



UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Wydział Chemii

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REVIEW

of scientific consultant

for a doctoral dissertation Ainagul Akhmet on the topic: «**Technology of the valuable components bioleaching from phosphorus-containing wastes of the Southern Kazakhstan**» for the academic degree of doctor PhD in the specialty 6D070100 - Biotechnology

In recent years, the use of microorganisms for extraction of metals from technogenic wastes has become increasingly widespread. The reason for increasing interest in this technology is the economic efficiency and the need to improve the process of extraction of natural resources in the sphere of production. Currently, all microorganisms used in the processes of biooxidation and bioleaching are isolated from the biocenoses of a defined area, specific to the region of extraction. One of the promising areas of bioleaching is the use of consortiums of microorganisms, which makes it possible to apply various mechanisms of bacterial oxidation of minerals. According to some data, in the processes of bioleaching and biooxidation, a total of about 20 types of microorganisms that can use inorganic substances of ore material have been employed.

The research work of Ms Ainagul Akhmet is related to the processing of one of the toxic wastes - phosphorus-containing slags and sludges, which pose a serious threat to the environment and public health in Shymkent. The goal of her studies was to develop a technology for bioleaching of valuable components from phosphorus-containing wastes of South Kazakhstan, whose achievement required detail identification of the mineralogical and physicochemical composition and biological properties of the wastes, determination of the distribution of microflora in the waste, identification and taxonomic assignment of the dominant groups of microorganisms and checking the possibility of their use in the processes of bioleaching of valuable components. The final stage was to develop a technological scheme and technology for the bioleaching of phosphorus-containing waste.

The studies used traditional and modern research methods, including PCR analysis of microorganisms, microscopy on a light and electron scanning microscope, ICP, etc.

The outcome of the studies carried out by Ms Ainagul Akhmet, include determination of the chemical, mineralogical and microbiological composition of phosphorus-containing slags, determination of the limits of their biological toxicity, isolation of new strains of microorganisms and a subsequent study of their physiological and biochemical characteristics and preparation of a technological scheme and technology for bioleaching of phosphorus-containing wastes.

During the research period, Ms Ainagul Akhmet has proved to be a responsible and diligent employee, constantly improving her professional skills.

In general, the dissertation written by Ms Ainagul Akhmet is a completed scientific work and meets all the requirements for doctoral dissertations. I am pleased to recommend Ms Ainagul Akhmet for the academic title of PhD in the specialty of 6D070100 - Biotechnology.

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