# Density measurements of the FeS-NiS binary melts at high pressure

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Planetary cores consist mainly of iron, nickle and some light elements. Sulfur is thought to be a primary lightening element in the metallic core of the small planets, satellites and planetesimals. Planetary magnetism arises from a dynamo driven by convection in the liquid core. Physical properties of sulfur-bearing Fe liquids are, therefore, fundamental to understand the dynamics of liquid core in the planetary interior. Here we report the results of density measurements of FeS-NiS binary sulfide melts at high pressure by means of X-ray absorption technique. Experiments were conducted at BL22XU of SPring-8, at which the cubic-type multi-anvil press is equipped and highly brilliant monochromatic X-ray is available. We determined the densities and the expansivities of NiS, $(Fe_{0.3}Ni_{0.7})S$, $(Fe_{0.5}Ni_{0.5})S$ and $(Fe_{0.7}Ni_{0.3})S$ composition liquids at about 2GPa and 1273-1673 K. Density of (Fe,Ni)S liquid increases with Ni content. Compositional dependence of density allow us to evaluate the partial molar volumes of liquids FeS and NiS. The partial molar volumes of liquids FeS and NiS are consistent with those at 1 atmospheric pressure (Kress, 2008). On the other hand, the extrapolated densities of liquid FeS is 8-10% lower than the EoS determined by Nishida et al (2011). Our new data would contribute to understand compressional behavior as well as thermochemical properties of Fe-Ni-S liquid alloys under pressure.

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References

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