

# Melting Experiment of Fe-FeS system using laser heated diamond anvil cell

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

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

The core of the Earth and Mars is believed to contain some amount of light elements. Although various elements such as S, H, O, Si, and C have been proposed so far (e.g., Poirier, 1994), sulfur is one of the most plausible candidates for the light elements in the core.

We have determined the stability of subsolidus phases at high pressure and temperature and the eutectic temperature of the Fe-FeS system up to 110 GPa by using laser heated diamond anvil cell. We judged melting of the sample by change of heating efficiency of the samples and by a melting texture of the recovered samples. We calculated heating efficiency by taking the differentials in temperature and laser power in each step of heating. When the sample starts to melt, laser absorption of the sample dramatically increases, and heating efficiency increases. However, the heating efficiency decreases soon after the increase perhaps due to movement of the molten sample into a low temperature portion of the sample or the effect of the latent heat of melting. We also recovered the samples which were heated at the temperature above the solidus temperature, and observed the melting texture by using SEM.

We confirmed that the phases, Fe, Fe<sub>2</sub>S, and Fe<sub>3</sub>S appear up to 70 GPa under the subsolidus conditions coexisting with the melt by using EPMA. The eutectic temperature of the Fe-FeS system is consistent with that reported by Li et al, (2001) using multi anvil apparatus. The eutectic temperature is about 1400 K up to 45 GPa. Fe and Fe<sub>3</sub>S are stable up to this pressure. We could not observe Fe<sub>3</sub>S, but found that Fe<sub>2</sub>S is stable at pressure above 50 GPa and 1500 K. We observed an inflection in increase of the melting slope associated with the change of the phases coexisting with the melt. Extrapolation of 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 (e.g., Boehler, (1996)).