Synthesis and characterization of a double-perovskite anode for solid oxide fuel cells

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Solid oxide fuel cells are one of the most efficient devices for the direct conversion of the chemical energy of a fuel into electricity. Nonetheless, standard solid oxide fuel cells (SOFC) with Ni/yttria-stabilized zirconia cermet anode have a serious decrease of their lifetime when fed with carbon-containing fuels due to coke formation. Ceramics with perovskite structure have been pointed out as good candidates to anodes. In this study, the $Pr_{0.5}Ba_{0.5}MnO_3$ was used as the precursor phase of the double perovskite $PrBaMn_2O_{5+δ}$ (PBMO), present at reducing conditions. The transport and catalytic properties were studied in the pristine compound and in Ru-doped samples $Pr_{0.5}Ba_{0.5}Mn_{1-x}Ru_xO_3$ (Ru-PBMO). Ru substitution at the B-site is expected to enhance the catalytic properties of the ceramic toward ethanol for SOFC's running on such fuel. Simultaneous thermogravimetric and differential thermal analysis (TG/DTA) were used to monitor the thermal evolution of polymeric resins up to 1400 °C. Ceramic powders were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM) analyses. The electrical properties of sintered samples were evaluated by dc 4-probe technique, in the 25 - 800 °C temperature range. The TG/DTA and XRD data show mass loss stabilization and crystalline phase formation occurring at ~800°C. The evolution of the XRD pattern upon calcining temperature indicated the formation of single phase of Ru-PBMO samples at ~1100°C. The initial results suggest that PBMO and PBMO-Ru compounds are promising SOFC anodes for carbon containing fuels.

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References:

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