Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.33329

Soil and groundwater contamination with chromite ore processing residues in Khan-Chandpur region, Kanpur and Nano-enabled remediation

RADHAKANTA SAHOO[1,2], NITIN KHANDELWAL[3], SONU KUMAR[4] AND SHRISHTI SUNDRIYAL[5]

[1]Indian Institute of Technology Roorkee
[2]Kalinga Institute of Industrial Technology, Bhubaneswar
[3]Indian Institute of Technology (IIT) Roorkee
[4]IIT Roorkee
[5]National Forensic Sciences University, Gandhinagar,Gujarat - 382007

Almost 90% of the world's leather products are tanned with chromium. Some other industries, like printing, dyeing, catalysts, medicine, oxidants, electroplating, metal corrosion inhibitors, etc., also utilize chromium in variety of applications. Due to this huge industrial demand for chromium, chromite ore processing industries are increasing rapidly. The main aim of the chromium extraction process is the conversion of insoluble chromite to soluble CrO_4^{2-}, but in this process remaining waste is disposed of in the open field, which is known as Chromite Ore Processing Residues (COPR). COPR waste interacts with the open air, rain water pollutes groundwater by leaching. As we know, Cr (VI) are highly soluble, toxic and carcinogenic in nature. To resolve this problem, in this work, we have collected soil and groundwater samples from a chromite ore processing residue (COPR) contaminated site at Khan-Chandpur, Kanpur, UP, India.

Collected groundwater samples were filtered and processed using standard EPA method to determine Cr (VI) concentration using 1,5-Diphenylcarbazide. The results showed a wide variation in Cr (VI) concentration, ranging from 2 mg/L to 22.8 mg/L in different samples. In case of COPR contaminated soils, we have mixed them with rain water to see the first phase of leaching. Results showed a leaching in the range of 30-300 mg/L from soil samples at a ratio of 25 mg/ml.

We further synthesized redox-active zerovalent iron particles (nZVI) using wet-chemical method and used them to treat groundwater and stabilize soils. Results showed complete Cr (VI) removal from groundwater samples and a maximum Cr (VI) stabilization capacity of 55 mg/g at a 10% nZVI mixing rate in soils. Results suggest strong potential of nZVI particles in the possible reclamation of COPR contaminated sites.