Equation of State for Detonation Product Gases KUNIHITO NA-
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Industrial Science and Technology — Based on the empirical linear relationship be-
tween detonation velocity and loading density, an approximate description for the
Chapman-Jouguet state for detonation product gases of solid phase high explosives
has been developed. Provided that the Grüneisen parameter is a function only of
volume, systematic and closed system of equations for the Grüneisen parameter
and CJ volume have been formulated. These equations were obtained by combin-
ing this approximation with the Jones-Stanyukovich-Manson relation together with
JWL isentrope for detonation of crystal density PETN. A thermodynamic identity
between the Grüneisen parameter and another non-dimensional material parameter
introduced by Wu and Jing can be used to derive the enthalpy-pressure-volume equa-
tion of state for detonation gases. This Wu-Jing parameter is found to be the ratio
of the Grüneisen parameter and the adiabatic index. Behavior of this parameter as
a function of pressure was calculated and revealed that their change with pressure
is very gradual. By using this equation of state, several isentropes down from the
Chapman-Jouguet states reached by four different lower initial density PETN have
been calculated and compared with available cylinder expansion tests.

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