A PROPOSED EQUATION OF STATE FOR ALUMINIZED EXPLOSIVES

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ABSTRACT

The JWL equation of state, used in most hydrocodes for predicting blast effects, has been shown to be quite accurate in a number of validation efforts that employed ideal explosives. However, the same cannot be said when it comes to aluminized explosives. In this paper we will derive a new equation of state that is designed to account for the changes in the gaseous properties of the detonation products as the post-detonation burn of the aluminum proceeds in a hydrocode calculation. There are two main steps in the derivation of this equation of state. In the first step, we extend the JWL to account for the equation of state changes due to partial or complete burn of the aluminum. In the second step we use the chemical kinetics routine in the thermochemical code Cheetah to quantify the changes in entropy and other thermodynamic quantities due to partial or complete reactions with the aluminum. The energy added by the chemical reactions will be inserted in the energy equation (in a hydrocode) as a source term. We will illustrate the steps with an example.