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Chromate and arsenate removal by layered double hydroxides-polymer beads

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In this study, a novel Mg-Al-Cl and Mg-Fe-Cl beads were developed for removal of hexavalent chromium. The Mg-Al-Cl and Mg-Fe-Cl beads were generated by impregnating synthetic Mg-Fe-Cl and Mg-Al-Cl (with a Mg:Fe, Mg:Al molar ratio 3:1) into alginate/PVA-glutaraldehyde gel bead. The adsorption of chromate and arsenate onto the Mg-Al-Cl and Mg-Fe-Cl beads were investigated by performing both equilibrium and kinetic batch tests. The adsorption kinetics of chromate and arsenate onto Mg-Al-Cl and Mg-Fe-Cl beads were well described by the pseudo second-order kinetic model and adsorption data fitted well to a Langmuir isotherm. Langmuir monolayer capacities were 1.4721 mg Cr/g and1.7737 mg As/g for Mg-Al-Cl beads and 1.3587 mg Cr/g and 1.6439 mg As/g for Mg-Fe-Cl beads. The removal efficiency of chromate by Mg-Al-Cl and Mg-Fe-Cl beads was 92.5% and 90.0% for the initial solution concentrations of 45 mg Cr/L, respectively. The efficiency of arsenate removal was 91.19% for Mg-Al-Cl beads and 79.08 for Mg-Fe-Cl beads at initial concentration of 50 mg As/L. Hence, the Mg-Al-Cl and Mg-Fe-Cl beads developed in this study can be used as promising adsorbents for simultaneous removal of chromate from industrial waste water or groundwater containing these contaminants.

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