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# Correlation between Fragility and Configurational Heat Capacity in Calcium Aluminosilicate Glasses

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**Abstract:** Enabling accurate prediction of the properties of aluminosilicate glasses and glass-forming liquids is important for the development of new glass compositions for high-tech applications. In this study, we use a combined topological and thermodynamic approach to connect the configurational heat capacity ( $C_{p,\text{conf}}$ ) with the liquid fragility ( $m$ ) and glass transition temperature ( $T_g$ ) of calcium aluminosilicate glasses. To obtain glasses with different structural and dynamical features, we study two glass series; one at the tectosilicate join with varying  $\text{SiO}_2$  content and one with constant  $\text{CaO}$  content but varying  $\text{Al}_2\text{O}_3/\text{SiO}_2$  ratio.  $C_{p,\text{conf}}$  is determined using differential scanning calorimetry (DSC), while  $m$  and  $T_g$  are determined through both DSC and direct viscosity measurements. The  $C_{p,\text{conf}}$  model is found to generally predict the measured data well, but deviations between modelled and measured  $C_{p,\text{conf}}$  values appear for the strongest glasses in the tectosilicate series and for the most peraluminous glasses in the constant  $\text{CaO}$  series. We discuss the origins of these model-data discrepancies based on the structural evolution in the glasses as determined through Raman spectroscopy measurements.

**Keywords:** calcium aluminosilicate glasses, configurational heat capacity, fragility, glass transition, network structure.

