Experimental studies on composition and crystal structure of core materials

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Laboratory measurements of core materials under high pressure and temperature (*P-T*) offer valuable insight for physics and chemistry of the core. However, limited accessibility in an ultrahigh *P-T* experiment to the real conditions of the core had required large extrapolations to discuss properties of the core. Very recently, high *P-T* condition corresponding to the center of the Earth was produced for the first time in a laboratory, using a laser-heated diamond-anvil cell (LHDAC) (Tateno et al., 2010).

The Earth's core includes substantial amount of light element(s) such as H, C, O, Si, and S in addition to iron and nickel. Determination of structures and compositions of light element-bearing phases provides essential information on not only geochemistry but also geodynamic processes. We examined phase relations in iron-light element system to core conditions using LHDACs. Crystal structures and volumes were determined based on in-situ X-ray diffraction (XRD) measurements using synchrotron radiation (SPring-8). In addition to the XRD measurements, chemical analyses with field-emission-type electron probe microanalyzer and/or analytical transmission electron microscope were carried out on the samples recovered from high *P-T*. On the basis of the experimental results in Fe-FeO and Fe-FeS system, the geochemical and geodynamical implications will be discussed.