The 511th Geodynamics Seminar

Structure measurement of oxide glasses at >100 GPa, and discovery of ultrahigh pressure polyamorphism in GeO_2 and SiO_2 glasses with coordination number >6

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Knowledge of pressure-induced structural changes in network forming liquids and glasses is of great interest in various scientific fields, such as condensed matter physics, geoscience, and materials science. However, due to experimental difficulties, pressure-induced structural changes in liquids and glasses have not been well understood in experiments. In the past decades, new developments in high-pressure experiments, particularly combined with synchrotron X-ray techniques, have advanced the study of liquids and glasses under pressure (cf. reviews in Kono and Sanloup, 2018). Here I will talk about recent advances in experimental study of structure of liquids and glasses at high pressures, developed at the beamline 16-BM-B, HPCAT in Advanced Photon Source, USA. The beamline 16-BM-B utilizes white X-ray combined with Paris-Edinburgh type large volume press for studying the structure and physical properties of liquids and glasses at in situ high-pressure and high-temperature conditions. Our recent development of double-stage large volume cell combined with multi-angle energy dispersive X-ray diffraction opened a new way to investigate structure of oxide glasses under ultrahigh pressure conditions of >100 GPa (Kono et al., 2016; 2018). The new experiment revealed existence of ultrahigh pressure polyamorphism in GeO_2 (Kono et al., 2016) and SiO_2 glasses with coordination number >6. In this talk, we introduce our recent development of the structure measurement of oxide glasses at >100 GPa and show ultrahigh pressure structure changes in GeO_2 and SiO_2 glasses with coordination number larger than 6.

Kono Y, *et al.* (2016) Ultrahigh-pressure polyamorphism in GeO_2 glass with coordination number> 6. *Proceedings of the National Academy of Sciences* 113(13):3436-3441.

Kono Y, Shibazaki Y, Kenney-Benson C, Wang Y, & Shen G (2018) Pressure-induced structural change in $MgSiO_3$ glass at pressures near the Earth's core–mantle boundary. 115(8):1742-1747.

Kono Y & Sanloup C (2018) *Magmas Under Pressure: Advances in High-Pressure Experiments on Structure and Properties of Melts* (Elsevier).

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