Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2013.771287

51 (2013) 6871–6881
October

Taylor & Francis
Taylor & Francis Group

Comparison of new biosorbents based on chemically modified *Lagenaria vulgaris* shell

Danijela V. Bojić, Marjan S. Ranđelović*, Aleksandra R. Zarubica, Jelena Z. Mitrović, Miljana D. Radović, Milovan M. Purenović, Aleksandar Lj. Bojić

Faculty of Science and Mathematics, Department of Chemistry, University of Niš, 33 Višegradska Street, Niš 18000, Serbia
Tel./Fax: +381 18 533014; email: marjanra@pmf.ni.ac.rs

Received 21 November 2012; Accepted 19 January 2013

ABSTRACT

Sorption characteristics of three *Lagenaria vulgaris*-based biosorbents: raw biomass (*r*LVB), acid–base-activated biomass (*a*LVB) and sulfuric acid-treated biomass (*cc*LVB), were compared as a function of contact time, initial methylene blue concentration, and initial pH, in order to evaluate the effect of chemical modifications. The adsorption studies of raw and chemically modified *L. vulgaris* biomass were compared in batch mode. The Fourier transform Infrared spectroscopy (FTIR) results of biosorbents' characterization showed presence of different functional groups which can be responsible for sorption of MB from aqueous solutions. Moreover, FTIR analysis reveals that acid–base activation of raw biomaterial resulted in hydrolysis of esters providing more reactive sites ($-COO^-$), while sulfuric acid-treatment method introduced new functional groups such as $-SO_3^-$. Surface functional groups containing oxygen, such as carboxylic, lactonic, and phenolic, are quantified using the Boehm's method. The kinetics of MB biosorption were found to follow a pseudo-second-order kinetics in all cases, while experimental equilibrium data were fitted to Freundlich, Langmuir, and Dubinin–Radushkevich isotherms by linear regression method. *Langmuir model* provides the *best fitting*. The MB biosorption capacity and uptake kinetics are greatly improved by chemical modification of the biomass. Effectiveness of examined biosorbents in MB removal from aqueous solutions can be put in the following order: *r*LVB < *a*LVB < *cc*LVB.

Keywords: Biosorption; *Lagenaria vulgaris*; Chemical modification; Mehylene blue; Kinetics; Isotherms

*Corresponding author.