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## **SILICA GEL MODIFIED WITH AMINO IMINE GROUPS AS AN ADSORBENT FOR METALLIC CATIONS**

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### **Abstract**

In this study, silica gel initially reacted with N-(2-aminoethyl)-3-aminopropyl-triethoxysilane and subsequently with formaldehyde resulted in a modified solid that contained amino imine groups,  $\text{Si}2\text{NCH}_2$ . The solids were characterized by CHN elemental analysis, thermogravimetric analysis (TGA/DTG), FTIR spectroscopy,  $^{13}\text{C}$  solid-state NMR, and nitrogen adsorption/desorption measurements. The adsorption of Cd(II), Pb(II) and Cr(VI) ions onto  $\text{Si}2\text{NCH}_2$  in aqueous solutions were examined to study the effect of the initial metal ion concentration, the pH, and the contact time at the liquid/solid interface. The studies showed that  $\text{Si}2\text{NCH}_2$  acted as an adsorbent for the moderate removal of Cd(II), Pb(II), and Cr(VI) from aqueous solutions. Lagergren first-order, pseudo-second-order, and intraparticle diffusion models were used to describe the kinetic data and showed that the processes fitted well with the pseudo-second-order model. Langmuir, Freundlich, Redlich–Peterson and Langmuir-Freundlich models were applied to the adsorption equilibrium. The Langmuir-Freundlich and Redlich–Peterson models best represented the adsorption of Cr(VI) and Pb(II), respectively. Cd(II) adsorption data were not adequately fitted to any of the investigated isotherm models. The results indicated that amino imine-modified silica can be used as a low-cost material for the removal of cations from aqueous solutions.

*Key words:* adsorption, heavy metal ions, silica gel.

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