**Equation of state and optical reflectance of strongly shocked water**

Most planetary models are constructed from space probe data (gravitational moments, magnetic fields), and typically these models do not include very sophisticated equations of state, electronic properties or chemistry. Peter Celliers will present equation-of-state and optical reflectance data for water compressed by laser-generated shocks. These data will provide rigid constraints for models of Neptune, Uranus and Europa. The measurements were carried out with a VISAR interferometer. Figure 1 shows new Hugoniot pressure-volume data for pressures up to 500 GPa (5 Mbar). The highest pressure reached in gas gun single shock measurements of water is 80 GPa (one ultra high pressure point exists from underground experiments). These data traverse a transition in which electrical conduction shifts from ionic to electronic. This transition has been predicted theoretically but there is no previous data. Figure 2 shows the reflectance of an attenuating shock in water in the velocity range from 14 to 26 km/s. The shock reflectance varies gradually from near 10% at 130 GPa increasing to ~60% at 400 GPa, where the temperature is ~ 3.5 eV.

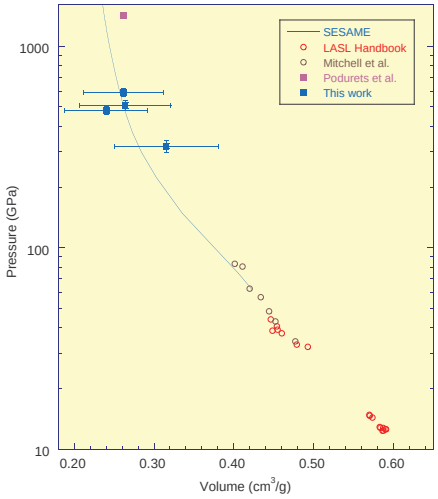


Figure 1. Pressure versus volume along the shock compression curve (principal Hugoniot) for water. New experimental measurements confirm predictions from an existing euqaition of state model (SESAME).

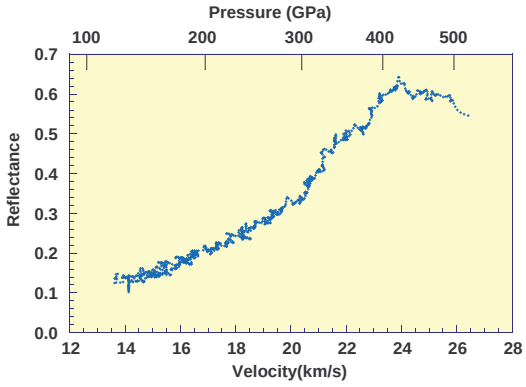


Figure 2. Optical reflectance of a high pressure shock front in water measured at 532 nm from an attenuating shock. The pressure scale was inferred from the shock velocity and and the equation of state.

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