Evaluation of Refused Tea Waste Activated Carbon for the Removal of Pollutant Using a Textile Dye, Methylene Blue

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The production of different chemicals and releasing of these chemicals to the environment, especially water sources, is one of the main reasons of environment pollution. Although the plenty of methods are being used to remove the pollutant from the waste water, it is essential to find new techniques and to improve existing techniques further to enhance the efficiency of pollutant removal from waste water. In this study, refused tea waste (RTW), an agricultural waste, was converted to low cost adsorbent for the removal of Methylene Blue (MB) from the aqueous solutions. The objectives of this study were to produce activated carbon from RTW, evaluated its performance using MB as a pollutant and modeling of its dye removal with the kinetic study. Activated Carbon (AC) was prepared using RTW by chemical activation. Removal of MB from aqueous solution was performed using batch studies for the determination of the effect of initial concentrations (50, 100, 150, 200 mg/L), and initial pH (2, 4, 6, 8, 10 and 12). The equilibrium time was found as 55 hrs. At the equilibrium, maximum adsorption capacity, 194.85 mg/g for 200 mg/L concentration was found at the pH 7. Elevated pH resulted in higher removal percentage (pH 12; 98.2% for 200 mg/L). Adsorption isotherms were described using both Langmuir and Freundlich models. The equilibrium data fitted well with Langmuir model with maximum monolayer adsorption capacity of 212.76 mg/g. The adsorption kinetics was investigated by pseudo-first order and pseudo-second order kinetic equations. It was found that the adsorption kinetics was well described by pseudo-second order kinetics equation. The results illustrated the potential use of Refused Tea Waste Activated Carbon (RTWAC) for the removal of pollutants from the waste water.

Keywords: Adsorption, activated carbon, isotherm, methylene blue, tea waste

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