Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

High pressure melt curve and yield strength of high-density carbon[1] J.H. EGGERT, D.G. HICKS, P.M. CELLIERS, R.F. SMITH, D.K. BRADLEY, R.S. MCWILLIAMS, G.W. COLLINS, Lawrence Livermore National Laboratory — Single and double shock temperature measurements have been used to map the melt curve of high-density carbon (diamond) from 6 to ∼23 Mbars. Combining temperature and Hugoniot measurements of the high-density fluid reveal carbon melts from the diamond phase to a chemically complex, perhaps polymeric carbon phase. Ultra-high density states of carbon well off of the diamond Hugoniot have been explored using ramp wave compression techniques. These ramp wave experiments have compressed carbon to the highest pressure solid ever studied and were used to map the stress strain of carbon to a stress of ∼ 10 Mbars. Finally, the yield strength of single, micro, and nano-crystalline carbon have been measured to several Mbars revealing an ultra-high, rate-dependent, and orientation dependent elastic limit ranging between 60 and 200 GPa. These measurements have been used to constrain equation of state and strength models used for designing ICF capsules with high-density carbon ablators.

[1]This work was performed under the auspices of the U. S. Department of Energy by University of California Lawrence Livermore National Laboratory under Contract No.W-7405-Eng-48.

Gilbert Collins
Lawrence Livermore National Laboratory

Date submitted: 24 Jul 2007 Electronic form version 1.4