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REMOVAL OF CADMIUM (II) FROM AQUEOUS MEDIA USING COOH/TUD-1 MESOPOROUS SOLID. KINETIC AND THERMODYNAMIC STUDIES

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Abstract

The adsorption potential of 10 wt.% COOH/TUD-1 material for removing Cd^{2+} from aqueous solutions was investigated via the batch technique, and the effects of pH, temperature and contact time were studied. Experimental data showed that the maximum Cd^{2+} adsorption, 90%, occurred at pH 6. The adsorption equilibrium was reached within 35 min for 10 wt.% COOH/TUD-1. The adsorption mechanism was investigated in terms of its thermodynamics and kinetics. The adsorption data were fitted using the Langmuir and Freundlich isotherms, and the obtained modeling equilibrium adsorption data suggested that the 10 wt.% COOH/TUD-1 sample contained homogeneous adsorption sites that fit the Langmuir adsorption model well. The pseudo-second-order model described well the 10 wt.% COOH/TUD-1 adsorption process. The positive values of both $\Delta H°$ and $\Delta S°$ suggest, respectively, an endothermic reaction and an increase in randomness at the solid-liquid interface during the adsorption of Cd^{2+} onto the COOH/TUD-1 adsorbents. And, $\Delta G°$ values obtained were all negative, indicating a spontaneous adsorption process. Desorption and regeneration experiments indicated that ≈ 98% of the metals were desorbed. COOH/TUD-1 samples were characterized using N_2 adsorption-desorption isotherms, powder X-ray diffraction (XRD), Fourier-transform infrared (FT-IR) spectroscopy and Transmission electron microscopy (TEM).

Key words: adsorption, Cadmium, COOH/TUD-1, mesoporous sorbents

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