Removal of Malachite Green from Aqueous Solution by Waste Tyre Derived Activated Carbon

Abstract

Waste rubber tyres were used to prepare activated carbon via destructive distillation method employing a two stage process i.e. carbonization and chemical activation in a tubular furnace. Carbonization was done at 500°C for 1 h followed by impregnation of char with NaOH. Activation was done in a horizontal tube furnace via CO2 activation. Two variables and three parameters i.e. impregnation ratio between NaOH and char (1:1 and 3:1), activation temperature (700°C and 900°C), and activation time (60 min and 180 min) were studied and its effects on percentage yield, and malachite green (MG) dye removal were compared and presented in this paper. IR spectra of all samples a number of bands at 1710, 1620, and 1054 cm–1 –1026 cm–1 which proved the presence of carboxylic, carbonyl, and some acids, alcohols, ether and ester groups on the surface of carbon prepared. Activated carbon, AC6, which was prepared at ratio 3:1 and heated at 900°C for 60 min preparation was selected due to high surface area (313.17 m2/g) and removed about 97.43% of MG dye after 60 minutes. AC6 was best fitted to the Freundlich isotherm indicating multilayer adsorption while the adsorption kinetic followed pseudosecond order kinetics. The maximum monolayer adsorption was 128.21 mg/g.