Studies on Structural and Electrical Properties of Lanthanum Doped $$Sr_2CoMoO_{6-}\delta$$ System

Authors : Pravin Kumar, Rajendra K. Singh, Prabhakar Singh

Abstract : A widespread research work on Mo-based double perovskite systems has been reported as a potential application for electrode materials of solid oxide fuel cells. Mo-based double perovskites studied in form of B-site ordered double perovskite materials, with general formula $A_2B'B''O_6$ structured by alkaline earth element (A = Sr, Ca, Ba) and heterovalent transition metals (B' = Fe, Co, Ni, Cr, etc. and B" = Mo, W, etc.), are raising a significant interest as potential mixed ionicelectronic conductors in the temperature range of 500-800 °C. Such systems reveal higher electrical conductivity, particularly those assigned in form of $Sr_2CoM_0O_{6-\delta}$ (M = Mg, Mn, Fe, Co, Ni, Zn etc.) which were studied in different environments $(air/H_2/H_2-Ar/CH_4)$ at an intermediate temperature. Among them, the Sr₂CoMoO₆- δ system is a potential candidate as an anode material for solid oxide fuel cells (SOFCs) due to its better electrical conductivity. Therefore, Sr₂CoMoO₆₋ δ (SCM) system with La-doped on Sr site has been studied to discover the structural and electrical properties. The double perovskite system $Sr_2CoMoO_{6-\delta}$ (SCM) and doped system $Sr_{2-x}La_xCoMoO_{6-\delta}$ (SLCM, x=0.04) were synthesized by the citrate-nitrate combustion synthesis route. Thermal studies were carried out by thermo-gravimetric analysis. Phase justification was confirmed by powder X-ray diffraction (XRD) as a tetragonal structure with space group I4/m. A minor phase of SrMoO4 (s.g. I41/a) was identified as a secondary phase using JCPDS card no. 85-0586. Micro-structural investigations revealed the formation of uniform grains. The average grain size of undoped (SCM) and doped (SLCM) compositions was calculated by a linear intercept method and found to be \sim 3.8 µm and 2.7 µm, respectively. The electrical conductivity of SLCM is found higher than SCM in the air within the temperature range of 200-600 °C. SLCM system was also measured in reducing atmosphere (pure H₂) in the temperature range 300-600 °C. SLCM has been showed the higher conductivity in the reducing atmosphere (H₂) than in air and therefore it could be a promising anode material for SOFCs.

Keywords : double perovskite, electrical conductivity, SEM, XRD

Conference Title : ICSOFCT 2018 : International Conference on Solid Oxide Fuel Cell Technology

Conference Location : Tokyo, Japan

Conference Dates : September 10-11, 2018

1