

Magnetic Nanoparticles for Removal and Recovery of Metal Anions from Wastewater

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Abstract

Nanomaterials have gained enormous interests in wastewater treatment due to their high surface area and large number of reactive sites. However, daunting recovery and poor regeneration of nanomaterials hinder their applications. Our studies to tackle these two issues by developing magnetic nanoparticles (MNPs) for metal anions removal from wastewater will be presented. Various iron-based MNPs, including Fe₃O₄, γ -Fe₂O₃, and γ -Fe₂O₃ based hydrogel, have been synthesized. The MNPs are characterized using transmission electron microscopy (TEM) for size and morphology investigation, X-ray diffractometer (XRD) for crystal identification, Brunauer-Emmett-Teller (BET) analyzer for surface area measurement, and vibrating sample magnetometer (VSM) for magnetic property analysis. The removal and recovery of metal anions from wastewater using MNPs will be presented. The removal mechanisms will be discussed based on the findings from XRD, Raman spectroscopy, Fourier transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS). A wastewater treatment prototype is further developed featuring a magnetic separation unit for recovering MNPs. The efficacy of this prototype in removing and recovering chromate from electroplating wastewater will be shown. In summary, MNPs is promising and cost-effective for wastewater treatment because of their short adsorption time, large adsorption capacity, high MNP recovery, and high regeneration of spent MNPs.

Biography

Prof. Irene M. C. Lo is currently a Chair Professor in the Department of Civil and Environmental Engineering at The Hong Kong University of Science and Technology (HKUST) and has been joining HKUST since 1992. She received her Master and PhD degrees in Civil (Environmental) Engineering from the University of Texas at Austin. Prof. Lo is an elected Academician of the European Academy of Sciences and Arts (EASA). She is the first Hong Kong scholar inducted into the EASA. She is an elected Fellow of the Hong Kong Institution of Engineers (FHKIE), and elected Fellow of the American Society of Civil Engineers (FASCE). Prof. Lo has held 2 patents, edited 9 technical books, and published over 270 SCI journal articles and conference papers with citation over 8000+. Her research areas include magnetic nanomaterial-based technology for water and wastewater treatment; soil/sediment/groundwater remediation; fate and transport of nanoparticles; and solid waste treatment and management.

Photo

