Abstract Submitted
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Properties and behavior of diamond ablators[1] D. FRATANDUONO, D.C. SWIFT, D.G. BRAUN, S. PRISBREY, N.R. BARTON, M. MARINAK, R. KRAUS, A. ARSENLIS, Lawrence Livermore National Laboratory — Diamond is an attractive ablator for laser loading experiments as it is efficient in converting laser energy to pressure, it transmits multi-kV x-rays such as are used for in-situ diffraction measurements, and it is readily available as single crystals, which do not produce diffraction rings that could obscure signals from a polycrystalline sample. However, radiation hydrodynamics simulations with standard models do not match the detailed velocity histories in ramp-loading experiments. Experimental measurements at the Omega laser showed that the (110) orientation exhibits much less elastic relaxation following the initial yield than did (100). Stress-density relations deduced from these experiments were consistent with the results obtained previously on thinner samples by Bradley et al (PRL 102, 075503, 2009), indicating that time-dependence in plastic flow had little effect on these time scales. The effect of dissipation, ignored in the characteristics analysis of ramp experiments, was assessed by analyzing simulated data, and was found to be negligible for diamond. Significant differences were found between equations of state in the several-megabar pressure regime, requiring quite different strength models to reproduce the stress-density relation.

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