentially hazardous to humans and animals, as well as the natural environment. The main sources of environmental pollution are mining sites (mines, quarries, etc.) and mining (smelting, metal-working, electroplating, and other enterprises), as well as various kinds of sedimentation ponds, tailings and concentrate storages, dumps and other materials.

As a result of human activity, there is a selective emission of various types of pollutants and ecotoxicants on an ever-growing scale over large areas. The main problem of controlling the composition of water is related to the complexity and temporal variability of the components of the analyzed objects. At first glance, natural and waste waters are solutions of mineral salts of various concentrations, but in reality they contain a wide variety of inorganic and organic compounds, including carcinogens. Therefore, micro- and trace analysis of natural and waste waters is a complex analytical task, the solution of which requires special and specific methodological and metrological approaches.

Heavy metals and their compounds can enter the human body through the lungs, mucous membranes, skin and gastrointestinal tract. The mechanisms and

speed of their penetration through various biological barriers and environments depend on the physicochemical properties of these substances, the chemical composition and conditions of the internal environment of the body. As a result of mutual transformations between the metals or their compounds that enter the body and the chemicals of various tissues and organs, new metal compounds can be formed that have different properties and behave differently in the body. At the same time, in different organs, due to the peculiarities of metabolism, composition and environmental conditions, the ways of transformation of the initial metal compounds can be different. Individual metals can selectively accumulate in certain organs and stay in them for a long time. As a result, the accumulation of metal in a particular organ can be primary or secondary.

On the example of lead, let's consider the ways of their entry into the body through the gastrointestinal tract (GIT) with food (animal and plant origin), as well as toxic effects.

Lead, refers to p-elements and is one of the most common metal pollutants of the environment and, above all, air, unfortunately, in significant quantities can enter the human body by inhalation. Lead in the form of insoluble compounds (sulfides, sulfates, chromates) is poorly absorbed from the gastrointestinal tract. Soluble salts (nitrates, acetates) are absorbed in slightly larger quantities (up to 10%). With a deficiency of calcium and iron in the diet, the absorption of lead increases.

When analyzing wastewater, the samples under study may simultaneously contain copper, lead, zinc, nickel, and other elements, although, as is known, for many heavy metals, the dominant form of their presence in natural and wastewater is still not known, but, as a rule, toxicity and biological activity depend not so much on the concentration of the element, but on the specific physicochemical form of its presence. It is generally accepted that free (hydrated) ions of heavy metals, etc., have toxic properties, and their complexes are toxic to a lesser extent.

In connection with the foregoing, there is a need to develop sensitive, accurate and express methods for the determination of heavy metals, the MPC (Maximum Permissible Concentration) of which in environmental objects should be significantly higher than the sensitivity and lower limit of the determined concentrations of the components of the developed methods. One of the more promising options for solving this problem and achieving the stated goal is the colorimetric method, which can achieve fast detection with bare eyes without the need for complex instruments, and can also be applied to analytical applications in the field due to its portable function, since it itself the device is available and at the same time by this method it is possible to determine up to 5 elements in one aliquot of the analyzed sample.

In our country, "natural" water quality standards are taken as a basis (i.e., based on a biological assessment of the degree of harmfulness of a regulated substance, both in the development of sanitary and hygienic standards and fishery standards). This is a big step up from the "technical" regulations, the so-called "standards". In recent years, biological standards "criteria" have also appeared, but they are not mandatory. Technical standards are determined by the capabilities of existing methods for assessing wastewater, and they are more practical. Biological standards, in turn, make it possible to assess the real state of aquatic ecosystems and apply more effective methods for eliminating pollution.

Pollution of water bodies is any negative effect (violation or deterioration of water use conditions) caused by the entry or appearance in a water body of substances directly or indirectly related to human activity. There are three types of pollution:

- primary pollution – caused by the intake of pollutants and the processes of their direct transformation. Secondary and downstream pollutants may appear in the primary pollution cycle;
- secondary pollution – develops as a consequence of primary pollution and represents a new cycle of pollution;

– re-contamination – caused by the repeated removal of pollutants due to primary pollution. For example, the removal of oil products that have settled to the bottom or frozen into ice during floods or ice melting.

Sources of pollution of water bodies can be organized, with a localized place of entry and devices for discharge (household effluents, industrial wastewater); unorganized, not having a localized place of discharge and devices or devices for discharge (timber rafting, washings of fertilizers from fields, drifts of pesticides during aerial processing); semi-organized, having one of the two listed conditions (drilling rigs, washouts from the territories of warehouses, transport enterprises, etc.).

According to the time of action, pollution of water bodies can be constant (incoming during the entire growing season), periodic (the water body does not have time to restore its properties in the intervals between the intake of pollutants) and one-time (the water body has time to recover).

The intensity of the direct action of pollutants is estimated by the following parameters:

– acute lethal concentrations that cause the death of living organisms within a few hours up to 10 days;
– chronic lethal concentrations that cause the death of living organisms in longer periods;
– sublethal concentrations (depressing), violating the basic vital functions – growth, reproduction, metabolism;
– stimulating concentrations;
– inactive concentrations.

The nature of the impact of pollutants on water bodies and aquatic organisms is divided into three main groups, which are commonly called limiting hazard indicators (LIH).

1. General health LIH. It includes a change in the trophy of water bodies, a decrease in the concentration of dissolved oxygen, a change in salinity and temperature of the environment, mechanical pollution with solid and liquid substances.

2. Toxicological LIH. Reflects the direct toxic effect of substances on aquatic organisms.

3. Economic (fishery) LIH. Shows damage to the commercial quality of commercial aquatic organisms.

There are two groups of standards for pollutants entering the aquatic environment.

1. Standards for the intake of pollutants, at which the properties of water bodies and their population protected by this standard are preserved – the maximum allowable discharge (MAD).

2. Content standards, under which the protected properties of the reservoir are not violated – the maximum permissible concentration (MPC).

MPC is set according to the lowest threshold concentration, taking into account the following aspects of action: the stability of harmful substances in water, their impact on the sanitary regime (self-cleaning ability) of water bodies, the impact on the organoleptic properties of water, the impact on the health of the population using water. These indicators refer to MPC and are considered sanitary and hygienic. There is another type of MPC, which reflects not only sanitary and hygienic requirements for water quality, but also environmental – MPC (fishery reservoirs).

The fishery MPC is such a maximum concentration of a pollutant, with the constant presence of which, in a reservoir, there are no negative consequences for the fishery use of the reservoir. It should be borne in mind that pollutants in water bodies are not always constantly present. In this case, the values of the maximum permissible single concentrations (MASC) are used. This is the maximum initially created in the water body concentration of a substance that enters there once, at which it and the harmful products of its decay do not cause negative consequences for the fishery use of the water body.

Fishery regulation includes the following aspects – assessment of the effect of a substance on the hydrochemical regime of a reservoir (the concentration of oxygen dissolved in water, oxidizability according to

Kubel, BOD_5 and BOD_{20}, changes in the content of three forms of nitrogen – ammonium ions, nitrites and nitrates), on the food base of fish (algae, zooplankton and benthos), on microorganisms, on the growth and development of fish (roe, juveniles and adults), its commercial qualities, as well as an assessment of the rate of destruction of the pollutant.

According to the degree of hazard of pollutants for MPC F.R. subdivided:

- especially dangerous (maximum concentration limit with the content of pollutants less than 0.0001 mg/l), providing for the absence of a harmful substance in the water;
- dangerous (toxic, but stable), limited by MPC;
- toxic (stable and non-accumulative);
- environmental, limited by general sanitary LGS.

The second standardized indicator used to protect the aquatic environment from pollution is the maximum allowable discharge (MAD). In accordance with interstate standard (IS), the maximum allowable discharge of substances into a water body is understood as the mass of a substance in wastewater, the maximum allowable for discharge with the established regime at a given point of a water body per unit of time in order to ensure water quality standards at the control point.

MAD is set taking into account the MPC of substances in places of water use, the assimilative capacity of a water body and the optimal distribution of the mass of discharged substances between water users discharging wastewater. When discharging substances with the same MPC, the MPC is set so that, taking into account impurities that enter the reservoir or drain from upstream outlets, the sum of the ratios of the concentrations of each substance in the water body to the corresponding MPC does not exceed one. MADvalues are valid only for a specified period of time, after which they are subject to revision.

References:

1. Yakhshieva Z. Amperometric determination of some metals sulfur-containing organic reagents in non-aqueous, and mixed aqueous media // Austrian Journal of Technical and Natural Science. Austria.– No. 5–6. 2015.– P. 151–154.
2. Yakhshieva M. Sh., Yakhshieva Z. Z., Davronova F. Ecological pollution monitoring // Young scientist. Russia. – No. 6(86). Part III. 2015.– P. 336–338.
3. Yakhshieva Z., Bakaxonov A., Kalonov R. The Influence of Toxic and Ecologically Harmful Components on the Environment // EPRA International Journal of Multidisciplinary Research (IJMR) – Peer Reviewed Journal V: 6 | Issue: 10 | October 2020. ISSN (Online): 2455–3662. Indiya / 2020.– P. 92–95.
4. Akhmadjonova Y. T., Yakhshieva Z. Z. Effects of heavy toxic metals on water quality // Science and Edication – No. 72020.– P. 8–11.
5. Yakhshieva Z. Z., Akhmadjonova Y. T. Pollution of water bodies with inorganic toxicants // Science and Education.– Vol. 2.– No. 9. 2021.– P. 106–121.
6. Yakhshieva Z. Z., Akhmadjonova Y. T. Ecological condition of Aydar-Arnasay lakes and its improvement // Problems and prospects of innovative technology and technologies in the field of environmental protection // International scientific and technical on-line conference Part-I. 2020.– P. 38–140.