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Editorial

ECOLOGICAL SECURITY AND SUSTAINABILITY

In 2015, UN Member States adopted the 2030 Agenda for Sustainable Development, aimed at balancing initiatives by the world community and individual countries in the environmental, social, and economic spheres. The global sustainable development goals are to promote the well-being of the world population, preserve the planet's resources, and maintain ecological security, which is vital in the age of the rapid industrial growth and ever-increasing anthropogenic pressure on the environment. For the successful achievement of sustainability goals in the manufacturing sector, integrated measures should be undertaken for monitoring and assessing the technogenic impact of industrial facilities. Additionally, it is necessary to develop environmentally-friendly technologies in the fields of gas and water treatment, land reclamation, and waste disposal. Therefore, fundamental and applied research in these related spheres is of particular importance.

Currently, environmental monitoring of all components of the environment, along with anthropogenic objects and processes, receives considerable attention, which is determined by the vector of development in science and technology. In this regard, the latest innovations in green technology in this area are becoming increasingly significant.

Scientists from the Saint Petersburg Mining University study the impact of the mining industry on the biosphere. The paper by Mariya A. Pashkevich et al. (DOI: 10.31897/PMI.2023.32) comprehensively considers the formation of an ecological catastrophe in the area of long-term development, enrichment and metallurgical processing of copper sulfide ores.

In the article by Aleksandr I. Semyachkov and colleagues (DOI: 10.31897/PMI.2023.24), waste disposal sites (dumps and sludge storages) are considered to be sources of environmental and economic damage to the aquatic environment. The authors have studied one of the largest tailings in the Middle Urals that poses a potential environmental and man-made threat, as it creates specific hydrogeoecological conditions on the territory.

A team of authors from the Perm State National Research University, led by Sergei A. Buzmakov (DOI: 10.31897/PMI.2023.22) considered the need to expand the range of observations of the technogenic processes development in oilfields using unmanned aerial photography to determine interpretation signs that register the consequences of technogenic transformation of the natural environment.

Studies of the distribution of natural and technogenic radionuclides in groundwater of the industrial zone in Sosnovy Bor town were carried out by Valentina A. Erzova, Corresponding Member of the RAS Vyacheslav G. Rumynin et al. (DOI: 10.31897/PMI.2022.27). Based on the results of the analysis, isotope contamination of the first two aquifers from the surface was revealed. A 3D geological model and hydrodynamic and geomigration models of the industrial zone of the nuclear power plant were constructed. Modeling has shown that during the time of the operation of the Leningrad Nuclear Power Plant there was no intake of contaminated water by the drainage system of the new power plant.

According to the results of monitoring the soil cover of the Nakyn kimberlite field in the Yakutia diamond province, Yana B. Legostaeva and colleagues (DOI: 10.31897/PMI.2023.35) revealed a technogenic impact of objects of mining and processing of mineral raw materials, which is of multielement nature, in local areas with high and very high contamination levels.

Iskhak M. Farkhutdinov and colleagues (DOI: 10.31897/PMI.2023.4) described the results of the analysis of the uranium content in man-made carbonates (scale crusts) on the territory of Ufa, depending on specific subsurface geology of the territory (gypsum, limestone), types of water supply, and water treatment processes for centralized type of water supply.

The elaboration of analytical methods for qualitative and quantitative analysis of various ecotoxicants faces a number of challenges, such as a lack of information on isomers and homologues of compounds that have already been studied. This problem was considered in the paper by Vladimir G. Povarov and Ignatyi I. Efimov (DOI:10.31897/PMI.2023.41), who explored the capabilities of the UNIFAC model for solving existing problems using the example of calculating the properties of real ecotoxicants.

Ensuring the sustainable development of regions and the rational use of natural resources becomes possible through the development of eco-technologies and the use of innovative methods of environmental protection in manufacturing.

Various methods for producing biodiesel fuel were considered in the work of Natalia K. Kondrasheva and Anzhelika M. Eremeeva (DOI: 10.31897/PMI.2022.15). Based on the analysis of the physical and chemical characteristics of biodiesel fuel, it has been determined that the best way to produce it is through transesterification of vegetable oils.

The problem of pollution of surface and ground waters with heavy metals, as well as methods for treatment of industrial wastewater containing ions, were considered by Natalya Yu. Antoninova and colleagues (DOI: 10.31897/PMI.2023.34). Studies were conducted on the redistribution of heavy metals in the "wastewater – waste" system using iron-magnesium production waste.

The effectiveness of soil reclamation by agrochemical and geochemical methods at the site of acid mine water discharge in the Kizel Coal Basin was studied by Natalya V. Mitrakova and colleagues (DOI: 10.31897/PMI.2023.31).

In the work of Svetlana V. Sverguzova et al. (DOI: 10.31897/PMI.2023.23), innovative approaches to the disposal of the dust from electric arc furnaces were considered. Based on the results of the analysis of physical and chemical properties, along with chemical and disperse compositions of dust and surface microstructure, it was concluded that this type of waste can be used as a raw material for coagulant production, resulting in a high efficiency (95 %) of water treatment from heavy metal ions.

Igor V. Sokolov and colleagues (DOI: 10.31897/PMI.2023.21) considered the topical issue of disposing the maximum possible volume of waste from the mining and processing of low-grade iron ores by placing them in the formed gob.

The development of more environmentally friendly, cost-effective, and less labor-intensive biological methods of remediation was considered in the work of Irina D. Sozina and Aleksandr S. Danilov (DOI: 10.31897/PMI.2023.8). As a result of their research, various bio-based products with proven efficacy, based on strains and consortia of microorganisms, have been developed to restore oil-contaminated soil.

The paper by Andrei M. Gerasimov and colleagues (DOI: 10.31897/PMI.2023.33) explores the possibility of recycling wastes from the processing of various ores by using them, after preliminary thermochemical treatment, as pozzolanic additives to cements and concretes, including concrete mixtures.

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