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"Gheorghe Asachi" Technical University of Iasi, Romania

BASIC RED DYE REMOVAL BY COUPLING ELECTROCOAGULATION PROCESS WITH BIOLOGICAL TREATMENT

Katia Madi[1*], Idris Yahiaoui[1], Farida Aissani-Benissad[1], Christophe Vial[2,3], Fabrice Audonnet[2,3], Lidia Favier[4,5]

[1]Laboratoire de Génie de l'Environnement (LGE), Faculté de Technologie, Université de Bejaia, 06000 Bejaia, Algérie,
[2]Clermont Université, Université Blaise Pascal, Institut Pascal, BP 10448, F-63000 Clermont-Ferrand, France
[3]CNRS, UMR 6602, IP, F-63171 Aubière, France
[4]Université Rennes 1, SDLM, École Nationale Supérieure de Chimie de Rennes, CIP, CNRS, UMR 6226, Av. Général Leclerc, CS 50837, 35708 Rennes Cedex 7, France
[5]Université Européenne de Bretagne, 35000 Rennes, France

Abstract

The applicability of an electrocoagulation process with the biological treatment for the color removal of C.I. Basic Red 46 (BR46) dye was studied. It was shown that decolorization efficiency increased by increasing current density (*j*), pH, temperature (T) and agitation speed (ω) and decreased with the initial dye concentration $[BR46]_0$. The optimal conditions in presence of a grid electrode (waste) used as cathode were found to be j=9 mA cm^{-2}, pH 8, T=35°C, $[BR46]_0$=30 mg L^{-1} and ω=120 rpm. Under these conditions, the electrocoagulation process was able to achieve 100% color removal efficiency in 5 min. The kinetics study showed that the apparent rate constants increased with increasing current density and the results suggest also a zero-order kinetic model. In addition, the plot of $[BR46]_t/[BR46]_0$ ratio vs time presents two steps. The first step, named latency period ($t_{Latency}$) is current-dependent, but depended only slightly on the initial BR46 dye concentration. The latency period obtained varies roughly as $1/I$ and a minimal iron concentration was required before electrocoagulation started (0.083 mg L^{-1}). The C.I. Basic Red 46 dye did not adsorb onto the flocs in its molecular form. The biodegradability of the solution treated by electrocoagulation process under the optimal conditions was examined and the increase of the BOD_5/COD ratio from 0.05 to 0.35 showed the enhancement of the biodegradability of the pretreated solution. The electrocoagulation coupled to 16 days biological treatment leads to almost 65% of the dissolved organic carbon mineralized by the hybrid process.

Keywords: activated sludge process, biological treatment, C.I. Basic Red 46 dye, electrocoagulation, textile effluent

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[*]Author to whom all correspondence should be addressed: e-mail: madi.katiia@gmail.com; Phone/Fax: 00 213 34 21 57 04