



Preparation, characterization, and Ce(III) adsorption performance of poly(allylamine)/silica composite

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ABSTRACT

In the present work, an organic–inorganic hybrid composite (poly(allylamine)/silica) was facilely prepared through grafting poly(allylamine) onto the modified silica. Surface property, morphology, and texture parameters of the composite were characterized by infrared spectroscopy (FTIR), scanning electron microscopy, and N_2 adsorption/desorption measurements, respectively. Then, the adsorptive property of this composite for recovery of Ce(III) was investigated systematically. Batch tests were performed under a range of conditions to examine the effects of contact time, adsorbent amount, initial Ce(III) concentration, and solution pH. At optimal experimental conditions, the maximum adsorption capacity of Ce(III) was up to 111.8 mg g^{-1} . Full kinetic and thermodynamic investigations as well as isotherm analysis were also undertaken. It was found that the adsorption kinetics could be well fitted by the pseudo-second-order model, whereas the Freundlich model provided the better description for the equilibrium data. The adsorption process was spontaneous and endothermic with an increase of randomness at the solid–solution interface during adsorption. Moreover, the reusability of poly(allylamine)/silica composite was evaluated, and the result showed that the composite could be well reused in several cycles without significant deterioration in its original performances.

Keywords: Silica; Poly(allylamine); Adsorption; Cerium

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