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Nitro Stretch Probing of a Single Molecular Layer to Monitor Shock Compression with Picosecond Time-Resolution[1] CHRISTOPHER BERG, ALEXEI LAGUTCHEV, YUANXI FU, DANA DLOTT — To obtain maximum possible temporal resolution, laser-driven shock compression of a molecular monolayer was studied using vibrational spectroscopy. The stretching transitions of nitro groups bound to aromatic rings was monitored using a nonlinear coherent infrared spectroscopy termed sum-frequency generation, which produced high-quality signals from this very thin layer. To overcome the shock opacity problem, a novel polymer overcoat method allowed us to make the observation window (witness plate) a few micrometers thick. The high signal-to-noise ratios (>100:1) obtained via this spectroscopy allowed us to study detailed behavior of the shocked molecules. To help interpret these vibrational spectra, additional spectra were obtained under conditions of static pressures up to 10 GPa and static temperatures up to 1000 $^{\circ}$C. Consequently, this experiment represents a significant step in resolving molecular dynamics during shock compression and unloading with both high spatial and temporal resolution.

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