Properties of porous samaria-doped ceria ceramics with lithium fluoride as sacrificial pore former

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Porous ceria: 10 mol% samaria (10SDC) ceramic solid electrolytes were prepared by solid state reaction with 0-50 vol.% lithium fluoride (LiF). Consolidation was done by heating to the melting point of LiF for 30 min to form a liquid phase, followed by elimination of LiF by capillarity after heating to 1500° C for 2 h, promoting intergranular porosity and 10SDC skeletal densification. Apparent density was evaluated by the Archimedes method, pore distribution by scanning electron microscopy and electrical properties by electrochemical impedance spectroscopy in the 5 Hz - 13 MHz frequency range and temperatures from 300 to 550° C. The main results show that porous ceramics with high skeletal density are obtained with sacrificial LiF. Moreover, the total electrical resistivity is directly related to the pore volume fraction. High temperature vacuum impregnation of lithium-potassium carbonate eutectic compositions onto the porous 10 SDC was carried out to consolidate composite SDC-molten carbonate ceramic membranes with tunable transport properties, for selective carbon dioxide separation. The enhancement of the total electrical conductivity was evaluated by electrochemical impedance spectroscopy. Percolation of the molten carbonate through the permeable porous membrane was ascertained by EDX analysis on both parallel surfaces of the membranes.
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