

The effect of temperature on the adsorption of 4-Nitrophenol onto palm shell based activated carbon

Abstract

A series of experiments was conducted to study the adsorption of 4-NP onto Palm Shell based Activated Carbon (PSAC) and the results obtained were compared to two commercial products, one is Coal based Activated Carbon (CBAC) and another is Coconut Shell based Activated Carbon (CSAC). The experiments were carried out in batch mode with the temperatures of the operation were varied from 25 to 40°C and the 4-NP concentrations were varied from 500 to 2000 mg/L. The Langmuir and Freundlich isotherms were found to represent the measured adsorption data well ($R^2 > 0.90$). The results show that in all cases, increasing the temperature from 25 to 40°C, the affinity decreases and CSAC has the lowest (26.13%), followed by CBAC (46.13%) and then PSAC (50.30%). Similar trends also found in the adsorption intensity, where CSAC was the lowest (11.12%), followed by PSAC (21.66%) and CBAC the highest (27.94%). The findings of this investigation suggest that PSAC can be used as an effective adsorbent for the removal of 4-NP from wastewater.

Keywords — Adsorption, 4-nitrophenol, palm shell based activated carbon, Freundlich.