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Ramp Compression Experiments

J. H. Eggert, R. F. Smith, M. Bastea, J. R. Rygg,
G. W. Collins

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J.H. Eggert, R.F. Smith, M. Bastea, J.R. Rygg, and G.W. Collins
Lawrence Livermore National Laboratory, Livermore CA

The past several years have seen dramatic improvements in dynamic ramp compression experiments to measure stress-density using laser and pulsed-power drivers (figure 1). Goals for future experiments center on achieving higher pressures while keeping the samples in a solid phase, and applying additional diagnostics to probe the materials.

We developed a new laser driven ramp compression technique capable of achieving pressures of 1500 GPa in diamond.[2] This new ramp-drive technique has been used recently in a variety of experiments including the equation of state of metals and x-ray diffraction. We will present recent results on the EOS of tantalum, and diffraction of iron.

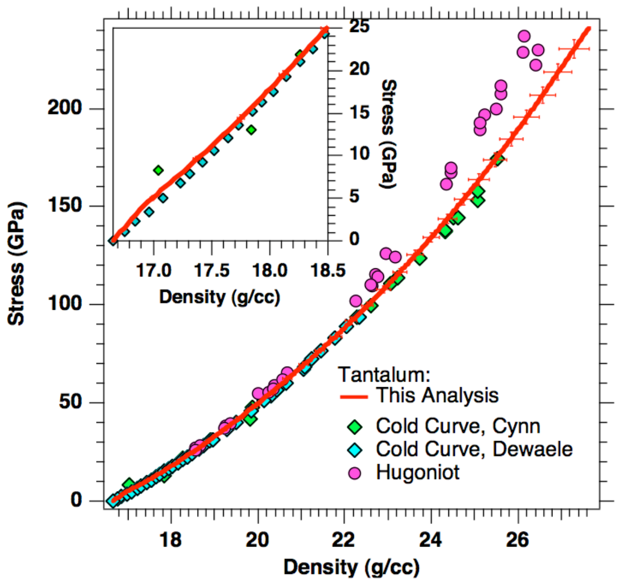

Figure 1. Pulsed-dower-driven ramp compression data for tantalum taken at the Z-machine.[1]

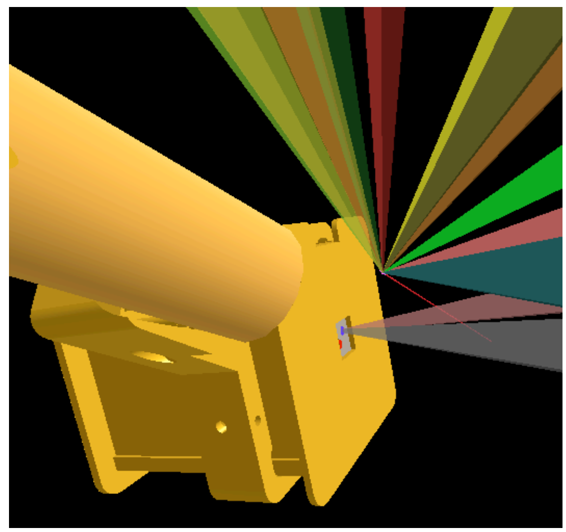

Figure 2. Powder X-ray diffraction target and beam configuration shot at the Omega laser**.**

* eggert1@llnl.gov This work performed under the auspices of the U.S. DOE by LLNL under Contract DE-AC52-07NA27344.

References

[1] D. K. Bradley, J. H. Eggert, R. F. Smith, S. T. Prisbrey, D. G. Hicks, D. G. Braun, J. Biener, A. V. Hamza, R. E. Rudd, G. W. Collins, PRL, To be published (2009).
[2] J. Eggert, M. Bastea, D.B.Reisman, S. Rothman, J.P.Davis, M. Knudson, D.B.Hayes, R.T.Gray, D. Erskine, and G. W. Collins, in *Shock Compression of Condensed Matter*, edited by J. W. Forbes (AIP Press, Melville, NY, 2007), p. 91.