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The Release Behavior of Diamond Shocked to 20 Mbar M.C. GREGOR, C.A. MCCOY, D.N. POLSIN, T.R. BOEHLY, D.D. MEYERHOFER, Laboratory for Laser Energetics, U. of Rochester, D.E. FRATANDUONO, P.M. CELLIERS, G.W. COLLINS, LLNL — High-density carbon (HDC) is used as an ablator for inertial confinement fusion experiments at the National Ignition Facility (NIF). Both its Hugoniot and release behaviors are needed for ignition target designs. The OMEGA laser was used to shock HDC to 10 to 20 Mbar; it was then released into materials with known Hugoniots (quartz, CH, silica foam, and liquid deuterium). The impedance-matching technique with these references provides data that constrains the HDC release models. This technique was applied to both the single-crystal diamond and the NIF ablator—ultra-nanocrystalline diamond (UNCD). This study provided the first data for the UNCD Hugoniot and models for the release isentropes of both types of HDC using a Mie–Grüneisen equation of state. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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