Development of Graphite/Ir Anode for Electro-chemical Denitrification of Landfill Leachate

U. Sivasubramaniyam', A. Manipura[2], K.G.N. Nanayakkara[2]
'Department of Science and Technology, Uva Wellassa University, Badulla, Sri Lanka
'Faculty of Engineering, University of Peradeniya

Contamination of water by NO3 can cause health issues such as methernoglobinemia or blue baby syndrome. Previous studies revealed that high concentration of inorganic nitrogen compounds such as NO3 and numerous organic nitrogen compounds present in leachate. Thus, appropriate treatment of landfill leachate is urgently required. Electro-chemical denitrification is one of the best technologies which can be used in denitrification. In this research, anode was developed by applying iridium (Ir) coating onto the graphite substrate by electro and electro-less plating methods. In electro-less plating, glycerol or formaldehyde was used as reducing agent while 325 ppm It' standard solution was used as the Ir precursor. EDTA was used as complexing agent. In electroplating, Ir was deposited onto well cleaned graphite cathode at 0.3 V and **110** mA from 250 ppm Ir^{3+} standard solution coating bath. The success of the plating process was initially analyzed using UV-Visible absorbance spectrum studies. UV-Vis spectrums and color changes of plating baths were shown that the Ir^{a}" concentrations in the plating bath were reduced with time for all methods. According to UV-Vis spectrums, excess formaldehyde which was used as reducing agent resulted high efficiency of plating. Therefore graphite/Ir anode which used excess formaldehyde in the plating bath was examined for Scanning Electron Micrograph (SEM), Energy Dispersive X-ray spectroscopy (EDX) and denitrification process. Observation of very small sizes of grains and 12.44 % Ir element present in the anode surface were the evidences that Ir deposited onto graphite substrate. Finally, developed anode and commercially available cathode electrodes were used for removing nitrate from nitrate solution.

Keywords: Denitrification, Landfill leachate, Iridium, Graphite

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