

ANNOTATION

For PhD dissertation of **Ikramov Ilyas Galimbetovich** on the topic of: **"Research of the harmful impact of lead production slags on the environment with the application of sanitary requirements for the processes of storage, processing, disposal and neutralization"** presented for the degree of Doctor of Philosophy (PhD) in the speciality 8D11210 - "Life Safety and Environmental Protection"

Relevance of the research topic. The use of waste as an additional source of raw materials opens the way to sustainable economic development of the country in terms of saving natural mineral resources and environmental protection. However, unfortunately, to this day, there is a risk of contamination of soils and suburban lands with heavy metals such as lead and zinc during the storage of solid waste from metallurgical production in open-air warehouses, namely slag waste from the lead plant in Shymkent. Soil contamination near the storage site of heavy metal residues occurs due to the fact that slag waste turns into dust over the years due to exposure to sunlight, humidity and atmospheric pressure, and it is scattered in the air in the direction of the wind. In this regard, the most urgent problem is the assessment of environmental pollution with slag dust, which is rich in heavy metals, by an economically simple innovative method and limiting the harmful impact of such waste on the environment using "sanitary and epidemiological requirements for the collection, use, application, neutralization, transportation, storage and disposal of production and consumption waste."

Correlation with the research and development plan. The topic of the dissertation corresponds to the priority areas of science development. The dissertation was carried out at the Department of "Life Safety and Environmental Protection" in accordance with the plan of state budget research works of the M. Auezov South Kazakhstan University. The work was carried out in the direction of "Development and creation of an environmentally safe technology for processing technogenic waste of phosphorus and lead-zinc production with the production of target products" - 21-04-05.

The aim and objectives of the research. To study the production of lead and assess the damage to the environment caused by the spread of slag waste in the atmosphere by wind and to develop a new scientifically обоснованный method for limiting their negative impact. This goal was achieved by solving the following tasks:

- to compile an ecological map-scheme of the area where the lead waste storage warehouse is located, to determine the boundaries of harmful substances in it in accordance with sanitary standards;
- to study the impact of slag dust mixed with lead and zinc on plant trees on the territory of the lead waste storage warehouse and the arboretum;
- to consider ways to limit the harm to the environment from lead production waste.

Research Objects.

The assessment of air pollution by slag dust rising from the surface of the slag storage warehouse of the lead plant located in Shymkent city on windy days into the atmospheric air using the lichen indication method is presented. This includes special classification data and indicators of lichen cover on the trunks of Karatal, oak and birch

trees in the arboretum located in the area of the village of Kaytpas, which are considered unpolluted.

Scientific novelty of the research:

-meteorological factors of the terrain on the dispersion of slag dust rising from the surface of the slag storage warehouse of lead production were analyzed using the method of applied mathematics, and the harm to the environment caused by slag dust was determined for the first time using the lichen indication method.

- a scientific aerodynamic basis for limiting the harmful impact of slag dust on the environment has been developed.

-in windy days, areas of pollution at a level exceeding sanitary requirements were identified due to the peculiarities of the spread of slag dust rising from the surface of the solid waste storage facility of the lead plant into the air of the atmosphere.

-the determination of the harmful impact of slag dust on the environment was carried out by the method of floristic lichen indication. For this purpose, a bioindication analysis of the growth conditions of lichens in areas with a high spread of slag dust was carried out, in particular, on the trunks of trees and in the Dendrium of the Kazygurt microdistrict, located at a distance of 1075 meters from the slag storage facility to Zhidelibaysyn Street.

-the limitation of the harmful impact of slag dust on the environment was implemented using the method of an innovative aerodynamic barrier.

Practical significance of the work

-an ecological map of a specific area has been compiled, where excessive sanitary pollution occurs during the spread of slag dust flying from the surface of the slag storage warehouse of the Yuzhpolimetall lead plant in Shymkent city into the atmospheric air.

- a simple lichen indication analysis method has been developed to determine the harmful impact of slag dust on the environment.

- a method of aerodynamic modeling has been developed to limit the harmful impact of slag dust on the environment.

-the results of the dissertation work have been implemented in the educational process and production practice in such universities as the M. Auezov South Kazakhstan University, the Korkyt Ata Kyzylorda University, the International Kazakh-Turkish University named after Khoja Ahmed Yasawi, and the Shymkent University.

The following are the main points defended in this dissertation:

-the results of air pollution levels determined by assessing the impact of slag dust rising into the air on windy days from the slag storage facility near the Shymkent lead plant, as measured in the conducted research.

-the results of analyzing the growth conditions of lichens on the tree trunks in the Kazygurt microdistrict dendrium, located south of the slag storage facility at a distance of 1075 meters to Zhidelibaysyn Street, to determine the level of atmospheric pollution by slag dust using the most effective method of floristic lichen indication.

-for the floristic lichen indication, fully grown Karatal, oak, and birch trees were chosen on each of the selected plots of land. The results include the degree of lichen coverage on their trunks.

-the results of bioindication studies on the degree of tree trunk density with lichen cover projections, using transparent frames divided into 10x10 cm squares with a height of 150 cm for each Karatal, oak, and birch tree.

-the results of installing a protection system consisting of two concentric barriers on the slag storage facility with an external resistance of 300 meters and an internal resistance of 60 meters.

The doctoral candidate's personal contribution lies in directly participating in summarizing and analyzing literary and patent materials related to the dissertation topic, choosing analysis methods, conducting theoretical and experimental research, and field tests. The main results and hypotheses of the dissertation were presented and discussed at the following international and national scientific conferences: M. Auezov South Kazakhstan University International Conference "Industrial Technologies and Engineering" (Shymkent, 2020); International Kazakh-Turkish University named after Khoja Ahmed Yassawi International Scientific-Practical Online Conference "Modern Scientific Research: Actual Problems, Achievements and Innovations" (Turkestan, 2021); North Caucasian Mining and Metallurgical Institute (State Technological University), Scientific Journal "Sustainable Development of Mountain Territories" (North Caucasus 2022); M. Auezov South Kazakhstan University International Scientific-Practical Conference "Auezov Readings-20: Dedicated to the 125th Anniversary of M.O. Auezov, the Classic of Kazakh Literature" (Shymkent, 2022); Turkistan Region Department for Development of Human Potential, Turkistan City Department for Development of Human Potential, State Communal Enterprise "Palace of Students" "Kazakhstan" Newspaper - International Scientific-Practical Conference "In the Footsteps of Alash" (Turkestan, 2023); M. Auezov South Kazakhstan University International Scientific-Practical Conference "Auezov Readings-21: The Future of Our New Kazakhstan" Dedicated to the 80th Anniversary of M. Auezov South Kazakhstan University (Shymkent, 2023); International Journal of Energy for a Clean Environment (South America 2023); Satbayev University of the National Academy of Sciences of the Republic of Kazakhstan, series of geology and technical sciences "Proceedings" (Almaty, NAS RK, 2023); Al-Farabi Kazakh National University "KazNU Bulletin. Ecology Series" (Almaty 2023).

During the scientific internship at the St. Petersburg State Institute of Technology (Technical University), the work was carried out at the Department of "Life Safety and Environmental Protection" and received a positive evaluation.

Publications on the Research Topic. The obtained scientific results of the dissertation work resulted in 14 scientific publications, including: 3 articles in publications included in the list recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan. 2 article in journals included in the international Scopus database. 9 articles in international and national conferences and collections of foreign conferences.

Structure and Volume of the Dissertation

The dissertation consists of 126 pages and includes 32 figures, 11 tables. The list of references used includes 104 entries. The content of the dissertation consists of: introduction, literature review, materials and methods of research, research results, their discussion and a conclusion.