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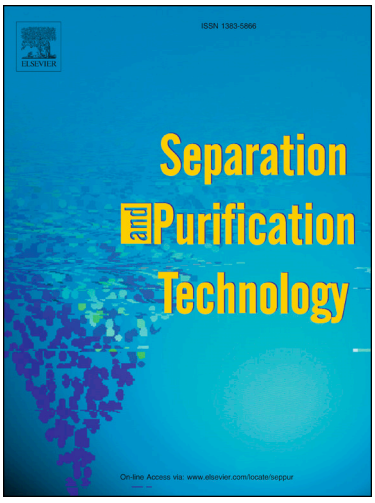

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Polyethylenimine modified graphene oxide hydrogel composite as an efficient adsorbent for heavy metal ions

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Abstract:

Graphene oxide embedded calcium alginate (GOCA) beads were synthesized and further functionalized/reduced with polyethylenimine to increase their adsorption capacity towards heavy metal ions. The adsorption of metal ions such as Pb (II), Hg (II) and Cd (II) from aqueous solutions on the functionalized GOCA was studied under different experimental conditions and the results showed that the functionalized beads had high adsorption capacity compared to the non-functionalized beads. The maximum uptake of heavy metal ions was 602, 374, 181 mg/g for Pb (II), Hg (II) and Cd (II) ions respectively. The kinetics were found to follow the pseudo-second-order and the equilibrium data fitted well with the Langmuir adsorption isotherm. Thermodynamic parameters such as standard Gibbs Energy (ΔG^0), standard enthalpy (ΔH^0) and standard entropy (ΔS^0) changes were calculated. Adsorption-desorption studies were carried out successfully up to five cycles using a mixture of HCl (pH 5) and 200 ppm $CaCl_2$ solution as eluent. The newly synthesized beads showed superior metal ion removal capacity compared to alginate beads and polyamine functionalized GO combined capability due to synergetic effect. The results suggest that the functionalized graphene oxide in calcium alginate bead matrix can be efficiently used as an adsorbent for metal ions removal from wastewater.

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