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USE OF BROWN COAL RESERVES IN THE DNIPRO BROWN COAL BASIN: SOLVING UKRAINE'S ENVIRONMENTAL PROBLEMS

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It has been noted that humic acids are one of the most valuable components of Ukrainian brown coal, whose total (balance sheet and off-balance sheet) reserves for the Dnipro brown coal basin amount to about three billion tonnes. The sorption capacity of these substances is determined by the presence of carboxyl groups, phenolic hydroxyls and =N–H and –N– groups. This work is devoted to studying the prospects for using the products of processing earthy brown coal from the Dnipro brown coal basin (Oleksandriya deposit), namely sodium humates isolated from them for deep purification of natural (river) water from lead and cadmium ions. These pollutants are among the most toxic heavy metals that enter the environment, in particular, with industrial wastewater. To ensure a high degree of purification, this work used the 'complexation-ultrafiltration' method with industrial membranes with pore sizes less than 10 mm.

Due to the fact that humates actively interact with heavy metal ions in water through complex formation, ion exchange and physical sorption, and also due to the fact that the size of humate molecules generally exceeds the diameter of the pores of the membranes used, a deep purification of water from the ions under study is achieved. Both lead and cadmium ions are almost completely removed from water: the selectivity of the 'complexation-ultrafiltration' process, which characterises the efficiency of purification, reached 97-98 %. The 'complexation-ultrafiltration' method was applied using a special experimental setup. Analytical methods included the use of Fourier-infrared spectrometry and inductively coupled plasma optical emission spectrometry.

Keywords brown coal, humic acids, sodium humates, complexation-ultrafiltration process, sorption, heavy metals, water purification.

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