Structure and phase separation investigation of Zr containing Na2O-CaO-SiO2-Al2O3 glass

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Abstract

Zirconium is widely used in glass ceramic as a nucleating agent. It can also enter a few specific glass compositions like nuclear waste insulation tank. We know that in MgO-Al2O3-SiO2-ZnO classical parent glass used in glass ceramic, it can generate some nanoscale heterogeneities before crystallization [1]. In that case, some regions are highly concentrated in Zr while the residual glass is Zr-poor. These heterogeneities can act as phase separation and are precursors for the crystallization. During classical SiO2-Na2O-CaO-Al2O3 industrial forming glass, some Zr can leave the Zr-containing wall of the furnace to enter the glass structure. Zr atoms can segregate into the glass matrix and form a droplet that can modify the final glass properties. These droplets can eventually crystallize to create another kind of defect. A structural study of NCAS glasses with variable amounts of Zr allows understanding how Zr environment impacts the crystallization processes. Various analyses have been obtained (XANES, EXAFS, NMR...) to describe the Zr environment from its first neighbors to the polymerized glass network in order to determine if phase separation also affects crystallization in this system. [1] O.Dargaud, L. Cormier, *Journal of Non-Crystalline Solids* 358 (2012)

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