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Topic of Research: Leaching of Heavy Metal from Selected Hazardous Industrial Solid Waste

Finding

This study delves into the leaching of heavy metals from selected hazardous industrial solid waste in the National Capital Region (NCR) of India, focusing on textiles, tanneries, and electroplating industries. The NCR, home to over 2409 small and medium-sized enterprises, faces groundwater contamination risks due to rapid industrialization. The research assesses heavy metal concentrations in industrial sludge, employing the Toxicity Characteristics Leaching Procedure (TCLP) method for up to 10 cycles. The characterization of sludge and wastewater samples from textiles, tanneries, and electroplating industries forms the basis of the study. The concentrations of Co, Cr, Cd, Zn, and Ni in textile, tannery, and electroplating sludges are detailed, revealing varying levels of contamination. Leaching percentages via TCLP range from 60% to 80%, signifying potential groundwater contamination. Health indices such as HPI, Igeo, and PI are used to evaluate health risks associated with heavy metal leaching. The study addresses critical gaps in understanding heavy metal leaching, providing insights for policymakers to formulate sewage treatment and industry regulations. Despite economic contributions from these industries, strategic interventions are recommended, including the establishment of Common Effluent Treatment Plants (CETPs), training programs, metal fixation methodologies, and eco-friendly technologies. Efficient sludge management is crucial for sustainable industrial practices, minimizing health risks, and ensuring compliance with environmental laws. The study identifies future research scopes, including advanced characterization, health impact evaluations, and innovative treatment methods. Collaboration with experts and regulatory authorities, adherence to BIS standards, and the utilization of innovative initiatives like phytoremediation, nanoparticle use, and evolving bioremediation techniques are recommended. The societal significance of studying industrial sludge leaching lies in protecting the environment, public health, and natural resources. The clustering of Small and Medium Enterprises (SMEs) and

Micro, Small, and Medium Enterprises (MSMEs) for the utilization of CETPs is strongly endorsed, facilitating the adoption of defined disposal methods for sludge with consistent characteristics.