

Phase stability and equation of state for FeS

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Iron sulfide is one of the candidates of major constituents of planetary core. Knowledge of phase relationships and physical properties of the high pressure phases of FeS is fundamental to investigate the formation, evolution and the present state of the core. Recently, the phase relationships of high pressure polymorphs of FeS have been revealed (Kusaba, et al., 1998; Kavner et al., 2001; Urakawa et al., 2002), and density of the FeS at high pressure and temperature was reported (Fei et al., 1995; Kavner et al., 2001). Here we report the new results of in-situ X-ray observations on the FeS at high-temperatures and high-pressures.

Experiments were conducted using SPEED-1500 system at BL04B1 of the SPring-8. Sample was a synthetic, stoichiometric FeS. NaCl was used as a pressure marker. Energy dispersive X-ray diffraction patterns were collected at the temperature between 300 and 1600K and the pressure between 7 and 22 GPa, which covered the stability regions of FeS III (monoclinic phase), FeS IV (hexagonal phase), and FeS V (NiAs phase) .

FeS transforms FeS III, IV, to V with increasing temperature above 7 GPa, and their phase boundaries have positive pressure gradient. Present X-ray observation revealed the pressure gradient of boundary between FeS IV and V is not steeper than those previously reported (Kusaba, et al., 1998; Urakawa et al., 2002). This means the expand of stability field of FeS V to higher pressure, although Urakawa et al (2002) predicted it is limited bellow 40 GPa. The measured P-V-T data yielded the high-temperature equation of state for FeS IV and V.

Fei et al., Science, vol. 268, 1892-1894, 1995.

Kavner et al., Earth Planet Sci. Letters, vol. 185, 25-33, 2001.

Kusaba et al., J. Phys. Chem. Solids, vol. 59, 6-7, 1998.

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