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CONDUCTIVE-DIAMOND ELECTROCHEMICAL OXIDATION OF A PHARMACEUTICAL EFFLUENT WITH HIGH CHEMICAL OXYGEN DEMAND (COD). KINETICS AND OPTIMIZATION OF THE PROCESS BY RESPONSE SURFACE METHODOLOGY (RSM)

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Abstract

Conductive-diamond electrochemical oxidation processes are promising technologies for treating biorefractory industrial wastes with organic loads below 20000 mg L^{-1}. In this work, electrochemical oxidation of a real industrial pharmaceutical wastewater with conductive-diamond anodes has been studied. The electrolyses were carried out in discontinuous operation mode under galvanostatic conditions, using a bench-scale plant equipped with a single compartment electrochemical flow cell. For optimizing the process and studying the interaction between the operating conditions, different experiments were performed by modifying the current density (from 25 to 180 mA cm^{-2}) and recirculation flow rate (from 105 to 565 ml min^{-1}) with residence times between 0 and 570 minutes. The corresponding contribution of these two operative parameters on COD removal and its evolution versus residence time was studied. A time of 98 minutes was obtained in order to evaluate the highest influence of operative parameters. For this time, the current density was found to have a considerable positive effect, while the flow rate proved to be a statistically insignificant variable. ANOVA test reported significance for three of the five involved variables and Response Surface Methodology technique was used to optimize COD removal.

Key words: anodic oxidation, boron-doped diamond electrodes, conductive-diamond electrochemical oxidation, pharmaceuticals, wastewater

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