Design and optimization of porous ceramic supports for asymmetric ceria-based oxygen transport membranes - DTU Orbit (09/11/2017)

Design and optimization of porous ceramic supports for asymmetric ceria-based oxygen transport membranes

The microstructure, mechanical properties and gas permeability of porous supports of $Ce_{0.9}Gd_{0.1}O_{1.95-\delta}$ (CGO) were investigated as a function of sintering temperature and volume fraction of pore former for use in planar asymmetric oxygen transport membranes (OTMs). With increasing the pore former content from 11 vol% to 16 vol%, the gas permeabilities increased by a factor of 5 when support tapes were sintered to comparable densities. The improved permeabilities were due to a more favourable microstructure with larger interconnected pores at a porosity of 45% and a fracture strength of 47±2 MPa (m=7). The achieved gas permeability of 2.25×10^{-15} m^2 for a 0.4 mm thick support will not limit the gas transport for oxygen production but in partial oxidation of methane to syngas at higher oxygen fluxes. For integration of the CGO support layer into a flat, asymmetric CGO membrane, the sintering activity of the CGO membrane was reduced by Fe_2O_3 addition (replacing Co_3O_4 as sintering additive).

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