Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2018.22781

123 (2018) 288–299
August

Hydrothermally produced activated carbons from zero-cost green sources for cobalt ions removal

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Received 16 March 2018; Accepted 4 July 2018

ABSTRACT

This paper investigates the synthesis of activated carbons with hydrothermal treatment (at three different time intervals 2, 4, and 24 h) from zero-cost sources (potato peels), and activation with H_3PO_4 (at three different temperatures 400°C, 600°C, and 800°C). Characterization techniques used for the study of surface chemistry of carbons prepared (Boehm and potentiometric titrations, Brunauer–Emmett–Teller analysis, scanning electron microscopy/energy dispersive X-ray analysis, and derivative thermogravimetric analysis). The adsorption ability of the prepared activated carbons was evaluated using as model pollutant cobalt ions. Equilibrium and kinetic experiments were carried out at the optimum found pH (6). The carbon sample of 400°C as activation temperature has approximately two times higher adsorption capacity (479 mg/g) than that of 600°C (217 mg/g), while the surface area of the former (466 m^2/g) three times higher than that of 600°C (167 m^2/g). The possible adsorption mechanism was proposed based on Fourier-transform infrared spectra taken after the adsorption of Co(II).

Keywords: Activated carbon; Hydrothermal treatment; Cobalt; Adsorption; Potato peels; Biochars

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