Study of quasi-isentropic compressibility of xenon to a density of 17 g/cm^3 with recording by pulse protonography

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The article presents the results of an experiment on studying the quasi-isentropic compressibility of xenon to a density of 17 g/cm^3, performed on a protonographic complex based on the U-70 synchrotron. In the experiment, ten consecutive proton images of the compression process of gaseous xenon at an initial pressure of 20.36 bar in a small-sized spherical single-cascade explosive device were obtained. Based on the obtained images, the equivalent radii of the first converging shock wave position in xenon, the positions of the inner and outer boundaries of the compressive steel shell, and the position of the shock wave reflected from the center in the material of the compressive shell were determined. The average density of xenon was determined, which at the moment of maximum compression was $\rho_{max} = (17.3 \pm 1.1)$ g/cm^3. One-dimensional and two-dimensional computational modeling of the experiment was carried out, based on which the pressure realized in the experiment in the state of maximum compression was estimated P = (770 ± 40) GPa and for several moments after during isentropic expansion from it.
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