A study of plasticities of silicate garnets at in-situ high P and T conditions by high-pressure apparatus and synchrotron X-ray

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We have examined rheological behaviors of silicate garnets at in-situ mantle conditions by using a multi-anvil high pressure apparatus (SPEED-1500 and SAM85) equipped at beam lines of SPring-8, Japan, and Brookhaven National Laboratory, USA. In the present study, we focused on changes in the synchrotron X-ray diffraction peak width from polycrystalline samples in the course of experimental process. The samples were Py100, Py50Mj50, Py23Al48Gr28Sp1 and Py68Al18Gr14Sp1 garnets. The experimental conditions were 7, 10 and 20 GPa and room to 800 C. The comparison of all these data suggests that the rheological behaviors of silicate garnets extremely depend on their compositions, namely that the plastic strength increases with increasing component of either pyrope or majorite, and pressure.