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# Electrocatalytic activity of $La_{0.6}Sr_{0.4}Co_{1-y}Cu_yO_3$ (y = 0.1, 0.2, and 0.3) for oxygen evolution in an alkaline medium at 25°C

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Binary metal substituted lanthanum cobaltate *viz.*, $La_{0.6}Sr_{0.4}Co_{1-y}Cu_yO_3$ (y = 0.1, 0.2, and 0.3) have been prepared by sol-gel method using alginic acid as a precursor and characterized by the TGA, IR, XRD, and SEM techniques. They have also been studied for their electrochemical performance towards the electrocatalytic splitting of water in an alkaline medium. Recorded cyclic voltammetry of the oxide electrodes on nickel support show a pair of oxidation-reduction peaks in the anodic peak potential region (Epa ≈ 508-553 mV) and in the cathodic peak potential region (Epc ≈ 305-322 mV). The polarization curves of each oxide electrode with Tafel slope (b) range from 95 to 101 mV $dec^{-1}$, and the apparent current density (ja) ranges from 31 to 45 mA $cm^{-2}$ at 0.7 V. Doping of copper in a $La_{0.6}Sr_{0.4}CoO_3$ matrix improves the electrocatalytic activity for the oxygen evolution reaction in an alkaline solution. The observed values of the reaction order with respect to the concentration change of [$OH^-$] are unity, and the strongly negative value of the reaction entropy indicates that the electrocatalytic oxygen evolution by water splitting occurs by the same mechanism involving the adsorption phenomenon of reaction intermediates on the electrode surface.

**Keywords**: Electrocatalysis, Cyclic voltammetry, Tafel-polarization, Perovskite-type oxide, Oxygen evolution reaction