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高温高圧下における Fe-C メルトの密度
Density measurement of liquid Fe-C at High pressure and high temperature

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Seismological and experimental studies show that the Earth’s outer core is approximately 10% less dense than molten iron at the core pressure and temperature conditions, implying that some light elements exist in the core. Carbon is one of the plausible candidate of the light element in the core. Based on the effect of pressure on carbon solubility into iron and thermodynamic calculation, 2-4wt% carbon is estimated to be in the core. In this study, we measured the density of liquid Fe-3.5wt%C using X-ray absorption method at BL22XU, SPring-8 synchrotron facility, and clarified the pressure and temperature dependency of the melt in 1.8-6.5 GPa and 1600-2299 K range. The present results revealed that the melt becomes more compressible in the pressure range of 4-6 GPa at 1800 K. This change of the compressibility suggests existence of a structural change of the Fe-C melt in this P-T range. Therefore we cannot ignore the effect of the structural change of the liquid Fe-C in order to consider an abundance of carbon in Earth’s outer core.

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