The 417th Geodynamics Seminar

Phase relations, elastic properties and symmetry studies in the system $MgSiO_3$-Al_2O_3

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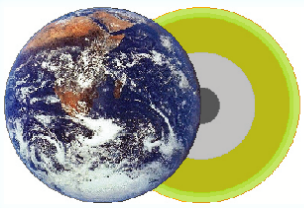

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Abstract

Investigation of the phase relations, elastic properties and symmetry studies in the system $MgSiO_3$-Al_2O_3 can help us understand the chemical composition, structure and mineralogy of Earth's mantle.

The symmetry studies on high-pressure sintering garnet in this system was further clarified that a phase transition from cubic to tetragonal structure was clearly observed at $Mj_{74}Py_{26}$ in the majorite-pyrope join. Then, the elastic properties of $Mj_{80}Py_{20}$ garnet were measured to 21 GPa and 2000 K using ultrasonic measurements in the multi-anvil apparatus, and the elastic properties of the majorte-pyrope join were discussed in this study. The pressure and temperature derivatives of elastic moduli of garnets in this solid join are not sensitive to majorite or Al_2O_3 content, and velocity gradients of the majorte-pyrope join are 3-6 times lower than those of lower parts of the mantle transition zone.

After that, we further determined phase relations in the system $MgSiO_3$-Al_2O_3 to 51.8 GPa and 2000 K using multi-anvil apparatus with sintered diamond anvils. Al_2O_3 solubility in bridgmanite and $MgSiO_3$ solubility in corundum are both dependent on pressure and temperature. Bridgmanite with pyrope chemical composition is formed at ~ 45 GPa, which is significantly higher than an early result (37 GPa). Al_2O_3 content in bridgmanite and $MgSiO_3$ content in corundum maybe a good pressure reference at pressures greater than 30 GPa in high pressure science.

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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