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Radiographic study on the viscosity of the Fe-FeS melts at the pressure of 5 to 7 GPa

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ABSTRACT

Stokes' viscometry combined with in situ X-ray radiographic observation, using the 6–8 type multi-anvil press and synchrotron radiation, has been applied to the viscosity measurement of the Fe-FeS melt up to pressures of 7 GPa. The viscosity is found to be about 2×10^{-2} Pa-s at 5 to 7 GPa and temperatures about 1350 K, in marked contrast to previous viscosity measurements, which showed high viscosity, 0.5 to 14 Pa-s, at 2 to 5 GPa (LeBlanc and Secco 1996). Our viscosity data, however, is consistent with all other evidence, which include 1 atm viscosity data, X-ray structure analysis, and ab initio simulations. Recent viscosity measurements (Dobson et al. 2000) also showed the viscosity of Fe-FeS melt to be about 10^{-2} Pa-s at 2.5 GPa. Thus, we are confident that the viscosity of the Fe-FeS melt is close to a typical value (10^{-2} Pa-s) of viscosity for liquid metal even at high pressures.