Preparation of crosslinked quaternary amide–sulfonamide resin for removal of mercury ions from aqueous solutions

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ABSTRACT

Cross-linked copolymer beads were prepared by suspension polymerization of styrene (0.90 mol) and divinyl benzene (DVB) (0.10 mol) mixtures. The resulting copolymer beads with sulfonamide-based quaternary amide functions were prepared in three steps: (1) by chlorosulfonation with chlorosulfonic acid; (2) by sulfonamidation reaction with N,N-dimethylethylenediamine; and (3) by quaternization reaction with chloroacetamide. The resulting polymer resin, which had a chloroacetamide content of 2.50 mmol/g, was effective in extracting mercury from aqueous solutions. The mercury sorption capacity was around 3.0 mmol/g in non-buffered conditions. Experiments performed in identical conditions with several metal ions revealed that Cd(II), Mg(II), Zn(II), and Fe(III) ions also were extractable in low quantities (0.2–0.8 mmol/g). The sorbed mercury could be eluted by repeated treatment with hot acetic acid without hydrolysis of the amide groups.

Keywords: Polymer modification; Sulfonamide; Mercury removal; Quaternization

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