

Seminar Title	: Study on Bi-functional Electrocatalytic activity of Sr-doped Lanthanum Ferrite
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Abstract	: Fuel cells and batteries are future of energy storage and conversion technologies that meet future energy requirements. These high energy density technologies depend on electrochemical reactions like oxygen evolution and oxygen reduction reactions. Currently, perovskites are introduced in place of conventionally used materials to conduct electrocatalysis due to their cost effectiveness, chemical stability, and high crystallinity. The present work focuses on studying the Bi-functional electrocatalytic activity of $\text{La}_{1-x}\text{Sr}_x\text{FeO}_3$ ($x = 0-0.9$). XRD patterns study reveals that $\text{La}_{1-x}\text{Sr}_x\text{FeO}_3$ ($x = 0-0.9$) has an orthorhombic phase. The lattice parameters change from $5.5547\text{\AA}$ to $5.4478\text{\AA}$ observed with Sr-substitution level ($x = 0-0.9$). In addition, crystallite size also reduces, and peak shifting is observed from the XRD patterns as a function of substitution level. Agglomerated spherical morphology particles were visualized from FE-SEM micrographs. There is no appreciable change in surface area after doping. The surface area ranges from $15\text{ m}^2/\text{g}$ to $20\text{ m}^2/\text{g}$. The FTIR data revealed the formation of the perovskite structure. The oxygen evolution reaction (OER) and oxygen reduction reaction kinetics were studied using linear sweep voltammetry (LSV) at a scan rate of 1 mV/s and cyclic voltammetry (CV) at a scan rate of 30 mV/s in 1 M KOH solution. Electrochemical parameters, namely onset potential, overpotential, Tafel slope, double layer capacitance, electrochemical active surface area (ECSA), specific activity, and mass activity are estimated from LSV and CV spectra. Substitution of La^{+3} by Sr^{+2} is expected to change the oxidation state of B-site iron to the optimum level to enhance the OER and ORR activity of the powder. Iodometric titration reveals the change in the oxidation state of Fe and oxygen nonstoichiometry with Sr-substitution level. From the present work, it can be concluded that $\text{La}_{0.5}\text{Sr}_{0.5}\text{FeO}_3$ shows better OER and ORR activity than undoped-LaFeO_3. The reason behind enhanced electrocatalytic activity is due to increases in the active sites for catalytic activity, improved adsorption capacity of OOH^*, OH^*, O^*, etc. on surface catalyst due to the combined effect of surface area, and change in the oxidation state of Fe and oxygen nonstoichiometry after doping. Keywords: Electrocatalysis, linear sweep voltammetry, cyclic voltammetry, onset potential, overpotential, Tafel slope, oxygen nonstoichiometry