

The
48th

GRC International Frontier Seminar

Title: Na-majorite $\text{Na}_2\text{MgSi}_5\text{O}_{12}$: phase relations, solid solutions, and structure

Speaker: Dr. Andrey Bobrov
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Date: 8.9.2013 (Friday) 16:30 – 17:30

Venue: Meeting Room #486, Science Research Bldg 1, Ehime Univ.

Na-majorite $\text{Na}_2\text{MgSi}_5\text{O}_{12}$, an end-member of sodium-rich majoritic garnet, was synthesized and garnet/pyroxene transition was studied in multi-anvil experiments at 11–20 GPa and 1500–2100°C. Na-majorite was obtained at 16 GPa and 1500°C; its stability spreads to the high-temperature region with pressure (1900°C at 17 GPa and 2100°C at 19.5 GPa). Single-crystal study of Na-majorite demonstrated its tetragonal symmetry, space group $I4_1/acd$, and cell parameters $a = 11.3966(6)$, $c = 11.3369(5)$ Å and $V = 1472.5(1)$ Å³. Experiments at 18 GPa and 1600°C on the pyrope–Na-majorite join allowed us to study mixing peculiarities for sodium-rich majoritic garnet. The transition from cubic to tetragonal symmetry was observed for the starting composition with ~80 mol % $\text{Na}_2\text{MgSi}_5\text{O}_{12}$, which is consistent with the similar change of the structure in the pyrope–majorite ($\text{Mg}_4\text{Si}_4\text{O}_{12}$) system. Significant Na-majorite solubility in pyrope, as well as findings of natural garnets with high Na concentrations (>1 wt % Na_2O) allow us to consider Na-bearing majoritic garnet as a concentrator of sodium in the deep upper mantle and transition zone.

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