



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Correlation between Fragility and Configurational Heat Capacity in Calcium Aluminosilicate Glasses

Bechgaard, Tobias Kjær; Mauro, John C.; Bauchy, Mathieu; Yue, Yuanzheng; Jensen, Lars Rosgaard; Smedskjær, Morten Matstrup

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Bechgaard, T. K., Mauro, J. C., Bauchy, M., Yue, Y., Jensen, L. R., & Smedskjær, M. M. (2017). *Correlation between Fragility and Configurational Heat Capacity in Calcium Aluminosilicate Glasses*. Abstract from 12th Pacific Rim Conference on Ceramic and Glass Technology, Waikoloa, United States.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- ? Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- ? You may not further distribute the material or use it for any profit-making activity or commercial gain
- ? You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Correlation between Fragility and Configurational Heat Capacity in Calcium Aluminosilicate Glasses

Tobias K. Bechgaard¹, John C. Mauro², Mathieu Bauchy³, Yuanzheng Yue¹, Lars R. Jensen⁴, Morten M. Smedskjaer^{1,*}

¹ *Department of Chemistry and Bioscience, Aalborg University, Aalborg, Denmark*

² *Science and Technology Division, Corning Incorporated, Corning, USA*

³ *Department of Civil and Environmental Engineering, University of California, Los Angeles, USA*

⁴ *Department of Mechanical and Manufacturing Engineering, Aalborg University, Aalborg, Denmark*

* Corresponding author. E-mail: mos@bio.aau.dk

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 SiO_2 content and one with constant 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 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.

