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Picosecond Dynamics of Shock Compressed and Flash-Heated Nanometer Thick Films of HMX[1] CHRISTOPHER BERG, DANA DLOTT, University of Illinois at Urbana-Champaign — New results are described for probing molecular dynamics of octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) subjected to shock compression to a few GPa and/or temperature excursions exceeding thermal decomposition values (T>500K). 5-10 nm thick films of δ-HMX were grown on metallic substrates coated with monolayers of 4-nitrothiophenol. Due to shock velocities of a few nm/ps, nanometer thick films allowed picosecond time resolution of shock loading. A plastic polymer layer a few microns in thickness was spin-coated on top of HMX for shock confinement purposes. Both the monolayer and explosive layer were probed utilizing an ultrafast nonlinear coherent vibrational spectroscopy, vibrational sum-frequency generation. Shock compression pressures were estimated via comparison of the monolayer nitro transition frequency shift with static high pressure measurements in a diamond anvil cell. Temperature determinations were based on thermoreflectance measurements of the metallic substrate.

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