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FLOW BEHAVIOR AND GLASS FORMING ABILITY OF CALCIUM ALUMINOSILICATE MELTS

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The relation between flow behavior and glass forming ability has been investigated for 10 calcium aluminosilicate (CAS) melts. Five melts include the two eutectic compositions of the anorthite-wollastonite-gehlenite and the anorthite-wollastonite-tridymite triangles, and three on the joining line between the two. The other five melts lie on a line parallel to the joining line. The temperature dependences of the viscosity are determined in the low viscosity range (approx. 10^0 - 10^2 Pa s) using concentric cylinder viscometry, and, in the high viscosity range (approx. 10^9 - 10^{13} Pa s) using micro penetration viscometry. The fragility parameters of the melts are obtained by fitting the viscosity data to the Avramov equation. These parameters along with crystallization behavior and working temperatures are used to define and evaluate the glass forming ability of the CAS melts. To reveal the structural origin of the flow behavior, the ten glasses are characterized using ^{29}Si and ^{27}Al solid state nuclear magnetic resonance spectroscopy. The final purpose of this study is to find an optimum composition for ensuring both good glass forming ability and qualified physical and chemical performances for a technical application within an industrial project.