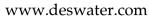
## Desalination and Water Treatment



doi: 10.1080/19443994.2015.1060906

57 (2016) 13472–13483 June



## A modeling study by artificial neural network on ethidium bromide adsorption optimization using natural pumice and iron-coated pumice

Behzad Heibati<sup>a,b</sup>, Susana Rodriguez-Couto<sup>c,d</sup>, Okan Ozgonenel<sup>e</sup>, Nurdan Gamze Turan<sup>f</sup>, Annalisa Aluigi<sup>g</sup>, Mohammad Ali Zazouli<sup>h</sup>, Mohammad Ghanbari Ghozikali<sup>b,i</sup>, Mahmoud Mohammadyan<sup>a,\*</sup>, Ahmad B. Albadarin<sup>j,\*</sup>

<sup>a</sup>Faculty of Health and Health Sciences Research Center, Department of Occupational Health Engineering, Mazandaran University of Medical Sciences, Sari, Iran, emails: bheibati@gmail.com (B. Heibati), Mohammadyan@yahoo.com (M. Mohammadyan)

<sup>b</sup>Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran, email: ghanbarym@yahoo.com (M.G. Ghozikali)

<sup>c</sup>CEIT, Unit of Environmental Engineering, Paseo Manuel de Lardizábal 15, San Sebastian 20018, Spain, email: srodriguez@ceit.es <sup>d</sup>IKERBASQUE, Basque Foundation for Science, Alameda de Urquijo 36, Bilbao 48011, Spain

<sup>e</sup>Electrical & Electronic Engineering Department, Ondokuz Mayis University, Samsun 55139, Turkey, email: okanoz@omu.edu.tr <sup>f</sup>Environmental Engineering Department, Ondokuz Mayis University, Samsun 55139, Turkey, email: gturan@omu.edu.tr <sup>g</sup>CNR-ISOF (National Research Council—Institute of Organic Chemistry and Photoreactivity), via P. Gobetti 101, Bologna 40129, Italy, email: annalisa.aluigi@isof.cnr.it

<sup>h</sup>Faculty of Health and Health Sciences Research Center, Department of Environmental Health Engineering, Mazandaran University of Medical Sciences, Sari, Iran, email: zazoli49@yahoo.com

<sup>i</sup>PhD Student of Environmental Health Engineering, Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

<sup>j</sup>Department of Chemical and Environmental Sciences, University of Limerick, Limerick, Ireland, Tel. +44 74 6080 5982; Fax: +353 0 61 202568; email: Ahmad.B.Albadarin@ul.ie

Received 3 February 2015; Accepted 1 June 2015

## ABSTRACT

In this study, the potential of natural pumice (NP) and iron-coated pumice stone (Fe-CP) as novel low-cost adsorbents to remove ethidium bromide (EtBr) from aqueous solutions was investigated. The operational parameters affecting removal efficiency and adsorption capacity such as adsorbent dose, initial EtBr concentration, pH, and contact time were studied in order to maximize EtBr removal. The maximum amount of adsorbed EtBr ( $q_{\rm m}$ ) using NP and Fe-CP was 40.25 and 45.08 mg g<sup>-1</sup>, respectively. It was found that EtBr adsorption followed the Freundlich isotherm model and fitted the pseudo-second-order kinetics equation for both adsorbents. In addition, the experimental system could be easily modeled by artificial neural network calculations.

Keywords: Artificial neural network (ANN); Ethidium bromide (Etbr); Pumice; Iron-coated pumice; Adsorption isotherms; Kinetics studies

<sup>\*</sup>Corresponding authors.