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Glass-Forming Ability of Soda Lime Borate Liquids

Qiuju Zheng¹², John C. Mauro², Morten M. Smedskjaer¹, Marcel Potuzak², Ralf Keding³, Yuanzheng Yue¹

¹Section of Chemistry, Aalborg University, DK-9000 Aalborg, Denmark
²Science and Technology Division, Corning Incorporated, Corning, New York, USA
³Max 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 \([xNa_2O-10CaO-(89-x)B_2O_3-1Fe_2O_3 (x=5, 10, 15, 20, 25, 30 and 35 \text{ mol\%})]\) by examining their crystallization behavior and fragility. GFA is characterized in terms of Hrubý 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 °C 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.