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ELECTROCHEMICAL DEGRADATION OF CLINDAMYCIN BY ANODIC OXIDATION ON SnO₂-Sb COATED TITANIUM ANODES

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Abstract

Degradation of Clindamycin phosphate (CMP) was studied in aqueous solutions by an anodic oxidation process under galvanostatic conditions. The electrolysis cell consisted of a Ti/SnO₂-Sb anode, prepared by dip-coating technique, and a 316 stainless steel cathode, both of which had a surface area of 6 cm². The effects of critical factors, including CMP concentration, current density, initial pH, and the supporting electrolyte were evaluated. The electrochemical oxidation of CMP was controlled by mass transport within the studied range. The kinetic analysis indicated that the degradation reactions followed pseudo-first-order equation. The rate of CMP decay, as well as that of COD removal, decreased with increasing initial concentrations. Better Instantaneous Current Efficiency (ICE) values were obtained at higher organic concentrations, due mainly to the increased mass transfer flux towards non-active anode surface. Increasing current density and initial pH led to the faster removal of CMP, primarily because of enhanced electrogenerated hydroxyl radicals ([•]OH) on the anode surface. However, COD reduction was found to be pH independent. The removal rates of CMP and COD were also discussed with respect to the supporting electrolyte in different types and concentrations. The GC-MS analysis indicated that tert-butyl compounds were the major organic intermediates for the electrochemical degradation of Clindamycin.

Keywords: clindamycin, electrochemical oxidation, hydroxyl radical, pharmaceutical compounds, SnO₂-Sb anodes

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