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VIRTUAL 

High temperature percolation of carbonate ions through porous alumina and zirconia-magnesia impregnated with alkali carbonates

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Na₂CO₃-K₂CO₃ (56-44 wt.%) eutectic composition was vacuum-impregnated into porous Al₂O₃ (alumina) and to ZrO₂: 3 wt.% MgO (magnesium-partially stabilized zirconia, Mg-PSZ) at the molten eutectic temperature. Porosity was achieved in the two compounds by addition and thermal removal of the eutectic composition before impregnation. The parallel surfaces of disk-shaped impregnated compositions were observed in a scanning electron microscope. The CO₃²⁻ carbonate ion conductivity of the two composite ceramics was measured by electrochemical impedance spectroscopy in the 5 Hz-13 MHz frequency range from 470°C to 780°C. The permeation of the carbonate ions via eutectic composition through the ceramic membranes was ascertained by the threshold temperatures of the onset of the carbonate ion percolation: 660°C and 720°C for alumina and Mg-PSZ, respectively.