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Peculiar properties of LTA/FAU synthetic composite zeolite and its effect on Cu²⁺ adsorption: factorial experimental design

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ABSTRACT

Synthetic zeolites have been widely studied as metal ion adsorbents from aqueous solutions due to their physical and chemical properties, such as their cationic exchange capacity, which gives them a high adsorption capacity. Copper is a toxic metal that is of particular concern due to its toxicity, and it is introduced into the environment mainly through the disposal of industrial effluents. It has a tendency to accumulate in groundwater, but it can contaminate the soil and air as well. In this work, a FAU/LTA (Faujasite and Linde type A) composite zeolite was investigated for its efficiency in removing copper metal ions from aqueous solutions. A material characterization was performed in order to determine its morphology and chemical composition. Using an experimental design, the main variables that affect the adsorption process were studied. The optimal values that were determined from the experimental design studies were 200 mg L⁻¹ for initial concentration and 100 mg for the mass of adsorbent. Kinetics studies indicated that the adsorption equilibrium was reached within 5 min. A maximum adsorption capacity of 120 mg g⁻¹ was found through isothermal studies. The results showed that the mix of synthetic zeolite (FAU/LTA) is very efficient in the removal of copper from aqueous solutions.

Keywords: Synthetic zeolite; Adsorption; Metal ion

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