Effect of sintering aids on mechanical strength and microstructure of a porous $LiAlO_2$ electrolyte support for molten carbonate fuel cells

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The molten carbonate fuel cell (MCFC) is one of the promising power generation systems by means of high energy conversion efficiency, low emission and flexibility of fuel utilization. Among components for MCFC, the matrix plays an important role in supporting the electrolyte. So, it should have proper pore structure and mechanical strength. $LiAlO_2$ have been used as the main material of the matrix for MCFC. However, the degradation of the matrix during long term operation and pretreatment steps, which lead to performance loss, is one of the main problems. In order to reinforce the matrix for MCFC, reinforcing additives having low melting points such as Al powders [average pore size of 3μm, 660°C], B_2O_3 [450°C] have been included into conventional $LiAlO_2$ by tape casting method. After reinforcing additives were melted, these can be coated on $LiAlO_2$ particles and can increase sintering rates. The mechanical properties and the micro structures of Al- and B_2O_3-included matrix were examined by 3-point bending strength measurement, scanning electron microscope, mercury porosimetry, X-ray powder diffraction and high temperature differential scanning calorimeter.