P-V-T-equations of state of knorringite and escolaite to 15 GPa and 1673 K

Litasov K.D.[1], Shatskiy A.[1], Suzuki A.[1], Ohtani E.[1]
1 Tohoku University

Silicate garnet is the second abundant mineral in the Earth's upper mantle and may compose more than 40 vol.% of the transition zone. Thus, knowledge of the thermoelastic properties of the garnet end members is very important to constrain mineralogical models of the mantle. We measured thermoelastic parameters of $Mg_3Cr_2Si_3O_{12}$ knorringite garnet using in situ X-ray diffraction at beamline NE7A, Photon Factory, Tsukuba. Knorringite is important end-member of many deep-seated garnets from kimberlite xenoliths and inclusions in diamonds. The measurements were completed in 6 heating cycles with about 2 GPa and 200 K steps. The pressure was calculated from the equation of state of Au. We used ZrO_2-TiB_2 cell assembly and 22 mm WC anvils with 3.5 mm truncations. Sample was synthesized from stoichiometric oxide mixture at high pressure. However, minor eskolaite (Cr_2O_3) was present in all diffraction patterns, therefore we could be able to calculate its equation of state too. High-temperature Birch-Murnaghan equation of state was used to fit P-V-T data to obtain thermoelastic parameters. In this presentation we discuss P-V-T data for knorringite and eskolaite and compare them to garnet end members and transitional metal trivalent oxides, respectively.