Desalination and Water Treatment
www.deswater.com
1944-3994/1944-3986 © 2012 Desalination Publications. All rights reserved
doi: 10/5004/dwt.2012.3531

Taylor & Francis
Taylor & Francis Group

45 (2012) 297–304
July

Comparative mineralization of textile dye indigo by photo-Fenton process and anodic oxidation using boron-doped diamond anode

Samiha Hammami[a,b], Mehmet A. Oturan[a,*], Nihal Oturan[a], Nizar Bellakhal[b,c], Mohamed Dachraoui[b]

[a]*Laboratoire Géomatériaux et Environnement (LGE), Université Paris - Est, 5 bd Descartes, 77454 Marne la Vallée Cedex 2, France Tel. +33 1 49 32 90 65; Fax: +33 1 49 32 91 37; email: mehmet.oturan@univ-paris-est.fr*
[b]*Laboratoire de Chimie Analytique et Électrochimie, Département de Chimie, Faculté des Sciences de Tunis, Campus Universitaire, 2092 Tunis El Manar, Tunisie*
[c]*Département de Chimie et de Biologie Appliquées, Institut National des Sciences Appliquées et de Technologie (INSAT), B.P. N°676, 1080 Tunis Cedex, Tunisie*

Received 26 November 2011; Accepted 2 January 2012

ABSTRACT

In the present study, we applied two advanced oxidation processes (AOPs); photo-Fenton and anodic oxidation (using a boron doped diamond (BDD) anode) processes, to oxidative degradation and mineralization of the textile dye Indigo in sodium dithionite aqueous media. The effect of key parameters, such as H_2O_2 dosage for photo-Fenton process and initial pH for anodic oxidation, on the degradation and mineralization kinetics of dye Indigo was investigated. The highest mineralization rates were observed at pH 3.0 for anodic oxidation process, and for a ratio *R*: $[H_2O_2]/[Fe^{2+}] = 40$ for photo-Fenton process. Under optimal operating conditions a complete mineralization of Indigo dye was achieved after 7 h treatment by anodic oxidation whereas only 63% of TOC removal was obtained after 10 h treatment by photo-Fenton process. The carboxylic acids (glyoxylic, malonic, oxalic, acetic and formic) formed as oxidation by-products were identified and their evolution was followed by ion-exclusion chromatography. The evolution of NO_3^- and NH_4^+ ions released to the solution during the treatment was followed by ion chromatography. These results show that anodic oxidation using a BDD anode is an efficient environmentally friendly technology for the remediation of wastewaters containing textile dye Indigo.

Keywords: Indigo; Hydroxyl radical; Anodic oxidation; Photo-Fenton; Water treatment

*Corresponding author.