Short Communication

Facile Preparation of Cu²⁺-doped Tin(IV) Pyrophosphate /Potassium Metaphosphate Composite as a Highly Efficient Electrolyte for Intermediate Temperature SOFCs

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In this study, a Sn_{0.95}Cu_{0.05}P₂O₇/KPO₃ composite ceramic was synthesized via a facile solid state reaction method and characterized by X-ray diffractometer (XRD), scanning electron microscopy (SEM) and Raman spectroscopy. The intermediate temperature electrical properties were evaluated using impedance spectroscopy. The results showed that the microstructure of the Sn_{0.95}Cu_{0.05}P₂O₇/KPO₃ electrolyte pellet plays an important role in determining electrical properties, and amorphous secondary phases appreciably influence proton conduction. The highest conductivity of Sn_{0.95}Cu_{0.05}P₂O₇/KPO₃ was $3.4 \times 10^{-2} \text{ S} \cdot \text{cm}^{-1}$ in a dry nitrogen atmosphere at 700 °C. The operation tests of an H₂/O₂ fuel cell with the Sn_{0.95}Cu_{0.05}P₂O₇/KPO₃ composite electrolyte showed an open circuit voltage of approximately 1.06 V and a maximum power output density of 218.9 mW·cm⁻² at 700 °C. This work offers new alternatives for the design of metal pyrophosphates composite electrolyte.

Keywords: Pyrophosphates; Composite electrolyte; Ionic conductivity; Solid oxide fuel cell

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