Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

The influence of thermal confinement and temperature-dependent absorption on resonant infrared ablation of frozen aqueous and alcohol targets[1] DANIEL BUBB, STEPHEN JOHNSON, RICHARD HAGLUND, Vanderbilt — We investigated the mechanism of matrix-assisted resonant infrared laser ablation in frozen aqueous and methanol solutions of polymer, by performing plume shadowgraphy and ablation yield measurements. A picosecond, tunable free-electron laser was used for ablation at two wavelengths, one (2940 nm) that was resonant with the –OH stretch in both water and methanol, and the other (3450 nm) that is resonant with the –CH stretch in methanol. The plume images showed gross similarities, differing only in the time required for the shockwave to appear and in the velocity of the shock front. Typically, 15-25 μs after the ablation laser pulse arrives the primary material ejection commences and lasts for hundreds of μs. In all three cases, the ablation plume appears to consist entirely of vapor with no droplets or solid particles. The ablation yield is either linear or quadratic in fluence. This dependence can be understood if we consider thermal diffusion in the targets and the temperature dependence of the absorption coefficient. .

[1]Research supported by a Cottrell College Award from Research Corporation and Awards DMI-0613837 and CMMI-0727713 from the National Science Foundation

Daniel Bubb
Rutgers-Camden

Date submitted: 23 Nov 2008 Electronic form version 1.4