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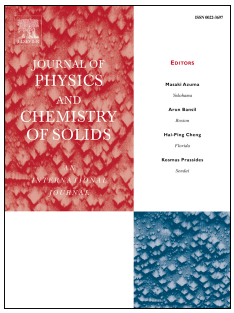

Mechanical and thermal properties of SrO/BaO modified Y_2O_3-Al_2O_3-B_2O_3-SiO_2 glasses and their compatibility with solid oxide fuel cell components

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Mechanical and thermal properties of SrO/BaO modified Y_2O_3-Al_2O_3-B_2O_3-SiO_2 glasses and their compatibility with solid oxide fuel cell components

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Abstract

In this study, various compositions of (30-x) SrO-xBaO-10Al_2O_3-45SiO_2-5B_2O_3-10Y_2O_3 (mol%) ($5 \leq x \leq 25$) were synthesized using the melt-quench technique. The as-prepared glasses were characterized by X-ray diffraction, micro-hardness testing, dilatometry, and scanning electron microscopy to determine their thermal and mechanical properties. Powders of the glasses were used to make diffusion couples with Crofer 22 APU (interconnect) and yttria stabilized zirconia (YSZ) for the interfacial study. Diffusion couples of the pre-oxidized Crofer 22 APU/glasses and YSZ/glasses were tested for 500 h at 850°C. The coefficients of thermal expansion obtained for all the glasses were in the required range for applications in solid oxide fuel cells. The highest hardness and fracture toughness were obtained for the glass with x = 10 mol% due to the mixed modifier effect. However, the glass with x = 15 mol% exhibited better adhesion with YSZ and Crofer 22 APU.

Keywords: Coefficient of thermal expansion, Fracture toughness, Glass seal, Hardness, Scanning electron microscopy, Solid oxide fuel cell.

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