Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Tabletop Optical Diagnostics for Shock Compression of Liquids

WILL BASSETT, Univ of Illinois - Urbana — A novel platform for probing chemical properties in shocked liquids has recently been developed. A target cell consisting of around two hundred cuvettes roughly fifty microns deep for use with the laser-launched flyer plate apparatus developed in our group which takes advantage of our ability to perform more than a hundred launches per day. Modeling of the shock events suggests that we can access pressures between two and thirty GPa and temperatures as high as 1500 kelvin in liquid phase materials through impact driven shocks lasting tens of nanoseconds. The tabletop scale of our laser-launched flyer apparatus allows for a variety of techniques for optical diagnostics of shocked states such as fluorescence emission, infrared absorption, and Raman scattering. Preliminary results on Rhodamine 6G in glycerol shocked to 4 GPa show fluorescence red shifts of tens of nanometers. Initially, fluorescence emission of pH-indicator dyes will be used to monitor dissociation of water under shock. Future efforts will include temperature measurements during shocks using the Stokes:anti-Stokes ratios in Raman scattering and chemical compositions of reacting liquids determined through infrared absorption.

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Date submitted: 23 Jan 2015 Electronic form version 1.4