Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Shock wave diagnostics using fluorescent dye probes ALEXANDR BANISHEV, JAMES CHRISTENSEN, DANA DLOTT, University of Illinois at Urbana-Champaign — Fluorescent probes are highly developed, and have found increasing use in a wide variety of applications. We have studied shock compression of various materials with embedded dye probes used as high speed probes of pressure and temperature. Under the right conditions, dye emission can be used to make a map of the pressure distribution in shocked microstructured materials with high time (1 ns) and space (1 micrometer) resolution. In order to accomplish this goal, we started by studying shock compression of PMMA polymer with rhodamine 6G dye (R6G), as a function of shock pressure and shock duration. We observed the shock-induced spectral redshift and the shock-induced intensity loss. We investigated the fundamental mechanisms of R6G response to pressure. We showed that the time response of a dye probe is limited by its photophysical behavior under shock. We developed superemissive ultrafast dye probes by embedding R6G in a silica nanoparticle. More recently, we have searched for dye probes that have better responses. For instance, we have found that the dye Nile Red embedded in the right polymer matrix has 1.7 times larger pressure-induced redshift than R6G.

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Date submitted: 28 Jan 2015 Electronic form version 1.4