



Surface functionalization of D301 resin with urea: synthesis, characterization, and application for effective removal of toxic heavy metal ions

Fu-Qiang An*, Xiao-Yan Xue, Min Li, Tuo-Ping Hu, Jian-Feng Gao

Chemical Department, North University of China, Taiyuan 030051, China, Tel. 86-351-3923197; Fax: 86-351-3922118; emails: anfuqiang@nuc.edu.cn (F.-Q. An), 1056446066@qq.com (X.-Y. Xue), limin@126.com (M. Li), tuopinghu@126.com (T.-P. Hu), gaojianfeng@163.com (J.-F. Gao)

Received 12 May 2017; Accepted 29 August 2017

ABSTRACT

In this study, urea-modified D301 resin, UD301, was obtained successfully. The surface properties, chemical functional groups, element content, and surface morphology were investigated. The adsorption properties of UD301 for toxic heavy metal ions (Pb(II), Hg(II), Cd(II), and Ni(II)) were studied by batch method and the practical application value was evaluated by column method. The experimental results showed that UD301 possesses strong adsorption ability for Pb(II), Hg(II), Cd(II), and Ni(II). pH and temperature has a great influence on the adsorption capacity in the studied range. The adsorption capacities of UD301 towards Pb(II), Hg(II), Cd(II), and Ni(II) could reach 412.8, 396.9, 210.2, and 121.9 mg·g⁻¹ at 293 K and pH of 6, respectively. The adsorption process was a typical monolayer chemical adsorption and could be well described by the Lagergren-first-order model. The adsorption was also an endothermic and spontaneous process driven by entropy. In addition, UD301 could be reused almost without any loss in the adsorption capacity.

Keywords: Adsorption; Removal; Heavy metal ions; Urea; D301 resin

* Corresponding author.