

EFFECT OF NIOBIUM OXIDE ON THE CaO-Al₂O₃-SiO₂ CRYSTALLIZATION

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Glass-ceramics are microcrystalline materials obtained from a parent glass by almost complete devitrification, that generally have low coefficients of linear thermal expansion together with high chemical and thermal shock resistance and have a wide variety of applications.^{1,2} The CAS (CaO-Al₂O₃-SiO₂) ternary system has a wide range of glass forming compositions. All these systems glasses are difficult to crystallize and they require the addition of nucleating agents for crystallization, such as TiO₂.³ This work studied the influence of Nb₂O₅ on the glass structure of anortite by the crystallization in glass-ceramic body.⁴ The additional niobium oxide present in the composition glass was added with concentration of 5 and 10% in mass. The glass was obtained by quenching in the deionized water and milling by 96 h in a ball mill with zirconia grinding media. The powder was conformed in cylindrical samples for the thermal treatment. The crystallization temperature was 960°C (with $T_g \sim 850$ °C obtained by DTA analyses) by 1, 2, 4 and 8 h in dilatometer NETZSCH 402 E. The samples with 10% of niobium oxide showed a significant linear shrinkage (22%) . The Vickers Hardness test showed an increase in the hardness with the increase in the concentration of niobium oxide. For the samples without Nb₂O₅ the hardness was 450 Kg/cm², however for the ones with 10% of Nb₂O₅ the hardness was 664 Kg/cm². It was also observed that the increase of isothermal time did not promote significant changes in the physical properties. The DRX analysis showed that niobium oxide in anortite system induced a new phase and promoted the crystallization at lower temperatures.

References:

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