The role of sacrificial fugitives in thermoplastic extrusion feedstocks on properties of MgO supports for oxygen transport membranes

Abstract

Three different compositions of MgO compounds were investigated for use in oxygen transport membranes. Porous MgO supports were extruded using different kind (size, morphology and chemistry) of pore formers: A flaky graphite, a spherical graphite and ideal spheres of PMMA. The influence of the pore former on microstructure, gas permeation and the mechanical properties for various sintering temperatures were investigated. The gas permeation behavior of the MgO supports was highly dependent on pore neck size and total open porosity. MgO substrate, with 20% spherical graphite as a pore former, sintered at 1300 °C for 2 h, showed a total porosity of 42.5% and gas permeability of $4.7 \times 10^{-16} \text{m}^2$. Subsequently, the 4-point bending strengths of this substrate, scaled to an effective volume of 10 mm$^3$, were 77 and 60 MPa for room and operation temperature (850 °C). Both, permeation rate and mechanical strength is sufficient for using the support for further investigations in OTM. © 2014 Elsevier Ltd. All rights reserved.

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