Degradation of methyl orange by electro-Fenton-like process in the presence of chloride ion

Wenyan He\textsuperscript{a}, Xiaoning Yan\textsuperscript{b}, Hongzhu Ma\textsuperscript{a,*}, Jie Yu\textsuperscript{a}, Jing Wang\textsuperscript{a}, Xiaoli Huang\textsuperscript{a}

\textsuperscript{a}School of Chemistry and Chemical Engineering, Institute of Energy Chemistry, Shaanxi Normal University, Xi'an 710062, China
\textsuperscript{b}Xi'an Hangjie Chemical Technology Co., Ltd, Shaanxi Province 710067, China

Received 15 February 2012; Accepted 28 January 2013

\textbf{ABSTRACT}

The degradation of azo dye methyl orange (MO) in wastewater by several electrochemical processes, especially the electro-Fenton-like process with chloride ion, was investigated. The effect of some important operating parameters, Fe\textsuperscript{3+} and Cl\textsuperscript{-} dosage, the initial concentration of MO on the decolorization and COD removal was also investigated. The response surface methodology was selected to optimize the operating conditions, and the results showed that almost 100% color and 78.93% COD removal efficiency were obtained, when [Fe\textsuperscript{3+}] = 2.14 mM, [Cl\textsuperscript{-}] = 16.36 mM, [MO] = 106 mg L\textsuperscript{-1}, [Na\textsubscript{2}SO\textsubscript{4}] = 0.05 M, pH = 3 at 2.1 A, and approximately 96.93% COD removal was achieved after 90 min of electrolysis and 8 min centrifuged with speed of 500 r min\textsuperscript{-1}. The oxidation kinetics of the process and the reaction order were also studied.

\textit{Keywords:} Azo dye; Methyl orange; Direct electrochemical process; Electro-Fenton; Response surface methodology; Chloride ion

\*Corresponding author.

1944-3994/1944-3986 © 2013 Balaban Desalination Publications. All rights reserved.