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Impact of Compression on Structure and Properties of Borate Glasses

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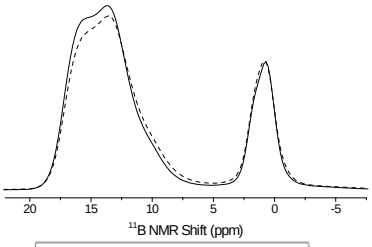
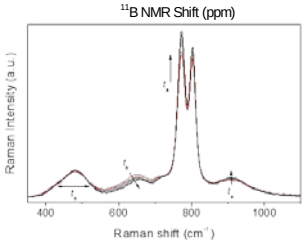
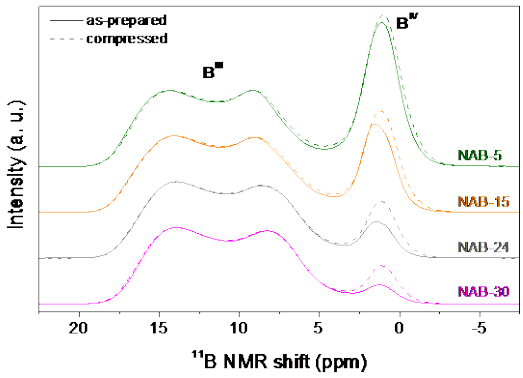
ORAL Presentation

Abstract

Borate glasses continue to be of significant interest, especially in the development of models and understanding of structure/property relations. These glasses are well known in exhibiting substantial structural change in response to different thermal histories, especially in terms of the polyhedra comprising the glass networks. In this work, we study the impact of high temperature compression on the structure and properties of a variety of boron-containing glasses, ranging from simple borates to more complex borosilicate and aluminoborate glasses. The application of pressure at temperatures around Tg enables permanent densification of the glasses, and sizes of the resulting glass pieces are amenable to a variety of characterization approaches, including NMR, Raman and mechanical testing. Compression leads to changes in bulk density and short-range structure involving cation coordination. We also see evidence for alteration of the ring and non-ring BO_3 environments as detected by ^{11}B NMR methods, as well as changes in the vibrational modes associated with ring-type superstructural units. The impact of compression on both structure and glass properties will be described.







Brief Biographical Notes

Randall Youngman *has been with Corning Incorporated since 1997, and is currently a Senior Research Associate in the Characterization Sciences research group. He received a B.S. in Chemistry from Fort Lewis College in 1991 and a PhD in Physical Chemistry from Indiana University in 1996. He has seven granted US patents and has published over 60 journal articles. Dr. Youngman is a Fellow of the American Ceramic Society (ACerS), and served as Chair of the Glass & Optical Materials Division of ACerS from 2015-2016. His research interests include structure of inorganic glasses and polymer dynamics using solid-state NMR spectroscopy.*