Desalination and Water Treatment
www.deswater.com
doi: 10.1080/19443994.2013.878255

54 (2015) 113–121
April

Taylor & Francis
Taylor & Francis Group

Adsorption of sulfamonomethoxine antibiotics to cucurbit[6]uril polymer: kinetics and thermodynamic studies

Hong-Tao Qiao[a,b], Yun Liu[a,*], Yuan-Hua Dong[a], Sirui Li[c], Ping Wang[b], Tao Jin[a]

[a]*Key Laboratory of Soil Environment and Pollution Remediation, Institute of Soil Science, Chinese Academy of Sciences, Nanjing 210008, China*
Tel. +86 25 86881370; Fax: +86 25 86881000; email: yliu@issas.ac.cn
[b]*School of Chemistry and Biological, Lanzhou Jiaotong University, Lanzhou 730070, China*
[c]*Nanjing Foreign Language School, Nanjing 210008, China*

Received 2 September 2013; Accepted 16 December 2013

ABSTRACT

The occurrence of sulfonamide antibiotics in aquatic environments has been recognized as a significant issue warranting focused attention. A cucurbituril polymer (CP) was used as an adsorbent for sulfamonomethoxine (SMM) in aqueous solution. The experimental isotherm data were analyzed using non-linear Freundlich and Henry isotherm equations. Five error functions were used to predict the parameters of the isotherm. The Freundlich model had performed better with respect the equilibrium data and the HYBRID error function provided the lowest sum of normalized error. Our thermodynamic investigation indicated that the adsorption of SMM onto CP was spontaneous at all temperatures and was an exothermic process. The pseudo-first-order and pseudo-second-order kinetic model were used to fit the kinetics process of SMM adsorption on CP. The adsorption of SMM could be best described by the pseudo-second-order equation. The intra-particle diffusion model was used to further analyze the diffusion mechanism of SMM on CP. The result implies that intra-particle diffusion is not the only rate-limiting step. And the adsorption was favorable in the pH range of 2.0–6.0. The results indicate that CP could serve as alternative adsorbent for removing SMM antibiotics from water.

Keywords: Polymer; Cucurbiturils; Sulfamonomethoxine; Adsorption

*Corresponding author.