

Multi-Template Molecularly Imprinted Polymer: Synthesis, Characterization and Removal of Selected Acidic Pharmaceuticals from Wastewater

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Abstract : Removal of organics from wastewater offers a better water quality, therefore, the purpose of this work was to investigate the use of molecularly imprinted polymer (MIP) for the elimination of selected organics from water. A multi-template MIP for the adsorption of naproxen, ibuprofen and diclofenac was synthesized using a bulk polymerization method. A MIP was synthesized at 70°C by employing 2-vinylpyridine, ethylene glycol dimethacrylate, toluene and 1,1'-azobis-(cyclohexanecarbonitrile) as functional monomer, cross-linker, porogen and initiator, respectively. Thermogravimetric characterization indicated that the polymer backbone collapses at 250°C and scanning electron microscopy revealed the porous and roughness nature of the MIP after elution of templates. The performance of the MIP in aqueous solutions was evaluated by optimizing several adsorption parameters. The optimized adsorption conditions were 50 mg of MIP, extraction time of 10 min, a sample pH of 4.6 and the initial concentration of 30 mg/L. The imprinting factors obtained for naproxen, ibuprofen and diclofenac were 1.25, 1.42, and 2.01, respectively. The order of selectivity for the MIP was; diclofenac > ibuprofen > naproxen. MIP showed great swelling in water with an initial swelling rate of 2.62 g/(g min). The synthesized MIP proved to be able to adsorb naproxen, ibuprofen and diclofenac from contaminated deionized water, wastewater influent and effluent.

Keywords : adsorption, molecularly imprinted polymer, multi template, pharmaceuticals

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