Electrochemical Oxidation of Rhodamine B: Optimization and Degradation Mechanism

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doi: 10.20964/2017.05.60

Received: 31 January 2017 / Accepted: 24 March 2017 / Published: 12 April 2017

Titanium based lead dioxide electrodes were successfully prepared by the method of electrodeposition in nitrate solution, including titanium base, Sn-SbO_x interlayer, α -PbO₂ middle layer and β -PbO₂ active layer. Rhodamine B (RhB) was selected as the model pollutant to optimize the effects of operational factors in the electrochemical oxidation process. The removal of RhB and chemical oxygen demand (COD) were detected at different reaction time and the relative optimized results were achieved on condition of the concentration of supporting electrolyte, initial RhB concentration, pH value and applied current density at 0.1 mol/L, 200 mg/L, 4.4, and 20 mA/cm², respectively. The kinetics results on RhB removal indicated that RhB degradation by electrochemical oxidation followed the pseudo-first-order reaction. Besides, UV-vis spectra revealed that the conjugated structure of RhB was easier and prior to be degraded. The intermediates generated in the solution were identified by GC/MS and a possible degradation pathway of RhB was proposed.

Keywords: lead dioxide electrode; Rhodamine B; electrochemical oxidation; kinetics

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