

Electrocoagulation for the Abatement of Cr(VI) from Simulated Water Using Al Electrodes

D.S. Chandima and A.M.C. Herath*

Department of Chemical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka

**Corresponding Author E-mail: ajithch037@gmail.com, TP: +94774692681*

Potentially toxic metal/metalloid contamination of water is inevitable mainly due to anthropogenic activities and pose highly adverse health effects on humans. Therefore, development of cost effective promising green technology is of immediate priority concern worldwide. Electrocoagulation holds great promise for the remediation of water and wastewater contaminated by toxic metal ions and organic pollutants. This study evaluates the electrocoagulation performance for the removal of 5 ppm Cr(VI) in simulated water composed of $0.003 \text{ mol dm}^{-3} \text{ Na}_2\text{SO}_4$ which imparts a conductivity of $600 \mu\text{s cm}^{-1}$. The electrocoagulation process, in terms of pH, conductivity, dissolution rate of both anode and cathode, current density was monitored at fixed direct current potentials in a range 1V to 5V at initial pH of 6.5 in a batch mode reactor. In the first 10 min, pH was found to increase from 6.5 to 9.0 and remained constant until the end of the electrocoagulation process after 60 min. Higher rate of dissolution of both anode and cathode was noticed due to electro oxidation and chemical dissolution of the anode and cathode respectively. The removal of Cr(VI) was monitored by UV-Visible spectroscopy at 370 nm and Inductively-Coupled Mass Spectroscopy (ICP-MS). The maximum removal of 97% achieved after two hours of electrocoagulation. The X-ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR) studies performed on dried electrochemically generated sludge in the electrocoagulation reactor revealed the presence of Al and Cr.

Keywords: Electrocoagulation; Batch-mode reactor; Pollution abatement; Cr(VI); Al electrodes

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