SHOCK13-2013-000762

Abstract for an Invited Paper
for the SHOCK13 Meeting of
the American Physical Society

Shock wave viscosity measurements[1]

PETER CELLIERS[2], Lawrence Livermore National Laboratory

Several decades ago a method was proposed and demonstrated to measure the viscosity of fluids at high pressure by observing the oscillatory damping of sinusoidal perturbations on a shock front [1]. A detailed mathematical analysis of the technique carried out subsequently by Miller and Ahrens [2] revealed its potential, as well as a deep level of complexity in the analysis. We revisit the ideas behind this technique in the context of a recent experimental development: two-dimensional imaging velocimetry. The new technique allows one to capture a broad spectrum of perturbations down to few micron scale-lengths imposed on a shock front from an initial perturbation. The detailed evolution of the perturbation spectrum is sensitive to the viscosity in the fluid behind the shock front. Initial experiments are aimed at examining the viscosity of shock compressed SiO_2 just above the shock melting transition.

[1] A. D. Sakharov et al., Sov. Phys. Dokl. **9** 1091 (1965);
[2] G. H. Miller and T. J. Ahrens Rev. Mod. Phys **63** 919 (1991).

[1]This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.
[2]In collaboration with: M.A. Barrios, C.A. Bolme, R.G. Kraus, R.F Smith, S. Ali, D.G. Hicks, J.H. Eggert, D.J. Erksine and G.W. Collins.