Electrocatalytic Properties of $\text{La}_{1-x}\text{Cu}_x\text{CoO}_3$ ($0 \leq X \leq 0.8$) Film Electrodes Prepared by Malic Acid Sol -Gel Method at pH = 3.75

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La-based Perovskite-type oxides with composition $\text{La}_{1-x}\text{Cu}_x\text{CoO}_3$ ($0 \leq X \leq 0.8$) have been synthesized by malic acid sol-gel low temperature route at pH 3.75. In each preparation, nitrate salts of lanthanum, copper, cobalt and malic acid were taken as starting material. The pH of the solution was adjusted by using ammonia solution. Techniques used to know the physical properties of the materials were scanning electron microscope (SEM) powder X-ray diffraction (XRD). All the electrochemical *viz*a cyclic voltammetry, roughness factor and anodic polarization studies have been performed in three electrode single compartment glass cell. For the purpose, materials were transferred in the form of oxide film electrode on Ni conducting support. XRD data showed the formation of almost pure phase of the material with hexagonal crystal geometry. The cyclic voltammetric study showed that each oxide electrode exhibited a pair of redox peaks prior to the oxygen evolution reaction (OER). The values of Tafel slope ($78\text{--}90 \text{ mV decade}^{-1}$) and reaction order (~ 1) indicate that each catalyst follows similar mechanistic path. The data of anodic polarization study shows that the substitution of Cu in place of La in the base oxide increases the electrocatalytic activity considerably. The value was found to be highest with 0.4 mol Cu substitution. Electrochemically active area of the material was determined in terms of roughness factor by recording the cyclic voltammograms at different scan rates in the potential region 0.0–0.1V. The roughness factor was observed to be highest with 0.2 mol Cu-substituted oxide.

Keywords: Perovskite-type oxide, malic acid sol-gel, XRD, Electrocatalytic activity, Thermodynamic parameters, roughness factor

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