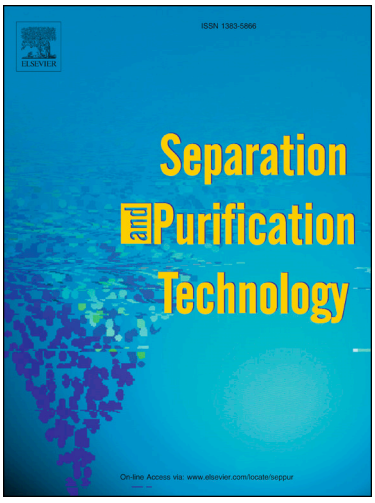

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Evaluation of agarose-entrapped magnetic nanoparticles influence on protein adsorption isotherm and kinetics using nickel-iminodiacetic acid ligand

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Abstract

Employing magnetic beads for immobilized metal affinity chromatography application was studied with the approach of magnetic effects investigation. Hence, fabricated magnetic nanoparticles-carrying beads were functionalized with Ni(II)-iminodiacetic acid (IDA). BET-BJH results showed that nanoparticles affected pore sizes lower than 10nm. Therefore, the pore blockage by protein molecules is considered as an outcome of the new pore diameter in magnetic beads. In accordance, bovine serum albumin (BSA) adsorption isotherms revealed a significant difference between magnetic and nonmagnetic beaded matrices. For nonmagnetic beads, adsorption isotherm followed Langmuir model. However, one step increase in adsorption isotherm for initial BSA concentration from 0.5mg/ml to 0.8mg/ml was observed on magnetic beads due to pore blockage by proteins. BSA Adsorption kinetics on beads was found to follow the assumptions of an intraparticle diffusion-controlled pseudo-second order mechanism, with higher adsorption rate constants at lower adsorbate concentrations.

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