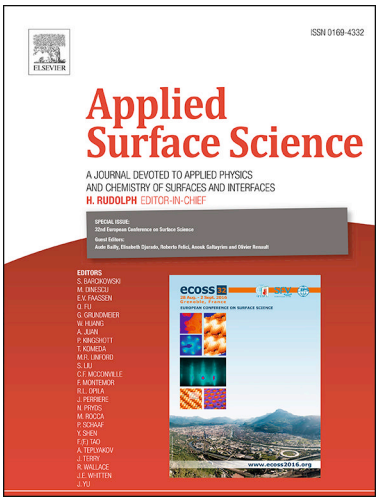

Full Length Article

Preparation of molecularly imprinted ordered mesoporous silica for rapid and selective separation of trace bisphenol A from water samples

Zulei Zhang, Lei Li, Hongmei Wang, Liping Guo, Yunyun Zhai, Jian Zhang, Yiwen Yang, Hailong Wang, Zhengzhi Yin, Yixia Lu

PII: S0169-4332(18)30971-1
DOI: https://doi.org/10.1016/j.apsusc.2018.04.017
Reference: APSUSC 39016

To appear in: *Applied Surface Science*

Received Date: 21 December 2017
Revised Date: 30 March 2018
Accepted Date: 2 April 2018

Please cite this article as: Z. Zhang, L. Li, H. Wang, L. Guo, Y. Zhai, J. Zhang, Y. Yang, H. Wang, Z. Yin, Y. Lu, Preparation of molecularly imprinted ordered mesoporous silica for rapid and selective separation of trace bisphenol A from water samples, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.04.017

Preparation of molecularly imprinted ordered mesoporous silica for rapid and selective separation of trace bisphenol A from water samples

Zulei Zhang, Lei Li, Hongmei Wang, Liping Guo, Yunyun Zhai, Jian Zhang, Yiwen Yang, Hailong Wang, Zhengzhi Yin, Yixia Lu

School of Biology and Chemical Engineering, Jiaxing University, Jiaxing 314001, China

Abstract

A novel molecularly imprinted ordered mesoporous silica SBA-15 (MI-SBA-15) was prepared using a semi-covalent approach to achieve high selectivity toward bisphenol A (BPA) from water samples. The structure and morphology of synthesized MI-SBA-15 were characterized by transmission electron microscopy, Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy, thermogravimetry, X-ray diffraction, and N_2 absorption analysis. Results show that MI-SBA-15 possessed highly ordered mesoporous structure with large surface area. Batch experiments were conducted to investigate the rebinding capability of MI-SBA-15 to BPA, showing rapid kinetics, high rebinding capacity, and excellent selectivity. The experimental data fitted well to the pseudo-second-order model and Langmuir–Freundlich adsorption isotherm, indicating chemical adsorption as the rate-limiting step. In addition, selectivity assay showed all the relative selectivity coefficients toward BPA over its structure analogs, which were higher than 132, further indicating the significant enhancement of the rebinding selectivity of MI-SBA-15. Furthermore, water samples were analyzed with MI-SBA-15 successfully, showing high recovery in the range of 87.0%–110.2%. In conclusion, MI-SBA-15 possessed high affinity and selectivity and compelling adsorption capacity for the extraction of BPA from water samples.

Keywords:

Ordered mesoporous silica; Surface molecularly imprinted; Selective separation; Bisphenol A; Water samples

1. Introduction