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Glass-Forming Ability of Soda Lime Borate Liquids

Qiuju Zheng[1,2], John C. Mauro[2], Morten M. Smedskjaer[1], Marcel Potuzak[2], Ralf Keding[3], Yuanzheng Yue[1]

[1]*Section of Chemistry, Aalborg University, DK-9000 Aalborg, Denmark*
[2]*Science and Technology Division, Corning Incorporated, Corning, New York, USA*
[3]*Max Planck Institute for the Science of Light, D-91058 Erlangen, Germany*

We investigate the glass-forming ability (GFA) of a series of iron-containing soda lime borate compositions [$x$$Na_2O$-10CaO-(89-$x$)$B_2O_3-1Fe_2O_3$ (x=5, 10, 15, 20, 25, 30 and 35 mol%)] by examining their crystallization behavior and fragility. GFA is characterized in terms of Hrubÿ parameter K_H and our newly established criterion. In general, the GFA decreases with increasing content of Na_2O. Interestingly, we observe that after the first upscan to 1000 ºC at 20 K/min and a subsequent downscan at the same rate, two glasses containing 20 and 25 Na_2O mol% do not exhibit any crystallization exotherms during the second upscan at 20 K/min to 1000 °C. Even when the upscan rate is lowered to 5 K/min, the same phenomenon is observed. This means that the stability of these glasses against crystallization is dramatically enhanced for these two compositions. This particular behavior is explained in terms of the temperature dependence of the boron speciation.