

The Key Role of Yttrium Oxide on Devitrification Resilience of Barium Gallo-germanate Glasses: Physicochemical Properties and Crystallization Study

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Abstract : Two barium gallo-germanate glass series were elaborated to investigate the effect of the yttrium introduction on the glass physicochemical properties and crystallization behavior. One to twenty mol% of YO₃/2 were either added into the glass matrix or substituted for gallium oxide. The glass structure was studied by Raman spectroscopy, and the thermal, optical, thermo-mechanical and physical properties are examined. The introduction of yttrium ions in both glass series increases the glass transition temperature, crystallization temperature, softening temperature, coefficient of linear thermal expansion and density. Through differential scanning calorimetry and X-ray diffraction analyses, it was found that competition occurs between the gallo-germanate zeolite-type phase and the yttrium-containing phase. From 13 mol% of YO₃/2, the yttrium introduction impedes the formation of surface crystallization in these glasses.

Keywords : photonic, heavy-metal oxide, glass, crystallization

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