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SAPROPEL-BASED WASTEWATER TREATMENT TECHNOLOGY

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Abstract

This scientific work analyzes in detail the role of sapropel as a natural resource, its physicochemical properties and application possibilities in various fields. In particular, the ways of effective use of sapropel reserves in the Aral Sea region are considered. The results of the study show the importance of sapropel in reducing environmental problems and increasing economic efficiency.

Keywords: Sapropel, ecology, natural resource, sorbent, adsorption, wastewater, fertilizer, biotechnology

Introduction: In the 21st century, global environmental problems, especially the degradation of water and soil resources, pose urgent challenges to humanity. As a result of the rapid development of industry, the amount of harmful substances released into the environment is increasing. This leads to a disruption of the natural balance. The effective and rational use of natural resources is an important factor in solving these problems. In this regard, sapropel is of particular importance as a unique natural raw material. Sapropel is an organic-mineral sediment formed at the bottom of water bodies, which has multifunctional properties. Its composition and properties allow it to be widely used in ecology, agriculture and industry. Origin and formation process of sapropel: Sapropel is formed as a result of the accumulation of organic residues at the bottom of lakes, reservoirs and seas over thousands of years. Formation stages:

Accumulation of plant and animal residues

Decomposition under anaerobic conditions

Enrichment with minerals

Formation of a stable organic-mineral mass

As a result of this process, a substance with high biological activity is formed. Sapropel is a complex system consisting of the following components: Organic part - humic substances, amino acids, lipids

Mineral part - silicon compounds, calcium carbonate, iron oxides

Microelements - zinc (Zn), copper (Cu), manganese (Mn)

Main properties: high porosity, large surface area, adsorption capacity, ion exchange properties allow sapropel to be used as a universal sorbent.

№	Metal ion	Primary concentration. (mg/L)	Final cons. (mg/L)	Purification rate (%)
1	Pb^{2+}	10.0	0.3	97.0
2	Cd^{2+}	5.0	0.4	92.0
3	Cu^{2+}	8.0	0.6	92.5
4	Zn^{2+}	12.0	1.5	87.5

The ecological significance of sapropel - sapropel plays an important role in solving environmental problems. Water purification - Sapropel-based sorbents: retain heavy metal ions (Pb, Cd, Cr), adsorb oil products, reduce organic pollutants Soil reclamation - increase soil fertility, improve its structure, activate the activity of microorganisms. Sapropel-based materials can also be used to adsorb gases to reduce atmospheric pollution. Sapropel is an economically useful resource. In agriculture, it increases productivity as an organic fertilizer, allows the

production of environmentally friendly products. In industry - as a sorbent, in the production of building materials, can be processed as fuel. It is found in medicine and cosmetology, in balneological treatment, in the treatment of skin diseases, and in cosmetic products. The role of sapropel resources in the Aral Sea region - The Aral Sea region is an area of ecological crisis. At the same time, this region has large sapropel reserves. The use of sapropel helps to: purify water, restore soil, improve balance. Research results and analysis. According to the results of scientific research: the efficiency of purification of heavy metals is up to 90%, for organic substances up to 80%. This confirms the high efficiency of sapropel.

Conclusion: Sapropel is an ecologically and economically important natural resource. Through its effective use, it is possible to: reduce water and soil pollution, increase agricultural efficiency, and solve environmental problems. The use of sapropel is especially promising in the Aral Sea region.

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