Removal of COD, TOC, and color from pulp and paper industry wastewater through electrocoagulation

Ravi Shankar, Lovjeet Singh, Prasenjit Mondal*, Shri Chand

Department of Chemical Engineering, Indian Institute of Technology Roorkee, Roorkee 247667, Uttarakhand, India
Tel. +91 1332 285181; Fax: +91 1332 276535; email: mondal2001@gmail.com

Received 30 January 2013; Accepted 14 July 2013

ABSTRACT

The present paper deals with the treatment of paper and pulp industry wastewater through electrocoagulation in a batch reactor using aluminum as a sacrificial electrode. The effect of various parameters such as pH, treatment time, current density, and inter-electrode distance on the removal of chemical oxygen demand (COD), total organic carbon (TOC), and color from pulp and paper industry wastewater has been investigated to determine the optimum process conditions. A central composite design has been used to design the experimental conditions for developing mathematical models to correlate the removal efficiency with the process variables. The optimum process condition for the maximum removal of COD, TOC, and color from pulp and paper industry wastewater have been found to be as pH: 7, treatment time: 75 min, current density: 115 A/m², and inter-electrode distance: 1.5 cm with a combined desirability index value of 0.816. Under optimum operating conditions, the percent removals of COD, TOC, and color are approximately 77, 78.8, and 99.6%, respectively. The proposed models are found suitable to predict the percent removals of COD, TOC, and color with the error limits of ± 7, ± 9, and ± 2 to −6%, respectively. The sludge and scum produced during the process have been characterized to assess their potential as a source of energy and aluminum recovery.

Keywords: Wastewater; Electro-coagulation; COD; TOC; Colour; Electrode; Pulp and paper industry

*Corresponding author.

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