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Fabrication of Porous Materials for the Removal of Lead from Waste Water

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Abstract : Adsorption of lead by a natural porous material was studied to establish a baseline for the removal of heavy metals from drinking and waste water. Samples were examined under different conditions such as solution pH, solution concentration, solution temperature, and exposure time. New materials with potentially enhanced adsorption properties were developed by functionalizing the surface of the natural porous material to fabricate graphene based coated and sulfide based treated porous material. The functionalized materials were characterized with Fourier Transform Infrared Spectroscopy (FTIR), Raman, Thermogravimetric Analysis (TGA) and Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) techniques. Solution pH effect on removal efficiency has been investigated in acidic (pH = 4), neutral (pH = 6) and basic (pH = 10) pH levels. All adsorbent materials showed highest adsorption capacities at neutral pH levels. Batch experiment was employed to assess the efficacy for the removal of lead with the sorption kinetics and the adsorption isotherms being determined for the natural and treated porous materials. The addition of graphene-based and sulfide-based materials increased the lead removal capacity of the natural clean porous material. Theoretical calculations confirmed pseudo-second order model as kinetic mechanism for lead adsorption for all adsorbents.

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