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Editorial

ENVIRONMENTAL SAFETY AND SUSTAINABLE DEVELOPMENT: NEW APPROACHES TO WASTEWATER TREATMENT

In 2015, the UN member states adopted the 2030 Agenda for Sustainable Development. Despite significant progress, billions of people – one in three people – do not have access to safe, clean drinking water.

Modern wastewater treatment methods include a wide range of biological, chemical and physical processes, each having its own advantages and applications. This thematic volume considers the latest achievements in wastewater treatment technologies, wastewater purification and treatment as well as their potential applications at the local level.

The problem of surface water pollution is relevant for all regions of the world. One of the largest sources of pollutants is mining and processing industry. The first stage in the development of wastewater treatment technologies is monitoring of anthropogenically modified water bodies.

Long-term studies of the impact of the development of the Sibay deposit were carried out by scientists from Saint Petersburg State University under the *Anatolii Yu. Opekunov*'s supervision. An assessment of the effectiveness of geochemical barriers for water purification from Cu, Zn, Cd was carried on the Karagayly River, which was used for runoff of sub-dump and quarry water. The performed analysis of the efficiency of geochemical barriers in river water purification indicates the prospect of using nature-like *in situ* technologies in watercourses, canals and other water disposal systems.

Zoya A. Zhakovskaya and her colleagues' research presents the results of pollution by organotin compounds and heavy metals study in modern sediments of shelf areas of the Baltic Sea near Kaliningrad.

A new method of quantitative determination of various forms of sulfur in bottom sediments for express assessment of pollution of aquatic ecosystems was proposed in the paper of *Ivan P. Sverchkov* and *Vladimir G. Povarov*, which includes the analysis of X-ray emission spectra in the area of the S-Kβ line. The results are compared with the results of quantitative chemical classical methods analysis, as well as with the content of sulfur forms in certified standard samples.

Development of nature-like technologies for wastewater treatment for rational development and efficient use of natural resources is increasingly being used. One of such examples is the research of authors from the University of Continental (Peru) under supervision of *Pablo Espinoza Tumialán*. The method of neutralization of acid drainage water with a mixture of slaked lime and sodium bentonite (natural sorbent) was proposed. The sludge formed at treatment of acidic waters by mixture of neutralizing reagent with adsorbing material has better characteristics, reducing the degree of surface infiltration of water.

Scientists of the Institute of Mining Engineering (Ural Branch of the RAS) under the supervision of *Lyudmila S. Rybnikova* carried out research of the assessment effectiveness of acid mine water treatment by neutralization and sedimentation at flooded mines in the Middle Urals and identification of the main parameters that allow to achieve higher water quality indicators for discharge into water bodies.

The joint group of researchers of the Kyrgyz National University and Saint Petersburg Research Center for Ecological Safety of the RAS considered the possibility of using a sorbent based on coal from the Kara-Keche deposit for wastewater treatment from low molecular weight organic pollutants, the results of studies of the structure of the obtained sorbents and the effectiveness of their use were provided.

One of the goals of sustainable development is to significantly reduce the amount of waste by taking measures to prevent its generation, reduce it by recycling and reuse. The paper by *Natalya Yu. Antoninova* and her colleagues shows the results of research on determining the optimal conditions

and parameters for afterpurification of underspoil water from metal ions using humic acid production wastes in order to develop effective measures for the ecological rehabilitation of ecosystems disturbed during the mining of copper pyrite deposits.

Researchers of Saint Petersburg Mining University and University of Leoben under the supervision of *Vera A. Matveeva* presented the results of experimental studies on obtaining coagulant from iron ore processing waste. The technical solution obtained in the work allows to solve the problem of environmental protection by creating new target products from wastes for wastewater treatment.

Conservation, restoration and sustainable use of terrestrial ecosystems can be also achieved by taking into account the use of wastes from sewage treatment. The study conducted by *Lyubov A. Ivanova* and her colleagues shows the results of evaluation of the effectiveness of re-cultivation measures using sewage sludge for accelerated formation of sustainable erosion control vegetation cover on low-productive techno-soil of a sand pit in the Kola North.

Marina V. Bykova and co-authors analyzed the existing approach to sewage sludge handling and experimentally substantiated the most promising technology of utilization, which allows to use maximally the resource potential of the considered waste.

The paper by *Olga M. Guman* and *Irina A. Antonova* provides a rationale for the composition and properties of material for reclamation of sludge reservoir from water treatment wastes placed in it.

The method of joint utilization of blast furnace slag with the filtrate of solid municipal waste landfills, the formation of which occurs when atmospheric precipitation passes through the deposited waste, was presented by a team led by *Mariya A. Pashkevich*. The proposed method is based on the transfer of filtrate from liquid phase to solid aggregate state by lithification with the use of blast furnace slag as a binding material.

Systems of complex treatment facilities are objects of critical infrastructure. *Evgeniya S. Novikova* and her colleagues proposed a methodology for identifying and subsequently assessing the risks of cyber sustainability of the wastewater treatment process, including an original method for generating training data sets and identifying anomalies based on deep learning methods.

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