

## **Characterization and Remediation Planning of Two Uranium Tailings Facilities at a U-Production Legacy Site in Ukraine (Pchp)**

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The results of recent studies on characterization of uranium production residues accumulated in Centralny Yar and Zapadnoe tailings (created about 60 years ago) at the site of the former Prydneprovskiy Chemical Plant in Kamyanske, Ukraine are considered. The main focus in this study are on the characterization of these uranium tailings and geochemical behavior of uranium series radionuclides (U-238 Ra-226 and Th-230) in different geochemical conditions within the tailings body and in the groundwater at the impacted areas.

Radionuclide migration at the tailings site and surrounding areas were studied using radiological survey spatial analyses. In addition, the radionuclide vertical profile was completed based on the borehole drilling survey at the tailings body and groundwater monitoring data (2009-2017). The residues of U-production in two studied tailings at the PChP site were determined to have different geochemical conditions and mineralogical composition with similar hydrogeological conditions. The comparative analyses of the different migration properties of the tailing's material and its potential impacts on the groundwater contamination are considered. The results of experimental studies and modeling have shown that the rates of migration of uranium, radium and thorium with infiltration waters into the aquifer depend significantly on the physical and chemical properties of the complexation of the studied radionuclides, and in particular on the pH of the tailings, hydrogeochemical composition of groundwater and the mineralogical composition of tailings materials.

The results of geochemical modeling using MEDUSA tool with the support of the HYDRA database for determination of U-equilibrium complexes are presented. The characteristics of the migration of uranium radionuclides from tailings into the groundwater evaluated using the NORMALISA software.

Examples of the application of the obtained results are provided to validate the appropriate remediation measures, allowing to control the migration processes in the tailings and their migration to the surrounding groundwater and surface water bodies (in particular to the small river located downslope of the site which inlet to the Dnieper river).