Magnetic Fe$_3$O$_4$/sepiolite composite synthesized by chemical co-precipitation method for efficient removal of Eu(III)

Shaoming Yu*, Xiguang Liu, Gaojin Xu, Yong Qiu, Leilei Cheng

School of Chemistry and Chemical Engineering, Hefei University of Technology, Hefei 230009, Anhui, China,
Tel. +86 551 62901342; Fax: +86 551 62901450; emails: shmyu@hfut.edu.cn (S. Yu), lelchg5@gmail.com (X. Liu),
collinscheng@163.com (G. Xu), eyrewang@yeah.net (Y. Qiu), leileicheng555@gmail.com (L. Cheng)

Received 23 February 2015; Accepted 8 August 2015

ABSTRACT

In this study, a novel magnetic Fe$_3$O$_4$/sepiolite composite (MFSC) was synthesized via chemical co-precipitation method. The synthesized MFSC was characterized by the several kinds of methods. The characterization results showed that MFSC was composed of Fe$_3$O$_4$ nanoparticles on the surface of sepiolite. Moreover, MFSC was used as an adsorbent for the removal of Eu(III) from aqueous solutions. The influences of contact time, pH, ionic strength, and temperature were investigated. The synthesized MFSC had a Langmuir adsorption capacity of 30.85 mg/g at 293 ± 1 K, which was much higher than that of some common and low-cost adsorbents. Ion exchange and surface complexation were the main adsorption mechanisms of Eu(III) adsorption on MFSC. The novel MFSC adsorbent is efficient and economical for Eu(III) removal for its good adsorption characteristic, excellent regeneration property, and high magnetic separation efficiency.

Keywords: Magnetic Fe$_3$O$_4$/sepiolite composite; Co-precipitation; Eu(III); Adsorption