

Adsorption of ammonium ions using activated carbon derived from artocarpus odoratissimus skin

ABSTRACT

Wastewater consists of various contaminants including ammonium ions, which are toxic to aquatic life if the concentration exceeds the standard limit. The need for finding an effective treatment to remove the pollutant is crucial, as it is difficult to remove it due to its resistance and tenacity to the environment. In this study, *Artocarpus odoratissimus* or commonly known as "Tarap" skin (TS) was used as a precursor for the preparation of activated carbon (AC) by two-step KOH activation. The TS was pyrolysed first at 350°C prior to KOH activation at 1:1 of impregnation ratio and 800°C of activation temperature under nitrogen gas flow in a tubular furnace. Percentage of yield, surface area, and porosity, morphology structure, surface functionalities and as well as the ability of TS based AC to adsorb ammonium ions were investigated and analysed. The properties of carbon showed that the carbon yield produced was 18.5% with a 1372.51 m²/g of surface area, 0.6756 cm³/g of pore volume and 2.1453 nm of average pore radius. The adsorption capacity of carbon at equilibrium was 1.858 mg/g. The isotherm model and kinetic study for adsorption of ammonium ions were studied using Langmuir and Freundlich, Pseudo-first order and Pseudo-second order, respectively. The equilibrium data obey the Langmuir isotherm model with the highest correlation ($R^2 = 0.9373$). As for the kinetic study, the adsorption process follows Pseudo-second order, which has R^2 value of 0.9964 and adsorption capacity, q_e of 1.737 mg/g.