Tape-cast asymmetric membranes for hydrogen separation

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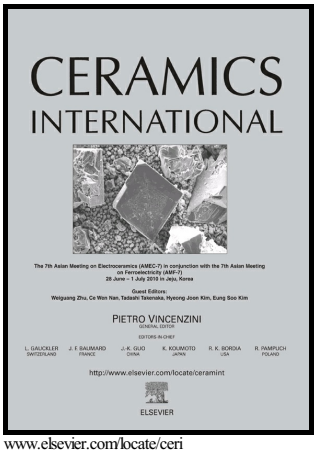

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Tape-cast asymmetric membranes for hydrogen separation

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Abstract

Ceramic hydrogen separation membrane is a promising technology for obtaining pure hydrogen in a wide range of processes including power generation with pre-combustion CO_2 capture, water-gas shift, methane reforming, etc. This work presents for the first time the production of cer-cer asymmetrical composite membranes. $BaCe_{0.65}Zr_{0.20}Y_{0.15}O_{3-\delta}$ (BCZY) supported BCZY-$Gd_{0.2}Ce_{0.8}O_{2-\delta}$ (GDC) membranes were produced by tape casting. Three different sintering aid incorporation methods were investigated to enhance the final density of the BCZY-GDC layer. The optimization of the whole process leads to produce planar crack-free asymmetrical proton conductive membranes with Ø = 12 mm, constituted by a porous 350 µm thick BCZY substrate with an open porosity of 48%, and a 20µm thick gas tight BCZY-GDC layer.

Keyword BCZY-GDC; Tape casting (A); Composites (B); Membranes (E)

1. Introduction

High temperature proton conducting ceramics based on perovskites of a general formula ABO_3 ($BaCeO_3$, $SrCeO_3$, $BaZrO_3$ and $SrZrO_3$), have received increasing interest as electrolytes in proton-conducting intermediate-temperature solid-oxide fuel cells (SOFCs) [1,2] and as hydrogen separation membranes [3,4]. Proton conducting perovskite membranes are in particular very attractive for: i) 100% selectivity towards H_2 separation, ii) direct integration into the reforming or gasification plants, iii) less-costly materials.