

ABSTRACT

Hexavalent chromium waste is classified as B3 waste with a level of oxidation and toxicity that can be dangerous for living things and the environment. An effective method for reducing Cr(VI) contamination levels is by adsorption using natural zeolite. In this research, adsorption of Cr(VI) anions was carried out with CTAB-modified natural zeolite using the Response Surface Method. Klaten natural zeolite was activated with HCl and modified with cetyltrimethylammonium bromide (CTAB) surfactant. Characterization of X-Ray Diffraction (XRD), X-Ray Fluorescence (XRF), Fourier Transform Infra Red (FTIR), and Gas Sorption Analyzer (GSA). A Cr(VI) adsorption test was carried out using RSM, Box-Behnken design (BBD) in RSM was used to obtain the relationship between the test variables and the response, interactions between variables, and obtain optimum conclusions in the test. In the adsorption test, the test variables were Cr(VI) concentration, amount of adsorbent, and pH. XRD results show that H-Zeolite is classified as a mordenite natural zeolite with high crystallinity. The XRF results show that the main components of natural zeolite are SiO₂ and Al₂O₃ with a Si/Al ratio of 5.95. The characterization results show that the natural zeolite was successfully modified with CTAB, with the absorption characteristics of the CTAB functional groups, namely the alkyl group and the trimethylammonium group. GSA results show that H-Zeolite and Z.CTAB 0.1 M are mesoporous materials. The adsorption results showed %Removal Cr(VI) at 11.88-51.88%. The results of the RSM analysis show that the most influential factor on %Removal is the concentration of Cr(VI) then the amount of adsorbent and pH. The RSM analysis results obtained showed that the quadratic model could be used to navigate the Cr(VI) adsorption test and the conclusion was obtained that the optimum conditions for Cr(VI) adsorption were %Removal at 58.37%. The appropriate kinetic model for Cr(VI) adsorption with Z.CTAB 0.1 M is a pseudo second-order kinetic model which shows that adsorption is influenced by electrostatic interactions between the adsorbent and the adsorbate.

Keywords : Natural Zeolite, CTAB, Adsorption, Cr(VI), RSM