Abstract

Chromium is a highly toxic heavy metal that poses a risk to human health and environmental quality. Its adsorption in wastewater is a key solution to mitigate its adverse effects. This study had a quantitative approach, experimental type and explanatory level. The dependent variable was the chromium removal efficiency and the independent variables was the adsorption conditions. A composite adsorbent with corn husk waste and bentonite was prepared, chemically characterized and subjected to FRIT analysis. The study was carried out in a laboratory scale batch system under controlled conditions. The kinetics, equilibrium, and adsorption mechanisms were analyzed. The adsorption was evaluated in synthetic chromium solutions with initial concentration between 20 and 100 mg/L. The results indicate that the adsorption kinetics fit the pseudo-first order model (R2 = 0.968), while the adsorption equilibrium fits the Freundlich model (R2 = 0.997). Response surface design was used to optimize the adsorption time, adsorbent dose, and initial concentration of chromium in solution. The optimum operating conditions for 100 % adsorption efficiency are 103 minutes, adsorbent dose of 29.71 g/L, and initial chromium concentration of 31.13 mg/L. Chemical analyses suggest that chromium interacts with silicon and aluminum atoms in the bentonite. These results demonstrate the potential of bentonite and corn husk waste as an adsorbent for chromium removal.

Key words: **Adsorption, Clay, Chromium removal, Heavy metals, Response surface design.**