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Modified silica gel surface with chelating ligand for effective mercury ions adsorption

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Abstract

The electron-donating group dithiocarbamate functionalized silica gel (SG-PDC) was prepared and used for adsorption of metal ions from aqueous solution. The modified silica gel was characterized by fourier transform infrared spectroscopy (FT-IR), elemental analysis (EA) and scanning electron microscopy (SEM). It showed excellent adsorption selectivity for Hg(II) ions over other metal ions, such as Cu(II), Cd(II), Pb(II). Kinetics and equilibrium isotherms of Hg (II) sorption were determined in batch equilibrium experiments. The adsorption capacity for Hg (II) of SG-PDC was more than five times as much as that of unmodified silica gel. X-ray photoelectron spectroscopy (XPS) was applied to study the adsorption mechanism and it confirmed that the improvement in mercury adsorption was related to the ligand groups containing S and N atoms anchored on the surface of silica gel. The adsorbent had high reusability after several adsorption–desorption cycles. This study provided a feasible strategy to develop the effective sorbent for Hg (II) ions by covalently modification of silica gel with ligand containing multiple coordination sites.

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