

In situ X-ray observations of the post-garnet transformation using sintered diamond multianvil apparatus

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We have conducted in situ X-ray diffraction experiments on the post-garnet transformation in pyrope using sintered diamond multianvil apparatus. Dissociation of pyrope to perovskite and corundum was completed within 30 minutes at 26.0 GPa and 1173K.

The post-garnet transformation is one of the important reactions occurred in the Earth's mantle. This transformation possibly affects on dynamics of the subducted oceanic crust in the deep mantle. It is indispensable to reveal mechanisms and kinetics of this transformation. We have conducted preliminary in situ X-ray diffraction experiments on the post-garnet transformation kinetics in pyrope using sintered diamond multianvil apparatus. Experiments were carried out using high-pressure apparatus 'MAX-80' installed at KEK-PFAR. The white X-rays from synchrotron radiation was used as the incident X-ray beam and the diffracted beam was detected by energy dispersive method. The starting material was a sintered mixture of synthetic $\text{Mg}_3\text{Al}_2\text{Si}_3\text{O}_{12}$ pyrope and gold. Temperature was measured by a W25Re-W3Re thermocouple, and pressure was evaluated from the volume of gold. Sample was compressed at room temperature to about 33 GPa and then heated to 1173K. We confirmed that dissociation of pyrope to perovskite and corundum was completed within 30 minutes at 26.0 GPa and 1173K.