The 459th Geodynamics Seminar

High temperature generation using multianvil apparatus with sintered diamond anvils and stability of Fe-rich bridgmanite in the lower mantle

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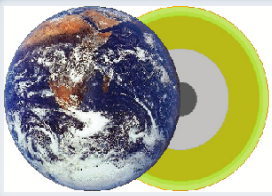

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Abstract

High temperature generations using multianvil apparatus combined with the Al_2O_3 pressure medium and sintered diamond anvils were made up to mid-lower mantle conditions. The efficiencies of pressure generation of the Al_2O_3 pressure medium are substantially higher than those of the Cr-doped MgO pressure medium. The generated temperature is up to 2000 K at 61 GPa using the Al_2O_3 pressure medium equipped with the $LaCrO_3$ heater. In addition, high temperature generations using the Re heaters were also conducted up to 61 GPa and 2300 K. Those temperature fluctuations in generated power are within ~5 K even at ~60 GPa region. We have optimized the cell assembly of the Al_2O_3 pressure medium to reproduce the high pressure and temperature conditions in the deep lower mantle.

Phase relations in the system MgO-FeO-SiO_2 were investigated using Kawai-type multianvil apparatus with sintered diamond anvils up to 61 GPa and 2300 K. The samples were analyzed with synchrotron X-ray diffraction at high pressure and high temperature. Fe-rich bridgmanite coexists with stishovite and wüstite up to 61 GPa. The solubility of $FeSiO_3$ in $MgSiO_3$ bridgmanite increases with increasing pressure and temperature. Ismailova et al. (2016) have reported pure iron bridgmanite at pressures between 45 and 110 GPa. We have made the experiment using starting material of $Fe^{2+}SiO_3$ ferrosilite at 51 GPa and 2000 K. However, $Fe^{2+}SiO_3$ ferrosilite dissociated into wüstite and stishovite, which is consistent with the computation of phase equilibria reported by Stixrude and Lithgow-Bertelloni (2011).

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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