Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Microscopic states of shocked polymers KATHRYN BROWN, HIROKI FUJIWARA, RUSTY CONNER, DANA DLOTT, University of Illinois at Urbana-Champaign — We use time-resolved emission spectroscopy to characterize the behavior of dye molecules in a polymer matrix under shock pressure from laser-driven flyer plates. Using an 8 GHz displacement interferometer and a spectrograph and streak camera, we are able to simultaneously measure the impact velocity history and shock and time- and wavelength-resolved molecular emission with sub nanosecond time resolution. Since the pressure-induced emission shift has been measured independently in a diamond anvil cell, time-resolved fluorescence spectra can be used to compare the shock pressure determined by a molecular probe and the shock pressure from the impact conditions and polymer Hugoniot. Other features of the dye emission such as fluorescence depolarization and Forster energy transfer can be used to study the details of shock-induced polymer dynamics. The research described in this paper was supported by the Stewardship Sciences Academic Alliance Program from the Carnegie-DOE Alliance Center under grant number DOE CIW 4-3253-13 and by the US Army Research Office under award W911NF-10-0072.

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Date submitted: 17 Feb 2011 Electronic form version 1.4