

SIT041-P09

会場:コンベンションホール

時間: 5月24日17:15-18:45

浮沈法を用いた高圧下におけるFe-Si液体合金の密度測定

Density measurement of liquid Fe-Si using sink/float method under high pressure

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Density of liquid Fe alloys is a fundamental property to understand the constitution of the Earth's core. Compositional dependence on the density of liquid Fe-alloy under high pressure is closely related to the composition of the outer core. Silicon is one of the most plausible candidates of the light elements in the core due to its high cosmic abundance and depletion in the mantle compared to the chondritic abundance. In this study, we performed density measurements of Fe-Si liquids at 4 GPa and 1650 C using the sink/float method and investigated the effect of the Si content on the density of liquid. For sink/float method, we have used a composite density marker which is composed of a Pt disk core and alumina tube mantle. The Si contents of the Fe-Si liquid used for the present experiments varied with an interval of 10 at% from pure Fe to pure Si. The experiments revealed that the addition of Si to liquid Fe decreases its density and this effect of Si content on the density become to be larger in the Si-rich composition. In other words, the density of liquid Fe-Si decreases nonlinearly with increasing Si content. The molar volume of Fe-Si liquid calculated from the measured density gradually decreases with increasing Si content. It is noted that the estimated molar volume is different from the molar volume of the ideal mixing between Fe and Si. This behaviour is similar to Fe-S liquid (Nishida et al. 2008). However, the excess molar volume of Fe-Si liquid is smaller than that of Fe-S liquid. While excess molar volume of the liquid with 50 at% of S is -3.7 cm³/mol, that of the liquid with 50 at% of Si is -2.4 cm³/mol. The results of this study suggest that the amount of Si in the core could be larger than that estimated previously.

キーワード:浮沈法,非理想性, X線ラジオグラフィ

Keywords: sink/float method, non-ideality, X-ray radiography