

Impedance spectroscopy analysis of calcia-stabilized zirconia with boron oxide addition

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Abstract

The effect of boron oxide addition on the properties of cubic $ZrO_2:12.5 \text{ mol\% CaO}$ ceramic powders was studied by impedance spectroscopy analysis in the 10 Hz - 10MHz range from 300 to 600 C. The effect of boron addition on the cubic-to-monoclinic phase ratio was followed by X-ray diffraction analysis. The grain morphology of fractured pellets was observed by scanning electron microscopy. 5 mol% B_2O_3 addition promoted slight improvement in the apparent density of the sintered pellets due to liquid phase sintering. Moreover, the value of the ionic conductivity in the electrolytic region increases. A detailed analysis of the impedance spectroscopy diagrams of pellets sintered with different boron oxide additions shows a medium frequency (between the intergranular and intragranular responses) response not observed in pellets sintered without the additive. Morphological differences of the intergranular regions in specimens with and without the additive were also observed by scanning electron microscopy.