Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2022.28751

269 (2022) 200–211
September

Adsorption efficiency of batik dye by modified *Dialium cochinchinense* activated carbon beads: kinetics and thermodynamics

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Received 5 November 2021; Accepted 14 July 2022

ABSTRACT

Dialium cochinchinense seeds as local agricultural waste were used with two preparation methods to create new adsorbents: *Dialium cochinchinense* seed activated carbon (DCS-AC); and a bead form composite of poly(lactic acid)/*Dialium cochinchinense* seed powder activated carbon (PLA/DCS-AC). The target was an eco-friendly, bio-degradable, inexpensive material for the treatment of wastewater from batik dyeing. Brunauer–Emmett–Teller surface area, scanning electron microscopy images, Fourier-transform infrared spectra, and the point of zero charge (pH_{pzc}) were assessed. The effects of contact time, adsorbent dosage, pH, and temperature were examined and the Langmuir adsorption isotherm fit well. The calculated maximum adsorption capacities (q_m) were 222.22 and 147.06 mg g^{-1} for DCS-AC and PLA/DCS-AC, respectively. The adsorption process was endothermic and spontaneous. Moreover, the desorption study confirmed that DCS-AC and PLA/DCS-AC can be regenerated. The batch adsorption of batik dye by DCS-AC and PLA/DCS-AC adsorbents appears an efficient approach to wastewater treatment.

Keywords: Adsorption isotherm; Batik process; *Dialium cochinchinense* seed activated carbon; Poly(lactic acid)

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