

The 457th Geodynamics Seminar

In situ X ray observations of crystallization of grossular glass
under high pressure and high temperature

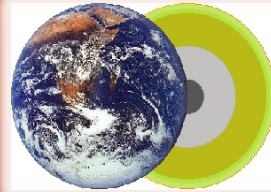
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Research Bldg. 1, Ehime Univ.

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場所 : 愛媛大学 総合研究棟 I
4階共通会議室



Abstract

Grossular garnet ($\text{Ca}_3\text{Al}_2\text{Si}_3\text{O}_{12}$) is an important end-member of garnets in the upper mantle and the mantle transition zone. Irifune et al. (2016; Nature Comm., in press) demonstrated that direct conversion from bulk glass starting material leads to highly transparent nano-polycrystalline grossular garnet at pressures above ~ 10 GPa at temperatures around 1400°C . Knowing crystallization temperature of glass under pressure is important for this technique, which is not well constrained in Irifune et al. (2016). Moreover, understanding crystallization processes of glass under high pressure is important in making the transparent nano-polycrystalline ceramics, but there have been virtually no such studies to date. In the present study, I tried to constrain the crystallization processes of grossular glass using in situ X-ray diffraction measurements with time-resolved measurements, as well as X-ray imaging techniques under high pressure. In situ X-ray observations were conducted at 8 and 15 GPa, using multianvil apparatus at BL04B1, SPring-8, where the pressure was increased first and then temperature was increased slowly, taking X-ray diffraction data and X-ray radiographic images in every 50°C . Crystallization of grossular glass started at and 1050°C at 8 GPa and 1100°C at 15 GPa, respectively, which are slightly lower than those ($\sim 1150^\circ\text{C}$) reported in Irifune et al. (2016) based on quench experiments. Significant decreases of the sample length were observed by the X-ray imaging just below these crystallization temperatures. Analyses of the crystallization kinetics of the glass are currently being conducted, and parts of the results will be shown in this talk.

詳細は当センターホームページ: <http://www.grc.ehime-u.ac.jp/> をご覧ください
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