

Navoiy kon-metallurgiya kombinatining 65 yilligiga bag'ishlangan
ZARAFSHON VOHASINI KOMPLEKS INNOVATSION
RIVOJLANTIRISH YUTUQLARI, MUAMMOLARI VA ISTIQBOLLARI
IV-XALQARO ILMIY-AMALIY ANJUMANI

MATERIALLARI



PROCEEDINGS

OF THE IV INTERNATIONAL CONFERENCE ON
INTEGRATED INNOVATIVE DEVELOPMENT OF ZARAFSHAN
REGION: ACHIEVEMENTS, CHALLENGES AND PROSPECTS
dedicated to the 65th Anniversary
of Navoi Mining and Metallurgical Company

Volume I

November 16-17, 2023. Navoi, Uzbekistan

Navoiy kon-metallurgiya kombinatining 65 yilligiga bag'ishlangan
ZARAFSHON VOHASINI KOMPLEKS INNOVATSION
RIVOJLANTIRISH YUTUQLARI, MUAMMOLARI VA ISTIQBOLLARI
IV-XALQARO ILMIIY-AMALIY ANJUMANI
MATERIALLARI

PROCEEDINGS

OF THE IV-INTERNATIONAL CONFERENCE ON
INTEGRATED INNOVATIVE DEVELOPMENT OF ZARAFSHAN REGION:
ACHIEVEMENTS, CHALLENGES AND PROSPECTS
dedicated to the 65th Anniversary of Navoi Mining and Metallurgical Company

16-17 November, 2023. Navoi, Uzbekistan

Volume I



The degree of density of francolite $[\text{Ca}_5(\text{PO}_4, \text{CO}_3)_3(\text{F}, \text{O})]$ was found to be high with a wavelength range from 760 to 1735 cm^{-1} , and in phosphate rock the absorption of infrared rays varies from 0 to 8 %. Microscopic analysis of the structure of phosphorite (francolite) grains revealed a discernible selective grinding process within the phosphorite ore. Evidently, microorganisms played a pivotal role in degrading the organic component of phosphorites, constituting approximately 0.5 % of the composition. Notably, these microorganisms harnessed phosphorite grains (francolite) as a source of phosphorus, leading to a reduction in size and a transformation into spherical shapes as observed in microscopic images.

Thus, considering that the mixture of activated sludge and low-grade phosphorites contains a substantial quantity of trace elements and organic growth stimulants, we propose further exploration of methods for segregating fine-crystalline and coarse-crystalline forms of francolite and calcite. This research forms a solid foundation for the development of processes aimed at producing organomineral fertilizers. These processes can be developed in tandem with biotechnological processing options for low-grade phosphorite ores.

REFERENCES

- [1] Doniyarov N.A., Tagaev I.A., Muratova M.N., Andriyko L.S. New organomineral fertilizer based on low-grade phosphorites and microflora of activated sludge. // *Nanosistemi, Nanomateriali, Nanotehnologii*. – 2021. – T. 19, № 2, C. 391-405.
- [2] Tagaev I.A., Asrorov A.A., Ergasheva Y.O., Andriyko L.S. Destruction of low-grade phosphorites of the Central Kyzylkum by heterotrophic microorganisms // *Proceeding of Ukrainian conference with international participation «Chemistry, Physics and Technology of Surface» dedicated to the 90th birthday of Academician of NAS of Ukraine Aleksey Chuiko, 21-23 October* – Kyiv, 2020. – P. 176.
- [3] Tagaev I.A., Andriyko L.S., Murodov I.N., Asrorov A.A. Character of dissolution and separation of salts of alkaline and alkaline earth elements after acid treatment of phosphorites // *Materials of the Republican scientific and practical conference with international participation of scientists on the topic: “Current problems of chemical technology.”* Tashkent Institute of Chemical Technology. Tashkent. March 2021.p.611-612. (in Russian).

ROLE OF SOLID SEDIMENT OF ACTIVE SLUDGE OF BIOCHEMICAL TREATMENT PLANT FOR THE DESTRUCTION OF INSOLUBLE MINERALS IN PHOSPHORITES

Tagaev I.A.¹, Andriyko L.S.², Rakhmatova Z.A.³, Rakhmatullaeva L.B.¹

¹*Navoi Institute of Innovations, Navoi, Uzbekistan*

²*Chuiko Institute of Surface Chemistry, NAS of Ukraine, Kiev*

³*Navoi State Mining and Technology University, Navoi, Uzbekistan*

Abstract: this work was carried out using the biotechnology methods, where the microflora of activated sludge from the biochemical treatment plant (BCP) of Navoiazot JSC was used to obtain polymicroelement nitrogen-phosphorus organomineral fertilizer. The species composition of activated sludge microflora has been studied, and the chemical composition of the solid activated sludge sediment was analyzed

Key words: microflora, activated sludge, municipal wastewater, protozoan microorganisms, bacteria, polymicroelement nitrogen-phosphorus organomineral fertilizer, trophic pyramid.

The aim is to study the species composition and properties of the activated sludge microflora at the biochemical treatment station of Navoiazot JSC, as well as the chemical composition of the solid sludge sediment for the production of organomineral fertilizer. The work used physicochemical methods of analysis, FTIR spectroscopy and microscopy to analyze the composition of activated sludge microorganisms.

Domestic wastewater, generated from activities such as bathing, laundry, and kitchen use, can be categorized into fecal water, primarily contaminated with human physiological

secretions, and household water, polluted with various household waste and detergents. Domestic wastewater is characterized by its relatively stable composition and high pollution levels, primarily consisting of organic substances from plant and animal sources. These waters invariably contain numerous microorganisms, some of which can be pathogenic, making them the most epidemiologically concerning part of the pollution. Typically, biological methods are employed for domestic wastewater treatment.

Within the activated sludge of a biological treatment plant, a wide array of microorganisms reside. In the wastewater environment, these microorganisms uptake pollutants into their cells, where enzymatic processes drive biochemical transformations. This absorption and transformation process serves a dual purpose: firstly, organic and certain types of inorganic pollutants are subject to biological oxidation in the presence of oxygen. This results in the conversion of these pollutants into harmless byproducts, specifically carbon dioxide and water. Secondly, the energy released during this process is harnessed by the bacterial cells to support essential life functions, including movement, respiration, and reproduction.

Chemical analysis results, presented in a table, demonstrate that heavy metal content (Cu, Zn, Mn, Ni, Cr, Pb, Cd) in the waste activated sludge remains within permissible standards (MPC), and the presence of biogenic elements suggests its high agrochemical value [1-2]. Activated sludge is a biocenosis composed of bacteria and protozoa that form zoogenic accumulations (colonies) and participate in wastewater treatment.

Thus, the analysis of solid sediments from the biochemical treatment plant revealed the presence of essential macroelements, including nitrogen, phosphorus, and potassium, as well as microelements, all of which conform to established MPC parameters. The Navoiazot BCP processes over 75-80 thousand m³/day of liquid household and industrial wastewater, resulting in approximately 1.5 thousand m³ of condensed sediments daily. An effective strategy for utilizing the excess sludge from the wastewater treatment plant (8.38 thousand tons) and stabilized sludge (22.1 thousand tons) involves their conversion into polymicroelement nitrogen-phosphorus organomineral fertilizer."

Table - Chemical composition of waste solid sediment of activated sludge

Metal content, mg/kg	Cu	Zn	Mn	Ni	Cr	Pb	Cd
GOST 17.4.3.07-2001	50	750	1000	200	500	56	15
In activated sludge	6	18	94	29	8	39	5
In aqueous extract, mg/L	PO ₄	NO ₂	NO ₃	Ammonia nitrogen	pH	Acidity	Organic substance, %
	0.7	0.71	0.08	3.1	5.9	1.4	50

REFERENCES

- [1] Tagaev I.A., Doniyarov N.A., Murodov I.N., Asrorov A.A. Features of the destruction of minerals of low-grade phosphorites of the Central Kyzylkum by neutrophilic heterotrophic microorganisms of activated sludge. Scientific, technical and production magazine "Mining Bulletin of Uzbekistan" № 3 (78) 2019. p. 70-74. <http://gorniyvestnik.uz/release/2019/3>. (in Russian).
- [2] Doniyarov N.A., Tagaev I.A., Asrorov A.A., Murodov I.N. Development of technology for producing high-quality phosphate fertilizers purified from ballast impurities. Scientific, technical and production magazine "Mining Bulletin of Uzbekistan" № 2 (77) 2019. p. 68-71. <http://gorniyvestnik.uz/release/2019/2>. (in Russian).