Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

CATALYTIC OZONATION ON IRON-LOADED RICE HUSK ASH/PEANUT SHELL ASH FOR THE REMOVAL OF ERYTHROMYCIN IN WATER

Shama Nazir[1], Amir Ikhlaq[1], Farhan Javed[2*], Zunaira Asif[1], Hafiz Muhammad Shahzad Munir[3], Samra Sajjad[1]

[1]Institute of Environmental Engineering and Research, University of Engineering and Technology, GT Road, 54890, Lahore, Punjab, Pakistan
[2]Department of Chemical and Polymer Engineering, University of Engineering and Technology, GT Road, Lahore, Faisalabad Campus 38000, Pakistan
[3]Chemical Engineering Department, University of Engineering and Technology, Lahore 54890, Pakistan

Abstract

This study investigates the mechanism and efficiency of catalytic ozonation process on iron-loaded rice husk ash (Fe-RHA) and Peanut shell ash (Fe-PSA) for the Erythromycin removal from aqueous solution. In the current study, the COD removal efficiency of Erythromycin was studied in simple ozonation and catalytic ozonation using Fe-RHA/O_3 and Fe-PSA/O_3 processes. The operational parameters such as pH effect, catalyst dose, and reuse performance of the catalyst were studied. Moreover, the hydroxyl radical scavenger effect and superoxide ion formation were investigated to understand the mechanism of processes. The results revealed the maximum COD removal efficiency of 91 % at pH 4.0 using Fe-RHA catalyst at an optimum dose = 0.8 g, temperature = 25 ^oC and initial concentration of 50 ppm. While Fe-PSA/O_3 process show high removal efficiency of 83 % at pH = 8.0 (near wastewater pH, 6.0-9.0) at optimum dose = 0.8 g, temperature = 25 ^oC and initial concentration of 50 ppm. The TBA effect and Superoxide ion formation studies reveal that Fe-PSA operates as an advanced oxidation catalyst as compared with Fe-RHA at pH 8.0. Both the catalysts showed reasonable re-use performance with more than 70 % removal efficiency even after the third cyclic run. Hence, it is concluded that Fe-PSA shows excellent performance as compared with ozonation alone and Fe-RHA/O_3 process at wastewater pH.

Keywords: catalytic ozonation; erythromycin; peanut shell ash; rice husk ash; superoxide ion

Received: June, 2019; Revised final: November, 2019; Accepted: December, 2019

* Author to whom all correspondence should be addressed: e-mail: farhan.javed@uet.edu.pk