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Equation of State for a Mixture of Unreacted HE and HE Detonation Products B.A. NADYKTO, Russian Federal Nuclear Center, All-Russian Scientific Research, Institute of Experimental Physics — For most of explosive conversion kinetics simulations associated with the analysis of HE initiation, one needs to know equations of state (EOS) of yet unreacted ("cold") HE and a mixture of cold HE and detonation products (DP). Earlier, we have developed EOS of HE and DP using the same (universal) analytical form of EOS. EOS parameters are fitted based on the comparison with experiment. In detonation products, rather large HE molecules are divided into small fragments, with H_2O and CO_2 constituting the larger fraction of them. Therefore, the equilibrium density of DP at T=0 in the simulations is assumed to be equal to about 1.2 g/cm^3. In fact, EOS parameters for DP are chosen such as to describe the largest possible set of experimental data, including the Jouget point parameters for different HE densities, unloading isentropes from the Jouget point, parameters of overdriven detonation and DP recompression (DP deceleration curve). We propose an EOS of the same form for a mixture of cold HE and DP. The equilibrium density of the mixture (at P=0, T=0) is defined as $1/\rho^0_{mix} = \alpha/\rho^0_{DP} + (1–\alpha)/\rho^0_{HE}$. The bulk compression modulus is calculated as $\mathrm{B}^0_{mix} = \mathrm{B}^0_{HE}(1–\alpha + \alpha\rho^0_{HE}/\ \rho^0_{DP})/(1–\alpha + \alpha\rho^0_{HE}\mathrm{B}^0_{HE}\ /\rho^0_{DP}\ \mathrm{B}^0_{DP})$. Here, α is the DP mass fraction in the mixture. Such formulas give an adequate transition to the EOS of pure mixture components.

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