Application of soot in the removal of 2, 5-dichlorophenol in aqueous medium

Abstract

In this study, soot was used as adsorbent for the removal of 2,5-dichlorophenol (2,5-DCP) in aqueous medium. The adsorption kinetic and isotherm were studied using a variety of adsorption models. Soot, obtain from the exhaust pipe of vehicles, was a poor adsorbent with a very limited surface area. As such, the adsorption of 2,5-DCP had to be conducted for 7 hours in order to achieve equilibrium, which was between the 240th and 360th minutes. The highest percentage of removal of 2,5-DCP achieve was 43.9%. This showed that soot was a weak adsorbent. The experimental data showed that the adsorption kinetics and adsorption isotherm of 2,5-DCP by soot obeyed the pseudo-second order kinetic model (R2=0.9985) and Freundlich isotherm (R2=0.9825) respectively indicating that both physisorption and chemisorptions were instrumental in the adsorption process. Characterization of the soot recovered from the exhaust pipe showed that the ash content and moisture content in soot were quite high at 4.62% and 2.50% respectively. SEM indicated that the soot was nanoparticle in size (>100nm) with non-visible pores. The soot had spherical shape and tend to cluster together forming aggregates. FTIR showed that the functional groups such as O-H, C-H, and C=O groups, may have contributed to the adsorption process. BET isotherm indicated that soot obey the type III isotherm without the presence of hysteresis loop. Although this material is not a good adsorbent, it adsorptive ability may be improved by altering its structure chemically providing a waste to wealth opportunity.