INFLUENCE OF THERMODYNAMIC NON-IDEALITY ON CUMULATION IN CONVERGING SHOCK WAVES WITH SYMMETRY VIOLATION

Konyukhov A. V.,* Likhachev A. P., Rostilov A. T.

JIHT RAS, Moscow, Russia

**konyukhov_av@mail.ru*

Converging shock waves provide a method for generating high energy densities including plasma states in the vicinity of its focus. The development of lower modes of perturbations of spherical and cylindrical shock waves leads to limitation of cumulation due to the transition from the Mach interaction of converging shock wave segments to a regular interaction with the formation of a 4-wave configuration (reflection from the plane of the contact discontinuity). Based on 3D hydrodynamic modeling using the Carnahan-Starling (CS) equation of state [1], the development of π-periodic perturbations of a spherical shock wave leading to limitation of cumulation is studied. The calculation technique based on moving (converging) grids allows one to trace the evolution of the converging shock wave front with high accuracy in a wide range of its radius. Calculations performed for the initial perturbation of the shape of the shock-wave discontinuity surface of the type $x^2 + (y + sign(x)\varepsilon)^2 + z^2 = 1$ show that the ratio of the azimuthal and radial velocity components behind the shock wave front is approximated by the following dependence on the radius $\bar{v}_\phi/\bar{v}_r = \varepsilon(1 + \varphi)r^{-n}$, where ε is an oscillating bounded function of the variable $\ln(r)$, $\varphi(0) = 0$, n depends on the parameters of the equation of state. On this basis, a technique is proposed for estimating the parameters of shock-wave compression in the vicinity of the shock wave focus that does not require three-dimensional calculations. It is shown that an increase in the sphere packing density parameter in the CS model leads to a significant increase in the pressures and temperatures achieved in shock-wave compression. This work was supported by the Russian Foundation for Scientific Research (No. 24-29-00659).

---

1. Carnahan N. F., Starling K. E. // J. Chem. Phys. 1989 V. 51. P. 635.