Adsorptive removal of Mn(II) from water and wastewater by surfactant-modified alumina

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ABSTRACT

The adsorptive removal of Mn(II) from aqueous solution on prepared surfactant-modified alumina (SMA) has been studied for the first time. The process of removal is via adsolubilization of Mn(II) in the admicelle formed by sodium dodecyl sulfate on the alumina surface. The effects of contact time, initial concentration of Mn(II), adsorbent dose, and pH on removal of Mn(II) have been examined by batch study. Adsorption–desorption equilibrium is reached in 30 min. The optimum range of pH for Mn(II) removal is 6–7. The results obtained are used for the applicability of Freundlich and Langmuir adsorption isotherm. The experimental and theoretical \( q_e \) values for both models have been compared. The error analysis and comparison of \( R^2 \) values shows that the adsorption follows Freundlich isotherm better. The adsorption kinetics obey pseudo-second-order model. The adsorbent SMA is used for the removal of Mn(II) from the Mn(II)-spiked wastewater and manganese-bearing real industrial wastewater.

Keywords: Mn(II) removal; Surfactant-modified alumina; Adsorption; Adsolubilization; Kinetic studies; Applicability to wastewater treatment