Ce³⁺ doped CeP₂O₇ Ceramic Electrolyte for high temperature Proton Exchange Membrane Fuel Cell

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doi: 10.20964/2017.04.31

Received: 10 January 2017 / Accepted: 9 February 2017 / Published: 12 March 2017

Proton conductors capable of operating in high temperature range (over 180°C) has attracted worldwide attention. The promising inorganic membranes candidates CeP₂O₇ and Ce³⁺ doped CeP₂O₇ were used between 160 °C and 280 °C for Proton exchange membrane fuel cell (PEMFC) in this study. The structure and phase stability were analyzed by X-ray diffraction, Fourier transform infrared (FTIR), XPS (ESCALAB250Xi) and thermogravimetric analysis (TGA), and also the microstructure morphology was analyzed by scanning electron microscopy (SEM). The CeP₂O₇ and Ce³⁺ doped CeP₂O₇ composite membranes exhibited high proton conductivity of 0.008 S cm⁻¹ and 0.0095 S cm⁻¹ at 200 °C, respectively. The peak power densities of Ce³⁺ doped CeP₂O₇ membrane were 23.5 mW cm⁻² at 180 °C and 26.6 mW cm⁻² at 200 °C, respectively.

Keywords: high-temperature proton exchange membrane fuel cells; low valency cations; cerium pyrophosphate

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