

Modification of commercial activated carbon for the removal of 2,4-dichlorophenol from simulated wastewater

Abstract

In this study, modification of commercial activated carbon (AC) has been examined for the removal of 2,4-dichlorophenol (2,4-DCP) from aqueous solutions. The modified process involves impregnation of phosphoric acid at ratios of 0.6–2.4 followed by 500 °C and 700 °C for 2 h. The effect of different impregnation ratios and activation temperatures was studied. Physical and chemical characterization of modified AC was conducted including percentage yield, moisture content, ash content, pH, morphology study and functional groups. The adsorption of 2,4-DCP by modified AC was also investigated. Various tests were conducted on the unmodified AC and chemically modified AC at different contact times (5–60 min) and adsorbent dosages (0.1–0.9 g). Results revealed that the modified AC (AC2) prepared with impregnation ratio, Xp value of 1.2 at 500 °C for 2 h was found to have the highest percentage removal of 2,4-DCP (50 ppm), which is 93.63%. The modified AC showed better capability to adsorb 2,4-DCP from aqueous solutions, the percentage removal was improved to 20.40%. Elovich and intraparticle diffusion kinetic models were used to test the adsorption kinetics. The adsorption of 2,4-DCP proved to fit better in the intraparticle diffusion model compared to Elovich equation. The mechanism of the adsorption process was determined by the intraparticle model.