

Activation characteristics of waste walnut shell by phosphoric acid and the application of produced activated carbon as adsorbent

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The adsorption capacity of the activated carbon which was produced using phosphoric acid as the activating agent increased with activation temperature and showed its greatest value at about 550°C. Yield for activated carbon was observed to decrease continuously as the activation temperature was raised. As the activation time increased the yield for activated carbon was showed to decrease continuously. The increase in the amount of activating agent resulted in the increase of the yield for activated carbon. To investigate the adsorption characteristics of the produced activated carbon, the adsorption reactions of Cu^{2+} ion were examined using the produced activated carbon as the adsorbent. In general, the kinetics of the adsorption of Cu^{2+} ion was observed to follow a 2nd-order reaction and the rate constant for adsorption reaction increased as the initial concentration of adsorbate was diminished. The equilibrium adsorption of Cu^{2+} was explained well with Freundlich model and its adsorption reaction was found to be endothermic. The activation energy for adsorption was calculated to be 13.07 kcal/mol, which implied that the adsorption reaction was very irreversible.