Analytical method of adiabatic curve plotting for explosion products expansion based on the cylinder-test experiment

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Process of work performance upon the environment under detonation and also shock wave profile generated in the environment for each high explosive (HE) are uniquely determined by the equation of state for explosion products (EP). Equation of state for EP explosive is determined based on the adiabatic EP expansion passing through Chapman–Jouguet point. Shock wave parameters in the reference materials contacting to an edge of detonating HE charge are usually measured for definition of the run of the adiabatic curve in the Chapman–Jouguet point region. HE propellant force experiments are performed for determining EP isentropic expansion in the low pressures range (in the order of 1–10 GPa). So experiments of edge throwing of the plates by HE explosion products are widely used.

This work presents the analytical method of the obtaining of the adiabatic curve of detonation products expansion directly from experimental data on cylindrical shells scattering, throwing by explosion products of detonating explosive. While plotting EP adiabatic curve, the shell incompressibility and its density stability during movement under the influence of explosion products were assumed. Adiabatic curves of explosion products expansion of the low sensitive HE for various initial HE radii were plotted.