Desalination and Water Treatment
www.deswater.com

46 (2012) 87–95
August

doi: 10.1080/19443994.2012.677514

Taylor & Francis
Taylor & Francis Group

Isothermal studies of adsorption of acenaphthene from aqueous solution onto activated carbon produced from rice (*Oryza sativa*) husk

Abass Olanrewaju Alade[a], Omotayo Sarafadeen Amuda[b,*], Asiata Omotayo Ibrahim[b]

[a]*Department of Chemical Engineering, Ladoke Akintola University of Technology, Ogbomosho, Nigeria*
[b]*Department of Pure and Applied Chemistry, Analytical/Environmental Chemistry Unit, Ladoke Akintola University of Technology, Ogbomosho, Nigeria*
Tel. +234 803 440 2907; email: osamuda@ftml.net

Received 10 July 2011; Accepted 27 March 2012

ABSTRACT

Rice husk (RH), which is an agricultural waste material of environmental impact, was carbonized at 300–600°C in an oven for 2 h, after which its adsorption capacities were investigated for the adsorption of acenaphthene in synthetic aqueous solution with various concentrations (50–150 mg/L). The yields of carbon obtained from the raw RH ranged from 20 to 40% (w/w), while the adsorption capacities of RH increased with increasing carbonization temperature (300–600°C) and increasing initial concentration of acenaphthene (50–150 mg/L). The removal efficiencies (REs) of the RH increased from 71.37 to 80.56% as the carbonization temperature increased from 300 to 600°C, but decreased with increasing initial concentration of acenaphthene. The adsorption equilibrium data obtained fitted well to Freundlich, Langmuir, Temkin and Dubinin–Radushkevich isotherms with minimum correlation values of 0.998, 0.926, 0.966 and 0.922, respectively, although they generally decreased with increasing carbonization temperature. The error analysis showed the order of suitability of the isotherm models selected to be Temkin > Freundlich > Dubinin–Radushkevich > Langmuir. This study therefore indicates that activated carbon developed from RH possesses high potency of being used as activated carbon for the removal of acenaphthene from wastewater.

Keywords: Adsorption; Acenaphthene; Dubinin–Radushkevich; Freundlich; Langmuir; Rice husk; Temkin

*Corresponding author.