*Desalination and Water Treatment*
www.deswater.com

doi:10.5004/dwt.2018.22193

111 (2018) 351–360
April

# Modifying *Amygdalus scoparia* biochar with MgO for eliminating tetracycline from aqueous solutions

Saeed Ardashiri, Seyedenayat Hashemi*†, Bahman Ramavandi, Sina Dobaradaran

*Environmental Health Engineering Department, Faculty of Health, Bushehr University of Medical Sciences, Bushehr, Iran, Tel. +989382229579, email: mr.saeed2008@yahoo.com (S. Ardashiri), Tel. +989363311903, email: ramavandi_b@yahoo.com (B. Ramavandi), Tel. +989173731242, email: sina_dobaradaran@yahoo.com (S. Dobaradaran)*
*†Environmental Health Engineering Department, Faculty of Health and Nutrition, Bushehr University of Medical Sciences, Sabzabad Bolvd., 7518759577 Bushehr, Iran, Tel. +989177755384, Fax +987733450134, email: seyedenayat_hashemi@yahoo.com (S. Hashemi)*

Received 2 October 2017; Accepted 16 March 2018

**ABSTRACT**

In this study, a biochar was provided from the wasted wood of *Amygdalus scoparia* tree and then modified with MgO to produce a biochar-MgO composite. This composite was then applied to remove tetracycline from aqueous solutions. The characteristics of the as-prepared composite were determined using X-ray diffraction, scanning electron microscopy, Fourier transform infrared spectroscopy, and specific surface area analysis. The specific surface area and pore volume of the adsorbent were obtained as 461 $m^2/g$ and 0.2403 $cm^3/g$, respectively. The response surface method (RSM) based on central composite design (CCD) was successfully used for modeling and optimizing the tetracycline removal by the adsorbent. The effect of six independent variables including pH, tetracycline concentration, adsorbent dose, shaking rate, temperature, and contact time was explored on the tetracycline adsorption. The analysis of variance (ANOVA) of the quadratic model suggested that the predicted values were in good agreement with experimental data. Based on the RSM model, the maximum removal was obtained at the conditions of pH = 4, adsorbent dose = 0.414 mg/L, tetracycline concentration = 91 mg/L, contact time = 118 min, temperature = 49°C, and shaking rate = 63 rpm. The adsorption data well followed the Langmuir isotherm and the pseudo-second order kinetic model. Finally, thermodynamic parameters determined that the adsorption process was spontaneous and exothermic in nature.

*Keywords: Amygdalus scoparia*; Adsorption; Tetracycline removal; Biochar-MgO composite; Response surface methodology

*Corresponding author.

1944-3994 / 1944-3986 © 2018 Desalination Publications. All rights reserved.