Melting relations of Fe-FeS system at high pressure

Tadashi Kondo[1]; Takeshi Sakai[1]; Yuichi Kosaka[2]; Eiji Ohtani[3]; Naohisa Hirao[4]; Nagayoshi SATA[5]

[1] Sci., Tohoku Univ.; [2] Geology Sci., Tohoku Univ; [3] Institute of Mineralogy, Petrology, and Economic Geology, Tohoku University; [4] Univ. of Hyogo; [5] IFREE, JAMSTEC

http://rance.ganko.tohoku.ac.jp/

Sulfur is one of the most plausible candidates for the light elements in the core. We have reported the eutectic temperature of the Fe-FeS system up to 110 GPa using laser-heated diamond anvil cell in the last joint meeting. In the study, we confirmed that the phases, Fe, Fe2S, and Fe3S appear up to 70 GPa under the subsolidus conditions coexisting with the melt from analysis of the recovered samples. The eutectic temperature up to 45 GPa was about 1400 K with the subsolidus phases of Fe and Fe3S . We found also Fe2S in the samples quenched from the condition above 50 GPa and 1500 K. In order to confirm the phase relation around 50 GPa, we performed in-situ X-ray observation of Fe-FeS system using laser-heated diamond anvil cell at SPring-8. The starting material was fine mixture of Fe and FeS with bulk composition of Fe86S14. Pressures were determined by both ruby fluorescence method and equation of state of Al2O3 or NaCl used for thermal insulation. Temperatures were measured by spectroradiometric method. The result was that Fe3S is still observed above 60GPa with unknown diffraction lines probably orignated from Fe2S. The appearance of Fe2S possibly bring a drastic change of eutectic temperature around 50GPa, then it increase gradually to 110 GPa. the melting curve to the core-mantle boundary indicates that Fe-FeS system would melt at about 2000 K, which is about 1000 degrees lower than that of the previous estimation.