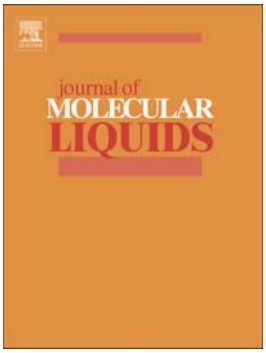

Ultrasonic assisted removal of methylene blue on ultrasonically synthesized zinc hydroxide nanoparticles on activated carbon prepared from wood of cherry tree: Experimental design methodology and artificial neural network

Payman Shirvani Ardekani, Hajir Karimi, Mehrorang Ghaedi, Arash Asfaram, Mihir Kumar Purkait

PII: S0167-7322(16)31107-2
DOI: doi: 10.1016/j.molliq.2016.12.028
Reference: MOLLIQ 6711

To appear in: *Journal of Molecular Liquids*

Received date: 4 May 2016
Revised date: 23 November 2016
Accepted date: 11 December 2016

Please cite this article as: Payman Shirvani Ardekani, Hajir Karimi, Mehrorang Ghaedi, Arash Asfaram, Mihir Kumar Purkait, Ultrasonic assisted removal of methylene blue on ultrasonically synthesized zinc hydroxide nanoparticles on activated carbon prepared from wood of cherry tree: Experimental design methodology and artificial neural network, *Journal of Molecular Liquids* (2016), doi: 10.1016/j.molliq.2016.12.028

Ultrasonic assisted removal of methylene blue on ultrasonically synthesized zinc hydroxide nanoparticles on activated carbon prepared from wood of cherry tree: Experimental design methodology and artificial neural network

Payman Shirvani Ardekani [a], Hajir Karimi [*b], Mehrorang Ghaedi *[c], Arash Asfaram [c], Mihir Kumar Purkait [d]

[a] *Department of chemical Engineering, Shahreza Branch, Islamic Azad University, Shahreza, Iran.*

[b] *Chemical Engineering Department, Yasouj University, Yasouj 75918-74831, Iran.*

[b] *Chemistry Department, Yasouj University, Yasouj 75918-74831, Iran.*

[d] *Department of Chemical Engineering, Indian Institute of Technology Guwahati, Guwahati-781039, Assam, India*

Abstract

The zinc hydroxide nanoparticles was synthesized and loaded on activated carbon prepared from wood of cherry tree ($Zn(OH)_2$-NPs-AC). Prepared NP based adsorbent was used to remove methylene blue (MB) from aqueous medium. The dependency of MB concentration, pH, adsorbent doses and sonication time on the extent of adsorption were investigated and optimized using response surface methodology (RSM) based on central composite design. Analysis of variance (ANOVA) was made to calculate coefficient of determination (R^2). The best operation of conditions were determined for MB concentration (12.5 mg L^{-1}), pH (6), adsorbent mass (0.025 g) and sonication time (6.5 min). In addition, all the experimental data was used to train the artificial neural network (ANN) model. Performance evaluation of the ANN model by means of squared error (MSE), average absolute percent deviation (AAD %) and correlation coefficient (R^2) depicted the experimental value of MSE = 0.0529, AAD = 0.1894% and R^2 = 0.98. These values were better than that of obtained from RSM model (MSE = 2.7107, AAD = 1.470 %, R^2 = 0.9142). It was noted that the equilibrium isotherm data followed Langmuir model with highadsorption capacity. The adsorption kinetics was efficiently represented by combination of pseudo second order and intraparticle diffusion models.

* Corresponding author at: Tel.: +98 741 2221711; fax: +98 741 2221711.
E-mail address: hakar@yu.ac.ir, hakar@mail.yu.ac.ir, hajirk2002@yahoo.com (H. Karimi)
* Corresponding author: Tel (✆):+98 13 33326643; Fax (🖷): +98 741 2223048.
E-mail address (✉):m_ghaedi@mail.yu.ac.ir; m_ghaedi@yahoo.com (M. Ghaedi).