Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2015.1076353

57 (2016) 16066–16077
July

Taylor & Francis
Taylor & Francis Group

Integrated air stripping and non-thermal plasma system for the treatment of volatile organic compounds from wastewater: statistical optimization

Mohammed Evuti Abdullahi[a,*], Mohd Ariffin Abu Hassan[b], Zainura Zainon Noor[b], R.K. Raja Ibrahim[c]

[a]*Department of Chemical Engineering, University of Abuja, Abuja, Nigeria, Tel. +234 8036200828; email: evutimohd@yahoo.com*
[b]*Institute of Environmental and Water Resources Management, Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia, email: mariffin@utm.my (M.A. Abu Hassan), zainurazn@utm.my (Z. Zainon Noor)*
[c]*Faculty of Science, Physics Department, Advanced Photonic Science Institute, Universiti Teknologi, Johor Bahru 81310, Malaysia, email: rkamarulzaman@utm.my*

Received 9 January 2015; Accepted 15 July 2015

ABSTRACT

This study examined the treatment of toluene and m-xylene from wastewater using integrated air stripping and non-thermal plasma (NTP) reactor system. Toluene and m-xylene concentrations, before and after plasma treatment, were determined using Fourier transform infrared spectroscopy. The performance of the NTP reactor was optimized using the central composite design of the response surface methodology. The optimum discharge gap, applied voltage, and flow rate for the decomposition were found to be 22.34 mm, 15 kV, 3.56 L/min and 20.10 mm, 15 kV, 3.34 L/min for toluene and m-xylene, respectively. Experimental removal efficiencies and model predictions were in close agreement with 1.25 and 2.16% errors for toluene and m-xylene, respectively. The developed model could fit the experimental data with acceptable values of percentage errors.

Keywords: Wastewater; Volatile organic compounds; Air stripper; Non-thermal plasma reactor; Response surface methodology

*Corresponding author.