Journal Article Volume 34, Issue 4 Polymers for Advanced Technologies Pages 1341 – 1357

Facial synthesis of colloidal stable magnetic nanoparticles coated with high hydrophilic negative charged poly(4-styrenesulfonic acid co-maleic acid) sodium for water remediation

Abstract

The enhancement of the colloidal stability of magnetite nanoparticles (MNPs) for environmental-related fields has greatly attracted researchers' attention. This study used a high hydrophilic negatively charged polyelectrolyte, poly(4-styrenesulfonic acid co-maleic acid) sodium (PSAAS), to enhance the colloidal stability of MNPs. Coating of the naked MNPs with PSAAS polyelectrolyte is a simple and rapid method to obtain colloidally stable MNPs while sustaining the chemical reactivity of MNPs in water purification. The prepared PSAAS-coated MNPs were characterized by scanning electron microscope, energy dispersive X-ray, Fourier transform infrared, zeta potential analysis, transmission electron microscope and X-ray diffraction. Moreover, the colloidal stability and adsorption performance tests of these naked MNPs and PSAAS-coated MNPs (with different concentrations of PSAAS coated) were investigated and compared. PSAAS-coated MNPs with 0.001 g/ml PSAAS coating possessed the best colloidal stability and the highest methylene blue (MB) dye removal efficiency (94.53 ± 0.69%). The adsorption isotherm and kinetic studies for the adsorption of MB onto PSAAS-coated MNPs were well-described by the Langmuir model and pseudo-second-order kinetic model. These magnetic adsorbents, with high separation efficiency, simple and low production cost and recyclable property, are promising as practicable adsorbents in water treatment.

Keywords

Adsorption; Iron Oxide; Methylene Blue; Polymer Coating; Reusable