Short Communication

Electrochemical Characteristics of La$_{0.65}$Sr$_{0.3}$MnO$_3$ and La$_{0.8}$Sr$_{0.2}$MnO$_3$ Nanoceramic Cathode Powders for Intermediate Temperature Solid Oxide Fuel Cell (SOFC) Application


Water and Energy Research Institute (WERI), King Abdulaziz City for Science and Technology (KACST) PO.Box.6086, Riyadh 11442, Saudi Arabia

*E-mail: gmotari@kacst.edu.sa

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In the present investigation, La$_{0.65}$Sr$_{0.3}$MnO$_3$ (LSM-1) and La$_{0.8}$Sr$_{0.2}$MnO$_3$ (LSM-2) nanoceramic powders were prepared by the citrate-nitrate route of auto-combustion with citrate to nitrate (c/n) ratio : 0.50 to assess the effect of these cathode powders on the performance of single SOFC cells. The prepared powders were calcined at 900 °C for 4hrs to remove carboneous residues and characterized them using SEM / EDS, XRD, TGA techniques. The electrochemical characterization of LSM cathode powders were carried out by coating these powders (as cathode functional layer CFL-Bottom and current collector layer CL-Top) using screen printing on the SOFC half cells (NiO-YSZ+YSZ) procured from CGCRI, Kolkata, India with a cell size of 36 mm dia x1.6 mm. These cells were tested with H$_2$-O$_2$ at 700-800 °C with the flow rates of 1.2-1.8 L min$^{-1}$ of hydrogen and 0.4-0.6 L min$^{-1}$ of oxygen. The current density and powder density values obtained for SOFC single cells were 0.85 A cm$^{-2}$ (at 0.7 V) and 0.58 W cm$^{-2}$ at 800 °C with 1.8 L min$^{-1}$ hydrogen and 0.60 L min$^{-1}$ oxygen. The area surface resistance (ASR) values obtained were ~0.52-0.58 Ω cm$^{-2}$ at 0.7 V at 800 °C.

Keywords: Strontium-doped lanthanum manganite, Solid Oxide Fuel Cell, Nickel anode, Yttria-stabilized zirconia, Cathode functional layer, Current collector layer

FULL TEXT

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