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## Doped lanthanum create catalytic materials for fuel cell applications

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Lanthanum cerate perovskites have been found to be the electrocatalysts for water splitting and other electrolysis under laboratory conditions. The lanthanum cerate perovskite is well known for its position in fuel cell technology as a highly active and compatible electrode material in solid oxide fuel cells (SOFCs) and proton exchange membrane fuel cells (PEMFCs). A doped  $\text{LaCe}_{1-x}\text{MxO}_3$  perovskite offers versatile solid state chemistry with defects balance and resulting electrochemistry poses the versatility for the important industrial process of water splitting. In this perspective, three series of  $\text{LaCe}_{1-x}\text{MxO}_3$  ( $\text{M}=\text{Cr}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$ ,  $x=0.02-0.10$ ) nanopowders were envisioned and tested electrochemically by using cyclic voltammetry and impedance analysis for water splitting in KOH and methanol solution at ambient conditions. Hydrogen evolution reaction (HER) was multifold with all of the perovskite powders. There was an obvious correspondence between the electrocatalytic activity and the morphological, structural properties of the doped systems. The most proactive ceramic in each series was tested for the SOFC technology and average fuel cell performance was observed for a few samples under ambient FC conditions.

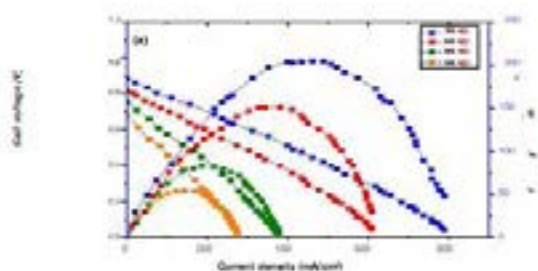


Fig. 1: Cathode performance evaluation curves for a) LCC-10

**Figure 1:** Cathode performance evaluation curves for a) LCC-10 powders with dry  $\text{H}_2$  as fuel and air as oxidant at various temperatures 700°C, 650°C and 600°C and 500°C.

### Recent Publications:

1. Dong W et al. (2016) All in one multifunctional perovskite material for next generation SOFC. *Electrochimica Acta* 193:225-230.
2. Hui J et al. (2017) Promoting photocatalytic  $\text{H}_2$  evolution by tuning cation deficiency in La and Cr co-doped  $\text{SrTiO}_3$ . *Chemical Communications* 53(72):10038-10041.
3. Lan R et al. (2016) A perovskite oxide with high conductivities in both air and reducing atmosphere for use as electrode for solid oxide fuel cells. *Scientific reports* 6:31839.
4. Yaqub A et al. (2015) Synthesis and characterization of B-site doped  $\text{La}_{0.20}\text{Sr}_{0.25}\text{Ca}_{0.45}\text{TiO}_3$  as SOFC anode materials. *International Journal of Hydrogen Energy* 40(1): 760-766.

### Biography

Naveed Kausar Janjua is an Associate professor in Department of Chemistry, Quaid-i-Azam University Islamabad, Pakistan. She has completed her Post-Doc in Fuel Cell Research. She has her interests in Materials chemistry, Electrochemistry, Fuel cells.

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