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BATCH AND COLUMN REMOVAL OF CHROMIUM (VI) FROM AQUEOUS SOLUTION USING POLYPYRROLE

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Abstract

The present study deals with the removal of Cr (VI) from aqueous solution by polypyrrole (PPy). Response surface methodology (RSM) was applied for the design and analysis of experiments in the optimization of pH, temperature, initial concentration, contact time and adsorbent dose during the removal of the Cr (VI). The optimum adsorbent dose, temperature, initial concentration of Cr (VI), pH and contact time were found to be 0.8 g, 46.5 ^{o}C, 187.5 mg/L, 5.3 and 15.4 min respectively. Under optimal values of process parameters, high removal efficiency (>90%) was obtained for Cr (VI). Analysis of variance (ANOVA) of central composite design showed a high coefficient of determination value (R^2 = 0.96) and satisfactory prediction second-order regression model was derived. Maximum chromium removal efficiency was predicted and experimentally validated. The Langmuir, Freundlich and Dubinin–Radushkevick isotherms are subjected to sorption data to estimate sorption capacity. The results gained from this study were well described by the theoretical Freundlich. Three equations, i.e. Morris–Weber, Lagergren and pseudo - second order have been tested to track the kinetics of adsorption process. The results gained from this study were well described by the theoretical pseudo - second order. The removal of Cr (VI) by PPy was also investigated in a fixed bed column. Experiments were conducted to study the effect of important parameters such as bed depth (5–20 cm), flow rate (5–15 ml min^{-1}) and initial concentration (50-300 mg/L). Also the PPy was used for the Cr (VI) removal from industrial wastewater and showed a high potential for the wastewater treatment.

Key words: batch, column, Cr (VI), polypyrrole, response surface methodology

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