ABSTRACT SBPMat 2017

Evaluation of the BDD/CF binary composite as electrode in the Brilliant Green Dye electrodegradation

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Wastewater treatment from mainly textile industries constitutes an issue of major economical and environmental concern. For electrochemical treatment of dyeing wastewater, the anodic oxidation using boron doped diamond (BDD) appears as a very effective electrode, which allows to reach a high anode potential to generate the hydroxyl radical (OH•) [1]. Carbon fiber (CF) is a suitable substrate to grow BDD films to obtain a three-dimensional material that exhibits high surface area as well as high active site density in a homogeneous porosity distribution. Thus, three dimensional electrode consisting of BDD/CF for the Brilliant Green Dye electroxidation process was studied. CF substrates were obtained from polyacrylonitrile precursor heat treated at two different temperatures of 1000 and 2000 °C at nitrogen atmosphere. BDD films were grown on CF1000 and CF2000 substrates by hot filament chemical vapor deposition with boron source from an additional hydrogen line passing through a bubbler containing B_2O_3 dissolved in methanol with B/C ratio of 15000 ppm in solution. All electrodes were characterized by field emission gun-scanning electron microscopy images and Raman spectroscopy. They were used to electrooxidation of the Brilliant Green dye at different potentials using 100 mg L^{-1} of the Brilliant Green dye in 0.1 mol L^{-1} K_2SO_4 solution for 360 min. Their efficiency was analyzed by UV/VIS Spectrophotometry and by Total Organic Carbon techniques. The results showed that all electrodes were efficient in the solution decolourisation as well as in the organic compound mineralizations. However, the BDD/CF electrodes, probably associated to its highest electrode surface area, showed the best performances when compared with the CF electrodes.

Acknowledgements:

FAPESP, CAPES and CNPq.

[1] D. Montanaro, E. Petrucci, Electrochemical treatment of Remazol Brillian Blue on a boron-doped diamond electrode, Chemical Engineering Journal. 153(2009)138–144.