Short Communication

Synthesis and Intermediate-temperature Electrochemical Properties of Tm^{3+} and Gd^{3+} Double Doped Ceria-Chlorides Composite Electrolyte

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In this study, $\text{Ce}_{0.8}\text{Gd}_{0.1}\text{Tm}_{0.1}\text{O}_{2-\alpha}$ was synthesized by a nitrate-citric acid combustion method. $\text{Ce}_{0.8}\text{Gd}_{0.1}\text{Tm}_{0.1}\text{O}_{2-\alpha}$ powder and binary chlorides (NaCl, KCl) were mixed with the weight ratio kept at 3:1 to prepare $\text{Ce}_{0.8}\text{Gd}_{0.1}\text{Tm}_{0.1}\text{O}_{2-\alpha}(\text{Na/K})\text{Cl}$ composite electrolyte. The crystal structures of $\text{Ce}_{0.8}\text{Gd}_{0.1}\text{Tm}_{0.1}\text{O}_{2-\alpha}$ and $\text{Ce}_{0.8}\text{Gd}_{0.1}\text{Tm}_{0.1}\text{O}_{2-\alpha}(\text{Na/K})\text{Cl}$ were determined by X-ray diffraction (XRD). The AC impedance spectra of $\text{Ce}_{0.8}\text{Gd}_{0.1}\text{Tm}_{0.1}\text{O}_{2-\alpha}(\text{Na/K})\text{Cl}$ were measured in the range of 450-700 °C and different oxygen partial pressures. The maximum conductivity and power density of the composite electrolyte reached $24.5 \text{ mS}\cdot\text{cm}^{-1}$ and $147.7 \text{ mW}\cdot\text{cm}^{-2}$ at 700 °C, respectively.

Keywords: Composite; Electrolyte; Fuel cell; Oxygen partial pressure; Conductivity

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