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High Performance Novel Symmetric Electrode Material for Intermediate-Temperature Symmetrical Solid Oxide Fuel Cell Applications

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ABSTRACT

In comparison to various power generating devices/energy conversion systems, solid oxide fuel cell (SOFC) has received much attention due to its remarkable efficiency, reliability and low pollution. Modified pechini method was adopted to synthesize La0.7Sr0.3Ti0.1Fe0.6Ni0.3O3-δ (LSTFN) perovskites and utilized it as an anode and cathode for intermediate-temperature symmetrical solid oxide fuel cell (IT-SSOFC). The XRD patterns for LSTFN revealed better reversibility with the cubic perovskite phase. The prepared samples were tested both with dry H2 and air. The conductivity of LSTFN was increased up to 1.1 Scm-1 at a temperature of 700 °C, but was further decreased with the increase in temperature due to small polaron mechanism. However, at the same temperature (700 °C) in the presence of air, conductivity was increased up to 318 Scm-1, fulfilling the requirement of utilizing the material as anode and cathode. Low polarization resistance (Rp) of 0.047 and 0.201 Ωcm2 was exhibited by LSTFN in the presence of dry H2 and air respectively at a temperature of 800 °C. LSTFN exhibits a maximum power density (Pmax) ~402 mWcm-2 at 800 °C.

Keywords: $La_{0.7}Sr_{0.3}Ti_{0.1}Fe_{0.6}Ni_{0.3}O_{3-\delta}$ (LSTFN); Symmetrical solid oxide fuel cell; Conductivity; Stability