Multi-edgespectroscopicstudy of lithium borate glasses/crystalsusing non-resonantinelastic X-ray scattering

G. Lelong[1,], L. Cormier[1], G. Radtke[1], L. Hennet[2], G. Monaco[3]*

[1]*Institut de Minéralogie, Physique des MatériauxetCosmochimie, Université Pierre et Marie Curie, CNRS, Paris, France*

[2] *Conditions ExtrêmesetMatériaux: Haute-Température et Irradiation, CNRS, Orléans, France*

[3] *ESRF, Grenoble, France*

Alkali borate glasses are considered as strong glass-formers, and they exhibit an increasing fragility as the alkali oxide content increases. This fragile behavior indicates a rapid raise in the configurational entropy above Tg, contrary to what it is observed in the strong B_2O_3 liquid. However, it is not well understood in which manner the structural mechanisms are involved in the entropy increase, partly due to the lack of data on the structural reorganization when going from the glass to the liquid.

Structure and electronic information can be obtained from K-edges spectra that are usually measured using energy-loss spectroscopy (EELS) or X-ray absorption spectroscopy (XAS). These techniques have been recently extended by the use of Non–Resonant Inelastic X-ray Scattering (NRIXS) that can yield to similar information. All these techniques are chemically selective and can probe the local environments of Li, B and O atoms in alkali borate glasses/crystals. Unlike EELS and XAS, NRIXS allows measurements in complex sample environments (high-pressure, high-temperature, …)

By coupling NRIXS with the aerodynamic technique, we probed the local environment of B and O atoms in the glassy and liquid states. We will present results on the evolution of B and O K-edges spectra as a function of temperature for an extended range of composition, from pure B_2O_3 up to 67mol% Li_2O. The $BO_3 \Rightarrow BO_4$ conversion will be followed and quantified and its impact on the O environment will be discussed.