

# DEVELOPMENT AND OPTIMIZATION OF AN ANODE MATERIAL FOR OXIDATION OF CHLORPYRIFOS

**G.C. Pathiraja**

Postgraduate Institute of Science, University of Peradeniya, Peradeniya  
National Institute of Fundamental Studies, Hantana Road, Kandy

Two dimensionally stable anodes (DSA), Ti/IrO<sub>2</sub> and Ti/IrO<sub>2</sub>-SnO<sub>2</sub> were developed in order to degrade chlorpyrifos in chloride free environment. The chemical oxygen demand (COD) results revealed that Ti/ IrO<sub>2</sub>-SnO<sub>2</sub> electrode has degraded 78.2% of COD after 6 hours of electrolysis. COD removal followed pseudo-second order kinetics. Radical scavenger studies confirmed that the hydroxyl radical can be the major factor responsible for degrading chlorpyrifos. The anodic charge is decreased from 153.76 mC to 145.15 mC, while accelerated life time showed 7h increment, indicating the higher stability of Ti/ IrO<sub>2</sub>-SnO<sub>2</sub> anode. The qualitative identification of oxides of both electrodes was investigated by X-ray diffraction (XRD). Roughness parameters and topography were determined using Atomic Force Microscopic (AFM) images.

Optimization of Ti/IrO<sub>2</sub>-SnO<sub>2</sub> anode for CP removal is successfully performed by Response surface methodology (RSM). Based on the optimization study, two-level factorial design was design was used to determine the optimal conditions for Ti/IrO<sub>2</sub>-SnO<sub>2</sub> anode preparation. Cyclic voltammetry, steady state polarization curves, impedance spectroscopy, and open circuit potential were performed to investigate the performance and stability of these electrocatalysts. It has found that the surface electrochemistry of Ti/ IrO<sub>2</sub>-SnO<sub>2</sub> anodes are governed by the Ir(III)/Ir(IV) couple. The impedance spectroscopy investigation permitted to propose an equivalent circuit to describe the modifications occurring in different potentials during oxygen evolution reaction. The best result of CP removal efficiency using GC/MS was obtained with the 0.3 M of [Ir] and 7.5 mM of [Sn] coated anode (92.88%), although complete CP removal was not achieved by all of the anodes.

