Geodynamics Seminar

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Phase relations of iron-nickel alloys at high pressures

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主催：愛媛大学地球深部ダイナミクス研究センター
日時：6/24（金）午後 4時30分～
場所：総合研究棟4F　共通会議室

Abstract

The inner-core and outer-core, which make up the center of the Earth, are thought to be composed predominantly of a solid and liquid iron alloying with 5 to 15 % nickel, respectively. Determination of the physical properties of iron alloy at extremely high pressures found in the deep Earth's core (>300 GPa) is a fundamental issue for understanding the thermal and dynamical state of the Earth's core. According to seismological observations, it is widely accepted that the Earth's inner-core is elastically anisotropic; the compressional wave in the inner-core propagates 3~4 % faster along its rotational axis than in the equatorial direction. A number of models on core dynamics have been proposed to explain the origin of the inner-core anisotropy, but all of them are based on the idea of the crystal preferred orientation of iron. The phase relation of iron at high pressures has been extensively studied using LH-DACs. At relatively low temperatures, around room temperature, the phase relations are already well established; a low pressure phase with a bcc structure transforms into an hcp structure above ~10 GPa and it persists above 300 GPa. In contrast, the phase relations of iron at high temperatures are highly controversial. Some experiments assigned different crystal structures including orthorhombic, dhcp, fcc, and bcc as candidate stable crystal structures, whereas others suggested that the hcp structure remains stable at high temperatures. Despite considerable attention on these new phases, there is, however, no experimental reproducibility. The lack of plausible data is mainly because of the substantial difficulties associated with high-temperature experiments at multimegabar pressures. In this talk, I will present new results on in-situ x-ray diffraction studies on iron-nickel alloys using a laser-heated diamond anvil cell and discuss the nature of the Earth's core.

詳細は当センターホームページ: http://www.ehime-u.ac.jp/~grc/をご覧ください

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