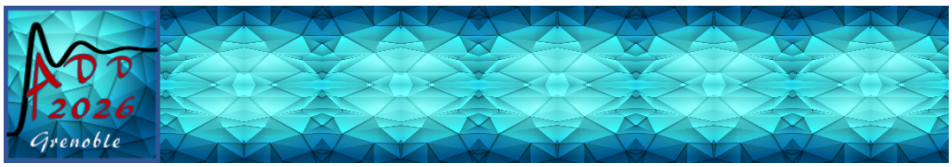

Abstract ID : **69**

Intermediate-range order in glassy oxide materials revealed by topological analyses

Content

The structural analysis of glassy materials remains a challenging topic in materials science, primarily due to the absence of long-range order. However, a combination of quantum beam (X-ray/neutron) diffraction measurements, computer simulations, and advanced topological analyses [1,2] focused on rings, cavities, and homologies, enables the investigation of intermediate-range order [3–6], which exists on a length scale larger than atomic bond lengths in glassy materials.
In this presentation, we focus on the intermediate-range order in glassy oxide materials. In particular, recent research in silica [7] and silicate [8] glasses is highlighted, where it was found that topology is a significant structural feature for understanding structure–property relationships in glassy materials. Furthermore, a recent work on the formation of a zirconium oxide crystal nucleus in the initial nucleation stage in aluminosilicate glass-ceramics investigated by anomalous X-ray scattering is addressed [9].

References

[1] Y. Onodera *et al., J. Ceram. Soc. Jpn.*, **127**, 853 (2019).
[2] S. Kohara *et al., J. Ceram. Soc. Jpn.*, **132**, 653 (2024).
[3] A. C. Wright and A. J. Leadbetter, *Phys. Chem. Glasses*, **17**, 122 (1976).
[4] J. C. Philips, *J. Non-Cryst. Solids*, **43**, 37 (1981).
[5] D. L. Price *et al., J. Phys. C. Solid State Phys.*, **21**, L1069 (1988).
[6] P. S. Salmon *et al., Nature*, **435**, 75 (2005).
[7] Y. Onodera *et al., NPG Asia Mater.*, **12**, 85 (2020).
[8] Y. Onodera *et al., NPG Asia Mater.*, **11**, 75 (2020).
[9] Y. Onodera *et al., NPG Asia Mater.*, **16**, 22 (2024).

Primary author: ONODERA, Yohei (National Institute for Materials Science)

Contribution Type: Invited

Submitted by **FISCHER, Henry** on **Thursday, November 13, 2025**