Abstract Submitted
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Shock compression of glow discharge polymer (GDP): density functional theory (DFT) simulations and experiments on Sandia's Z-machine[1] K.R. COCHRANE, T. AO, Sandia National Laboratories, S. HAMEL, Lawrence Livermore National Laboratories, R.W. LEMKE, Sandia National Laboratories, M.E. SCHOFF, B.E. BLUE, General Atomics, M.C. HERRMANN, Lawrence Livermore National Laboratories, T.R. MATTSSON, Sandia National Laboratories — Glow discharge polymer (GDP) is used extensively in inertial confinement fusion (ICF) capsules. Accurate knowledge of the equation of state (EOS) under shock and release is particularly important for high-fidelity design and analysis of ICF experiments since the capsule material is subject to several converging shocks as well as release towards the cryogenic fuel. We performed Density Functional Theory (DFT) based molecular dynamics simulations, to gain knowledge of the behavior of GDP - for example regarding the role of chemical dissociation during shock compression, we find that the dissociation regime along the Hugoniot extends from 50 GPa to 250 GPa. The shock pressures calculated from DFT are compared to experimental data taken on magnetically launched flyer plate impact experiments at Sandia's Z-machine. Large GDP samples were grown in a planar geometry to improve the sample quality and maintained in a nitrogen atmosphere following manufacturing, thus allowing for a direct comparison to the simulations.

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