Synthesis and electrochemical characterization of $T^*$ La$_{0.84}$Sm$_{0.96}$Sr$_{0.2}$CuO$_4$ as a cathode material for IT-SOFC

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Abstract

The synthesis and electrochemical characterisation of $T^*$ based La$_{0.84}$Sm$_{0.96}$Sr$_{0.2}$CuO$_4$ (LSSCu) has been carried out in order to use as a cathode material for intermediate temperature solid oxide fuel cell application. XRD studies shows, the phase pure material and matches with the JCPDF (79-1861), belong to space group of P4/nmmz. The electrical conductivity value decreases from 52 Scm$^{-1}$ at room temperature to 18 Scm$^{-1}$ at 850 °C showing metallic behaviour in all temperature range. A decrease in conductivity, decreasing the partial pressure of oxygen implying the above material is p-type conductor. The Coefficient of thermal expansion value measured from Dilatometry is $12.4 \times 10^{-6}$ K$^{-1}$ which matches with La$_{0.9}$Sr$_{0.1}$Ga$_{0.8}$Mg$_{0.2}$ (LSGM). Symmetrical cell testing results shows that the area specific resistance is 0.02 ohm.cm$^2$ at 800 °C when the 50:50 weight ratio of the LSSCu and LSGM composite was screen printed on LSGM electrolyte and sintered at 900 °C for 1 hr. The maximum power density of 390 mW.cm$^{-2}$ has been achieved on 350 µ LSGM electrolyte support cell.

XRD of La$_{0.84}$Gd$_{0.96}$Sr$_{0.2}$CuO$_4$

Electrical Conductivity w.r.t. temperature studies in air

Power density curve for LSSCu + LSGM (50: 50) using LSGM electrolyte supported cell