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Quasi-isentropic sound velocity measurements of deuterium-helium mixtures at planetary interiors conditions in reverberating shocks experiments ZHI-GUO LI, Institute of Fluid Physics, CAEP, QI-FENG CHEN, YUN-JUN GU, JUN ZHENG, CHENG-JUN LI, National Key Laboratory of Shock Wave and Detonation Physics, Institute of Fluid Physics, CAEP — The sound velocities of materials under high pressures and temperatures are important in characterizing the elasticities and phase changes, and especially crucial for our understanding of the seismic structures in planetary interiors. As the simplest elements, deuterium and helium can be well used as the standard test cases for the sound velocity studies. Moreover, deuterium and helium are major constituents of astrophysical objects such as stars and giant planets, and also the primary constituents in inertial confinement fusion (ICF). The knowledge of their physical properties such as sound velocities and equations of state (EOSs) at extreme conditions play a vital role in the constructions of giant planets interiors models and the understanding of fundamental physical processes in ICF. In this work, we perform a serious of reverberating shocks experiments on deuterium-helium (D-He) mixtures, yielding for the first time measurements of the isentropic sound velocity and EOS in a wide pressure regime. The measured sound velocity and EOS of D-He mixtures reached an unexplored range of pressure up to 120 GPa, which is direct relevant to the molecular region of giant planet interiors. The wide-range experimental data are used to validate the state-of-the-art first-principle simulation techniques and chemical models. Finally, the sound velocities data can provide more direct constraints on the seismic structure of giant planets

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