Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2017.21096

81 (2017) 233–241
June

Biodegradability enhancement of azo dye Direct Orange-26 using UV/Fenton-like process: optimization using response surface methodology

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Received 10 January 2017; Accepted 27 June 2017

ABSTRACT

In the present study, the enhancement of biodegradability of Direct Orange-26 (azo dye) in aqueous solution by photo-Fenton-like process and nano-Fe_2O_3 as catalyst was investigated. The effects of initial pH, reaction time, initial concentration of nano-Fe_2O_3, and H_2O_2 dosage on the biochemical oxygen demand (BOD_5)/chemical oxygen demand (COD) ratio were studied in batch process using response surface methodology. The analysis of variance suggested that the optimal conditions for enhancement of biodegradability of azo dye solution to be counted as a biodegradable effluent are as follows: nano-Fe_2O_3 concentration of 0.23 g L^{-1}, H_2O_2 concentration of 64 mM, pH of 7.5, and the reaction time of 21.66 min. The BOD_5/COD ratio at optimal condition was predicted to be 0.50 and confirmed by the experimental study. A good agreement between the model prediction and experimental results confirms the reliability of the developed model for BOD_5/COD ratio.

Keywords: UVC; Fenton-like; Direct Orange-26; Nano-Fe_2O_3; BOD_5/COD ratio

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