



Viscosity measurements of high-pressure melts in the Paris-Edinburgh press

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Knowledge of the viscosity of high-pressure melts is important for understanding the chemical, thermal and dynamic evolution of planetary interiors. Experimentally, the viscosity of liquids can be determined using the “falling sphere” technique. This method has been developed at high-pressure and high-temperature in a Paris-Edinburgh press at beamline ID27 of the ESRF. The descent of a dense sphere (Au, Pt, WC) through the melt is monitored, in real-time and in-situ, by X-ray radiography. The monochromatic beam illuminates the sample in between the two anvils; the absorption contrast image is formed on a phosphorescent YAG crystal, and then focused and recorded by a high speed CCD camera. The viscosity of the sample is derived from the terminal velocity of the sphere and the Stokes’ law. The originality of the system relies on the upside down rotation of the entire press which allows a series of measurements on a single sample, significantly improving the data reproducibility. Moreover, the simultaneous collection of high quality X-ray diffraction data offers the unique opportunity to investigate the relations between viscosity and the structure of liquids. The potentials of this new equipment will be illustrated on the example of FeS melt viscosity.