

One-Step Thermal Processing of BaCe_{0.8}Y_{0.2}O_{3-δ} Hydrogen Permeable Multi-Channel Hollow Fiber Membrane

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Abstract

Yttrium-doped barium cerate (BaCe_{0.8}Y_{0.2}O_{3-δ}, BCY) is the most widely studied proton conducting material and is frequently fabricated as dense membranes for hydrogen separation. However, the difficulty to prepare dense BCY membranes is the extremely high sintering temperature, normally higher than 1500 °C. Herein, the BCY 7-channel hollow fiber membrane was prepared by one-step thermal processing (OSTP). It proved that adding Co₂O₃ as sintering aid is beneficial to the densification and 1wt% Co₂O₃ was the optimum addition to form a homogeneous phase structure. The dense sintering temperature was greatly reduced from over 1500 to 1350 °C. The hydrogen permeation flux of the BCY hollow fiber membrane reached up to 0.34 ml min⁻¹cm⁻² at 900 °C. The long-term stability test last for 300 h. The properties of OSTP samples were demonstrated to be essentially higher than samples made by conventional ceramic hollow fiber fabrication methods.

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