Desalination and Water Treatment
www.deswater.com
doi: 10.5004/dwt.2018.21944

109 (2018) 318–325
March

Synthesis and characterization of a nanoadsorbent for removal of bisphenol A by hydrous magnesium oxide: kinetic and isotherm studies

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Received 13 July 2017; Accepted 24 January 2018

ABSTRACT

Endocrine-disrupting chemicals, bisphenol A (BPA), are currently unregulated chemicals that interfere with the endocrine systems of organisms by different ways. The removal of BPA in this study is by its adsorption on hydrous magnesium oxide (HMgO) nanoparticles synthesized by the sol–gel method via 1-*n*-butyl-3-methylimidazolium tetrafluoroborate ionic liquid. Several analytical techniques such as scanning electron microscopy, X-ray diffractometer (XRD) and Fourier transform infrared spectroscopy were used to characterize HMgO nanoparticles. The influence of different experimental factors including solution pH, contact time, adsorbent dosages, initial BPA concentrations and regeneration was studied. The XRD analysis showed that HMgO nanoparticles were successfully synthesized and illustrated their purity and crystallinity. Findings revealed that BPA removal was decreased from 4.2 to 2.5 mg/g by an enhancement in solution pH from 9 to 11, respectively. Increasing adsorbent dosage from 2 to 100 mg/L resulted in increasing the removal from 24.9% to 100%, respectively. In addition, 4.2 mg/g and 50 min were respectively obtained as the adsorption capacity and equilibrium reaction time of BPA adsorption in aqueous media using HMgO. Findings of equilibrium and kinetic studies revealed higher ability of Freundlich isotherm (R^2 = 0.997) and pseudo-first-order kinetic (R^2 = 0.998) models, than the other models for fitting the data of BPA adsorptive removal. Furthermore, it can be concluded that HMgO nanoparticles were the appropriate sorbents to remove BPA from aqueous media.

Keywords: Sol–gel process; Magnesium oxide; Bisphenol A; Adsorption; Isotherm; Kinetic

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