Preparation of eco-friendly activated carbon as a refining solution for the adsorptive treatment of analgesic acetaminophen

K.Y. Foo*

River Engineering and Urban Drainage Research Centre (REDAC), Engineering Campus, Universiti Sains Malaysia, 14300 Nibong Tebal, Penang, Malaysia. Tel. +6045996539; Fax: +6045996926; email: k.y.foo@usm.my

Received 20 January 2017; Accepted 8 April 2018

**Abstract**

This study explores the feasibility of durian seed as an alternative precursor for the preparation of eco-friendly activated carbon (DSAC) via physiochemical activation. The porosity, functionality, and surface chemistry of DSAC were featured by means of low-temperature nitrogen adsorption-desorption curve, elemental analysis, scanning electron microscopy, Fourier transform infrared spectroscopy, evaluation of surface acidity/basicity, and zeta potential measurement. The adsorption behavior was examined by performing batch adsorption experiments using acetaminophen (ACT) as the model pollutant. Experimental data were simulated using the Freundlich, Langmuir, Temkin, and Dubinin–Radushkevich isotherm models. Kinetic modeling was fitted to the pseudo-first-order and pseudo-second-order equations. Results illustrated an encouraging performance toward the removal of ACT, with a monolayer adsorption capacity of 304.48 mg/g. The adsorption equilibrium was best confronted to the pseudo-second-order kinetic model, while the adsorptive removal of ACT onto DSAC was satisfactorily described by the Langmuir isotherm model. The findings demonstrated the applicability of DSAC as a promising adsorbent for the adsorptive treatment of analgesic ACT from the pharmaceutical contaminated wastewater.

*Keywords: Acetaminophen; Activated carbon; Adsorption; Durian seed; Pharmaceutical*