Short Communication

The Intermediate Temperature Electrochemical Properties of Silver and Aluminum Double-Doped Strontium Silicate

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In this study, $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{SiO}_{3-\alpha}$ and $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{Si}_{0.9}\text{Al}_{0.1}\text{O}_{3-\alpha}$ electrolytes were synthesized via a high temperature solid state reaction method using SrCO_3 , SiO_2 , AgNO_3 and Al_2O_3 as raw materials. The phase purities and morphologies of $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{SiO}_{3-\alpha}$ and $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{Si}_{0.9}\text{Al}_{0.1}\text{O}_{3-\alpha}$ were confirmed by X-ray diffractometer and scanning electron microscopy. SEM photos showed that $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{SiO}_{3-\alpha}$ and $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{Si}_{0.9}\text{Al}_{0.1}\text{O}_{3-\alpha}$ pellets were well-sintered. The Arrhenius plots indicated that the activation energies of $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{SiO}_{3-\alpha}$ and $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{Si}_{0.9}\text{Al}_{0.1}\text{O}_{3-\alpha}$ are $107.3 \pm 3.2 \text{ kJ}\cdot\text{mol}^{-1}$ and $107.7 \pm 2.1 \text{ kJ}\cdot\text{mol}^{-1}$ in nitrogen atmosphere from 400 °C to 800 °C, respectively. $\text{Sr}_{0.6}\text{Ag}_{0.4}\text{SiO}_{3-\alpha}$ showed the highest maximum power density of $48.5 \text{ mW}\cdot\text{cm}^{-2}$ at 800 °C.

Keywords: Electrolyte; Fuel cell; Conductivity; Strontium silicate

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