Ultrahigh pressure structure change in SiO_2 glass with coordination number >6

*Yoshio Kono[1], Yu Shu[2], Curtis Kenney-Benson[2], Yanbin Wang[3], Guoyin Shen[2]

1. Geodynamics Research Center, Ehime University, 2. Argonne National Laboratory, 3. The University of Chicago

Possible existence of ultrahigh pressure structural change in silicate magma with the Si-O coordination number (CN) larger than 6 is one of the most important issues in understanding nature of silicate magmas at the Earth's core-mantle boundary. However, structure of silicate magmas at the ultrahigh pressure conditions of the core-mantle boundary remain poorly understood, because of experimental challenges. Efforts have been made to investigate structure and/or properties of silicate glasses, as an analogue of silicate magma, at ultrahigh pressure conditions. Pioneering work by Murakami and Bass (2010) discovered a kink in the pressure dependence of shear-wave velocity in SiO_2 glass around 140 GPa, which was interpreted as evidence of ultrahigh pressure structural transition with the CN>6. However, no structural information is available under such ultrahigh pressure 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. The new experiment revealed existence of ultrahigh pressure polyamorphism in GeO_2 glass with CN>6 (Kono et al., 2016). Our latest development further enhanced the structure measurement capability and we succeeded to measure structure of SiO_2 glass up to 120 GPa. Here we will show ultrahigh-pressure structural change in SiO_2 glass at the pressure conditions near the Earth's core-mantle boundary.

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.

Murakami, M., & Bass, J. D. (2010). Spectroscopic evidence for ultrahigh-pressure polymorphism in SiO_2 glass. *Physical review letters*, *104*(2), 025504.

Keywords: high pressure, SiO2 glass, magma, core-mantle boundary

