

Synthesis and characterization of molecularly imprinted polymer membrane for the removal of 2,4-dinitrophenol.

Abstract

Molecularly imprinted polymers (MIPs) were prepared by bulk polymerization in acetonitrile using 2,4-dinitrophenol, acrylamide, ethylene glycol dimethacrylate, and benzoyl peroxide, as the template, functional monomer, cross-linker, and initiator, respectively. The MIP membrane was prepared by hybridization of MIP particles with cellulose acetate (CA) and polystyrene (PS) after being ground and sieved. The prepared MIP membrane was characterized using Fourier transform infrared spectroscopy and scanning electron microscopy. The parameters studied for the removal of 2,4-dinitrophenol included the effect of pH, sorption kinetics, and the selectivity of the MIP membrane. Maximum sorption of 2,4-dinitrophenol by the fabricated CA membrane with MIP (CA-MIP) and the PS membrane with MIP (PS-MIP) was observed at pH 7.0 and pH 5.0, respectively. The sorption of 2,4-dinitrophenol by CA-MIP and PS-MIP followed a pseudo-second-order kinetic model. For a selectivity study, 2,4-dichlorophenol, 3-chlorophenol, and phenol were selected as potential interferences. The sorption capability of CA-MIP and PS-MIP towards 2,4-dinitrophenol was observed to be higher than that of 2,4-dichlorophenol, 3-chlorophenol, or phenol.

Keyword: 2,4-dinitrophenol; Cellulose acetate; Molecular imprinted polymer; Polysulfone.