Abstract of Thesis presented to the Process Engineering Graduate Program of the Universidade Tiradentes and to the Doctoral School of the University of Castilla La-Mancha as a partial fulfillment of the requirements to obtain a double degree of Doctor of Philosophy (PhD) in Process Engineering as well as Chemical and Environmental Engineering.

SYNTHESIS, CHARACTERIZATION AND APPLICATION OF SYNTHESIZED MIXED METAL OXIDES ANODES USING CO_2 LASER HEATING

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Mixed metal oxides anodes (MOMs) are promising materials in electrochemical technologies. In this work, the feasibility of a new method of synthesis of this kind of anodes using the CO_2 laser heating for the oxidation of organic pollutants in aqueous effluents was studied. Thus, in the first step of this thesis, the MOMs (active and non-active) of $Ti/Ru_xIr_{x-1}O_2$, $Ti/Ru_{0.3}Ti_{0.7}O_2$ and Ti/SnO_2-Sb, were synthesized and optimized using the CO_2 laser heating, aiming to attain a high electrocatalytic activity and physical stability of the coating, as well as fast processing at low energy consumption. Then, the synthesized anodes were characterized by physical and electrochemical characterization techniques, such as X-ray diffractometry, Scanning electron microscopy, X-ray dispersive energy; cyclic and linear voltammetry, electrochemical impedance spectroscopy and stability tests. In the second stage of the study, the $Ti/Ru_{0.3}Ti_{0.7}O_2$ anode was selected for the degradation of model organics, to evaluate its performance in different advanced electrochemical oxidative processes. This anode was applied in electrochemical oxidation, photoelectrochemical, electro-Fenton, photoelectro-Fenton and electrochemical oxidation processes with *in situ* generated hydrogen peroxide. All experiments performed in this final stage were compared with the boron-doped diamond electrode (BDD), recognized for its effectiveness in generating large quantities of hydroxyl radicals and non-selective nature. It has been observed that the combination with UVC irradiation with electrochemical oxidation using the $Ti/Ru_{0.3}Ti_{0.7}O_2$ makes the degradation more effective, especially in the presence of chlorine ions. In the electro-Fenton and photoelectro-Fenton processes, the anode was as efficient as the BDD electrode for both removal and mineralization of clopyralid. These results are important because they show that anodes produced by easy synthesis method, with improved catalytic efficiency and promising results for industrial application.