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Eco-friendly technology for Cr (VI) elimination from wastewater treatment

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Abstract

Waste mussel shells were used as new low cost and eco-friendly biosorbant for the removal of hexavalent chromium from aqueous solutions. Batch mode experiments were done using various parameters such as pH, contact time, dye concentration and thermodynamic study.

First, the adsorbent was characterized using X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) and ICP-MS analysis for chemical analysis. The experimental results showed that mussel shells are a mixture of 73% of calcite and 26% of aragonite with traces of aluminum, magnesium, sodium, silicium and zinc.

Maximum pH was about 2 for efficient biosorption of Cr (VI). The equilibrium was attained in 120 min. The kinetic analysis showed that the pseudo-second-order model is the best fit to the experimental data. The experimental isotherm data was analyzed using Langmuir and Freundlich isotherm equations. The best fit was obtained by Freundlich model with maximum monolayer biosorption capacity of 6 mg/g.

Thermodynamic study was found to be not spontaneous, endothermic. The Gibbs energy decreased with rise in temperature indicating an increase in feasibility of biosorption at higher temperature.

Keywords: Mussel Shells, Biosorption, Chrome VI