Sol-gel synthesis and characterization of Co-doped LSGM perovskites.

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ABSTRACT

Solid oxide fuel cells (SOFCs) offer a highly efficient power generation system. However, one of the major requirements for the development and commercialization of low-cost SOFCs is the reduction in the operating temperature, also by using solid electrolytes which exhibit superior ionic conductivity at intermediate temperatures (IT, T < 800°C). Among these ionic conductors, doped $LaGaO_3$ materials show high oxide ionic conductivity in the 600-800 °C range. In particular, $LaGaO_3$ perovskites doped with Sr^{2+} and Co^{3+} and/or Mg^{2+} in A and B sites, respectively, are promising electrolytes for IT SOFCs. These perovskites are usually prepared by time- and energy-consuming solid state reaction. In this paper, $La_{0.8}Sr_{0.2}Ga_{0.8}Mg_{0.2}O_{2.8}$ (LSGM) and $La_{0.8}Sr_{0.2}Ga_{1-x-y}Mg_xCo_yO_{3-\delta}$ (LSGMC) powders containing different amounts of Co were prepared from precursors synthesised by citrate sol-gel method. The precursors were calcined at 1000°C (10 h) and dense high-purity pellets were obtained by pressing (300 MPa) and by sintering in air at 1475°C (5, 10 and 20 h). Sintered pellets of LSGM and LSGMC contained very small amounts of $SrLaGa_3O_7$, as detected by X-Ray Diffraction (XRD) and by the combined use of Scanning Electron Microscopy (SEM) and spot Energy Dispersive Spectroscopy (EDS). LSGMC pellets exhibited a higher phase purity than LSGM materials thus demonstrating the feasibility of sol-gel methods to produce complex metal oxides.

Keywords: Fuel Cells, Perovskites, Powders-chemical preparation, Electrical conductivity.

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