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Shock Compression Response of the Light Noble Gases: Neon and Helium SETH ROOT, LUKE SHULENBURGER, KYLE COCHRANE, ANDREW LOPEZ, KEEGAN SHELTON, JOSE VILLALVA, THOMAS MATTSSON, Sandia National Laboratories — Understanding material behavior at extreme conditions is important to a wide range of processes in planetary astrophysics and inertial confinement fusion. Modeling the high pressure - high temperature processes requires robust equations of state (EOS). For many materials, EOS models have been developed using low-pressure Hugoniot data. Assumptions are made to extrapolate the EOS models to Mbar pressure regimes, leading to different model behavior at extreme conditions. In this work, we examine the high pressure response of the light noble gases: neon and helium in the multi-Mbar regime. We perform a series of shock compression experiments using Sandia's Z-Machine on cryogenically cooled liquids of Ne (26 K) and He (2.2 K) to measure the Hugoniot and reshock states. In parallel, we use density functional theory methods to calculate the Hugoniot and reshock states. The experiments validated the DFT simulations and the combined experimental and simulation results are used to assess the EOS models. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Securities Administration under Contract No. DE-AC04-94AL85000.

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