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Shock-Adiabatic to Quasi-Isentropic Compression of Warm Dense Helium JUN ZHENG, Institute of Fluid Physics, China Academy of Engineering Physics — Thermodynamic properties from shock-adiabatic to quasi-isentropic compression have been performed in the application of multiple reverberation compression technique. By this technique, the initial dense gaseous helium was compressed to warm dense matter (WDM). The experimental equation of state of WDM helium in the pressure-density-temperature range of 1-150GPa, 0.1-1.1g/cm3, and 4600-24000K were measured with higher precision. The results indicate that the values are totally enhanced by multi-compression in comparison with single-shock and isentropic-compression. The multiple compression ratios (1-10) are greatly improved from 3.5 to 43 based on initial precompressed helium density. For the relative compression ratio , a turning point occurs at the 3rd and 4th compression states under the different loading conditions, where relative compression ratio increases with pressure in lower density regime and reversely decreases in higher density regime. This anomalous phenomenon is explained for the equilibrium effect of the particle interactions at the onset of electron excitation and ionization. It induces the appearance of plasma phase transition of helium, which is verified by the contour with the experiments and the calculations.

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