Jones–Wilkins–Lee equation of state for high-explosive detonation products based on cylinder-test experiments using synchrotron diagnostics

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The work done by detonation products (DP) on the environment in a process and parameters of a shock wave generated within the environment for each high explosive (HE) are defined by the equation of state for DP. The DP equation of state is generally determined based on the DP isentrope passing through the Chapman–Jouguet point. The experiments to determine the HE throwing action are conducted to establish the behavior of the DP expansion isentrope. For this purpose, common are the experiments on end-face throwing of plates under the effect of HE DP and the experiments on throwing cylindrical shells, so-called cylinder-test experiments. The presence of the metal shell in the experiment contributes to distortion of the HE DP expansion process but remains necessary to conduct optical and electric-contact diagnostics. This work suggests the revised version of the cylinder-test experiments without metal shell involving diagnostics of DP expansion through synchrotron radiation. The experiments were conducted using the acceleration complex VEPP-3 of the Budker Institute of Nuclear Physics SB RAS. The experimental data were used to plot isentropic expansion of the HE DP for the Jones–Wilkins–Lee equation of state for DP.