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炭素質コンドライト組成系での高圧条件下における溶融金属鉄への炭素の溶解量
Solubility of Carbon in metallic liquid under high pressure in the natural carbonaceous chondrite system

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In order to explain of the density deficit of the core of the earth, the core is considered to contain some amounts of light elements. Oxygen, sulfur, silicon, carbon, and hydrogen are the possible candidates. It has been considered that the core composition was established by chemical differentiation processes in the magma ocean on the early stage of the earth. To clarify the core composition, the partitioning behavior between silicate- and metallic-liquids of the candidate elements; oxygen, sulfur, and silicon, has been investigated by many workers. However, there are not so many studies on carbon and hydrogen because of the difficulty of chemical analyses. The volatile depleted primitive materials similar to carbonaceous chondritie group have been considered as the building blocks of the earth. We choose Allende meteorite (CV3) as a model composition of primitive earth and investigated partitioning behavior of carbon together with sulfur and oxygen between silicate- and metallic-liquids.

We used natural Allende meteorite as the starting material. The sample was crushed and grounded to fine powder for high pressure experiments. High pressure experiments were performed using 3000 ton Kawai-type multianvil apparatus installed at Tohoku University. WC-anvils with truncation edge length of 12 mm were used. Semi-sintered zirconia was used as the pressure medium, and graphite was used for a sample container and a cylindrical heater. In each experiment, the sample was first compressed to the desired pressure, then, the temperature was raised to the target temperature at a rate of 85 K/min. Recovered sample was cut with a diamond blade and polished for electron microprobe analyses. Microfocused X-ray diffractometry and electron microprobe analysis were used for phase identification and compositional analysis of run products.

The experiments were performed at the conditions of 5 GPa and 2073 K. We will present experimental results and discuss about core-mantle chemical differentiation processes on early planets.

Keywords: Carbon, carbonaceous chondrite, high pressure, solubility, high temperature