



Fabrication and characterization of polyethyleneimine immobilized on chloropropyl- and silica-coated magnetic nanoparticles for Pb²⁺ removal from aqueous solution

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Received 20 November 2014; Accepted 3 June 2015

ABSTRACT

A new surface polymeric functionalized magnetic adsorbent was synthesized through the grafting polyethyleneimine onto chloropropyl- and silica-coated magnetic nanoparticles and characterized by transmission electron microscopy, X-ray diffraction, IR, elemental analysis, and thermo gravimetric analysis. The relationship between grafting reaction conditions, such as solvent, reaction time, reaction temperature, and the polyethyleneimine amount added, and grafting percentage was investigated systematically. Under the optimized conditions, the magnetic adsorbent was fabricated and used for the removal of Pb²⁺ from the solutions for the first time. Batch experiments were carried out to examine the influence of different sorption parameters, for example, solution pH, initial concentration of Pb²⁺, contact time, and adsorbent dosage. The equilibrium sorption data fitted Langmuir adsorption isotherm well and the adsorbent–adsorbate kinetics followed pseudo-second-order model with a maximum adsorption capacity of 131 mg g⁻¹, which revealed that the prepared polymeric magnetic adsorbent was attractive and effective material with high uptake capacity.

Keywords: Magnetic adsorbent; Surface polymeric functionalization; Adsorption; Pb²⁺

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