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У збірнику матеріалів конференції наведені матеріали наукових досліджень у сфері використання води на підприємствах харчової галузі, оцінки її якості та можливого впливу на організм людини.

Матеріали призначені для наукових, інженерно-технічних робітників, аспірантів, студентів, спеціалістів цехів та заводів, які працюють в харчовій промисловості та водних господарствах.

Матеріали, занесені до збірника, друкуються за авторськими оригіналами.

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СЕКЦІЯ 2

ПЕРСПЕКТИВНІ ТЕХНОЛОГІЇ, СУЧАСНІ РЕАГЕНТИ І МАТЕРІАЛИ ДЛЯ ОЧИЩЕННЯ ПРИРОДНИХ І СТІЧНИХ ВОД

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CLEANING WATER FROM PHENOLS BY LACCASES

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Phenols are derivatives of aromatic hydrocarbons (benzene) in which individual hydrogen atoms are replaced by a hydroxyl group. To phenols include: phenol, ie carbolic acid (antiseptic), cresols (disinfectants when added to soap solutions), insoluble in water xylenol (obtaining artificial resins), thymol (the softener antiseptic, used in dental powders, pastes) [1].

Phenols –is a very common type of pollution of industrial waste water. They are found in sewage treatment plants associated with the processing of wood, shale, peat, brown and coal (coke plants, gas generating stations); in sewage of refineries, plastic plants, artificial resins, organic dyes, wood chipboards, wood-processing plants, concentrating factories of non-ferrous metallurgy, etc.

In water, they are able to enter the reaction of condensation and polymerization, forming complex persistent compounds. The accumulation of phenols is possible in natural conditions in the processes of metabolism of aquatic organisms, as well as in the biochemical decay and transformation of organic substances occurring in the water column and bottom sediments [2].

Phenols are one of the most common contaminations of surface water. The reset of phenolic waters in the reservoir dramatically worsens their overall sanitary state, since, firstly, these compounds have a toxic effect, and secondly, they intensively absorb dissolved oxygen in water, which negatively affects the life of organisms of reservoirs.

Concentration of phenols in surface waters is prone to seasonal changes. In the summer, the content of phenols in water bodies decreases as a result of an increase in the rate of their decay with an increase in water temperature. Sources of pollution are the runoff of the enterprises of oil refining, shale processing, wood chemistry, coke-chemical, aniline-dye industry.

The purification of industrial effluents from phenol-containing compounds is one of the most important and at the same time difficult to solve problems, despite the large number of developments. This is due to the following factors: firstly, different chemical composition and conditions of pollution formation, and secondly, the complexity of compliance with the technological process of cleaning, and thirdly, the high economic costs associated with the use of scarce reagents, their regeneration and the need for the disposal of toxic waste. In view of all the above, it is very difficult to provide highly effective purification of compounds of phenols at enterprises. In this regard, the search for new effective technologies for the purification of phenol-containing wastewater is a very relevant area of research.

The known methods of purification from phenol can be conventionally divided into regenerative, allowing to extract commodity products, and destructive, as a

result of which the destruction of pollution occurs. The most common methods of regenerative wastewater treatment are extraction, evaporation and sorption [2].

Extraction and evaporation do not provide residual concentrations of phenols close to the MPC, after which a significant additional purification is required. Effective sorption methods for purifying sewage from phenol. As sorbents, activated charcoal and some industrial effluents of ash, slag, generator dust, etc. are used [1].

Dissolved in the extractant, phenols are extracted from it by means of caustic; regeneration of the extractant is also carried out by distillation. Extraction is a common method of sewage treatment at gas-generating stations and other similar enterprises.

At low concentrations of phenols it is not advisable to regenerate them, therefore, for the purification of sewage after regenerative removal, it is often advisable to use destructive methods, such as biological or chemical oxidation. In particular, there is a method of catalytic oxidation of phenols by a manganese-containing oxidizer in a thermosetting reactor with automatic mixing. In the role of an oxidant, it is possible to use laccase - (KE 1.10.3.2) - copper-containing glycoprotein, which catalyzes the oxidation of polyphenols and polyamines, some inorganic ions in the reaction of restoring molecular oxygen to water [2].

Substrate oblasts (phenols, benzyl alcohols, lignins, etc.) and their mediators are usually lipophilic. The enzyme itself, by contrast, dissolves and exhibits catalytic activity in water. This considerably limits the possibilities of practical application of oblasts and requires special study of the problem of creating acceptable for the implementation of processes of lactic oxidation of organic substrates of the water-organic medium [3].

One of the laccases isoforms (LacC1) has high thermostability, retains activity at neutral pH values, has high catalytic activity with respect to phenolic compounds, which determines the wide possibilities of application of this enzyme in biotechnological purposes. On the example of the reaction of the enzyme with highly toxic xenobiotics - pentachlorophenol, the possibility of using the LacC1 / 1-hydroxybenzotriazole system as agents of the primary attack in the development of technological methods for purifying the natural environment contaminated with chlorophenol is shown [4].

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The reaction of the catalyst catalyst is slowed down by the cumbersome substrate, which has a high oxidation-reducing potential. Lakazy reinforces the synthesis of the reaction of the breakthrough of various organic and aromatic compounds, decomposing harmful substances into the environment, while the

synthesis of complex compounds leads to bioremediation, producing non-toxic products. Phenolic compounds, such as hydroquinone and catechol, are good substrates for most odors; In addition, methoxy substituted phenol, syringdalazin, guajakol and DMF (2,4-dimethoxyphenol) are the most commonly used substrates [5]. Moreover, today scientists are studying the use of bacterial decoctions for the degradation of phenols due to their interesting properties, such as rapid cultivation, relatively cheap carriers and stability.

Biochemical purification of wastewater from phenol-containing compounds can be realized by introducing into the environment a strain of aerobic bacteria, for example, *Pseudomonas aeruginosa* XP-25 in concentrations up to 150 mg / l [2].

Currently, phenols are mainly used to obtain phenol formaldehyde resins and caprolactam, as well as flotation of ores associated with their high foaming [1].

Conclusions

Phenol is a particularly dangerous pollutant. It is present in the waste water of most refineries and coke plants. In view of the fact that phenol kills microorganisms, it significantly reduces the biological processes of water objects, the process of self-purification, water acquires a rather unpleasant smell. Getting into the environment, it has a detrimental effect on flora and fauna. Therefore, the production and industrial use of phenol is closely linked with issues of ecology, with the protection of nature from phenol-containing industrial waste. To this end, different methods are used: gases containing phenol, are subjected to catalytic oxidation, phenol is removed by solvents, etc. Continuous work is being done to improve these methods. Thus, the biological importance (biochemical) and biochemical method, which provides deep purification of sewage from phenol, are of great importance. Ozone treatment is also promising. The introduction of such cleaning methods makes it possible to switch to closed non-waste technologies with multiple use of industrial water.

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