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Preparation, characterization and selective recognition for vanillic acid imprinted mesoporous silica polymers

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Abstract A vanillic acid imprinted mesoporous silica polymers (MIPs) was prepared by copolymerizating a modified mesoporous silica molecular sieve with template molecule, functional monomer and cross-linker in present work. Interaction between the template and functional monomer was investigated by ultraviolet/visible spectrophotometry. These MIPs were characterized by Fourier transmission infrared spectrometry (FTIR) and scanning electron microscopy (SEM). Adsorption dynamics and thermodynamic behavior of MIPs was explored and the selective recognition capability evaluated. Also, the applicability for the MIPs as solid phase extraction media was tested. Results indicated the 1:1 (mole ratio) complex of vanillic acid-4-vinylpyridine might predominate in the pre-polymerization mixture and the MIPs obtained possessed rapid binding dynamics and higher affinity toward template molecules, reaching adsorption equilibrium within 230 min with the highest adsorption amount of 50.7 mg g^{-1}. Freundlich model was shown best to describe isotherm adsorption for the MIPs. The MIPs could selectively bind template molecule with selectivity coefficients of 1.36-1.50. In addition, a higher enrichment capability when using it for gathering target compound from methanol extract of *Artemisia stelleriana* and a good reusability during adsorption-desorption recycling use could be observed.

Keywords: Molecularly imprinted mesoporous silica polymer; Vanillic acid; Molecular recognition; Surface imprinting

1. Introduction

Design and preparation of novel separation materials at molecular level is of great attraction in the field of separation and purification. Molecular imprint technique (MIT) revealed a potential superiority in this respect. To produce molecularly imprinted polymers (MIPs), a compound is often chosen as the template around which a complex is formed by arranging functional monomers and polymerization started

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