UV-assisted electrochemical degradation of coumarin on boron-doped diamond electrodes

Daniele Montanaro, Roberto Lavecchia, Elisabetta Petrucci, Antonio Zuorro

PII: S1385-8947(17)30725-8
DOI: http://dx.doi.org/10.1016/j.cej.2017.04.129
Reference: CEJ 16883

To appear in: *Chemical Engineering Journal*

Received Date: 6 January 2017
Revised Date: 26 April 2017
Accepted Date: 27 April 2017

Please cite this article as: D. Montanaro, R. Lavecchia, E. Petrucci, A. Zuorro, UV-assisted electrochemical degradation of coumarin on boron-doped diamond electrodes, *Chemical Engineering Journal* (2017), doi: http://dx.doi.org/10.1016/j.cej.2017.04.129

UV-assisted electrochemical degradation of coumarin on boron-doped diamond electrodes

Daniele Montanaro, Roberto Lavecchia, Elisabetta Petrucci(*), Antonio Zuorro

Department of Chemical Engineering Materials & Environment, Sapienza – University of Rome, Via Eudossiana 18, 00184 Rome, Italy

Abstract

A combined treatment based on electrochemical oxidation on boron-doped diamond (BDD) anodes and UV-C irradiation was used to degrade the emerging contaminant coumarin, an ingredient of many personal care products. The efficiency of the process was assessed by monitoring the coumarin concentration decay and the total organic carbon (TOC). The effect of chloride was evaluated and the occurrence of inorganic chlorinated products was quantified.

The photo-assisted electrochemical degradation resulted in a faster removal and mineralization of the pollutant, compared to the treatment without UV irradiation. The observed synergistic effect was mainly ascribed to the ability of UV light to activate the peroxides electrogenerated during the electrolysis on BDD. An additional contribution was due to the photolysis of electrogenerated hypoclorite/hypoclorous acid in the presence of chloride. UV irradiation reduced the amount of residual active chlorine but not of chlorates. TOC analysis showed that mineralization occurred together with coumarin removal from the solution, indicating that no persistent organic by-products were formed during the treatment.

The possibility of reducing the energy consumption of the process by shortening the exposure time of the solution to UV light was also investigated.