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Detonation Failure in Ideal and Non-Ideal Explosives

P.J. HASKINS, M.D. COOK — In this paper we revisit and extend the classic treatment of detonation failure developed by Eyring et. al. [1]. We recently published a development of this theory [2] in which a pressure dependant rate law was substituted for the Arrhenius temperature dependant law originally considered. Here we show that by assuming a 2-component rate law based upon a temperature dependant ignition phase and a pressure dependant growth phase we are able to rationalise the very different failure characteristics (critical diameter and velocity decrement at failure) of ideal and non-ideal explosives.

[1] Eyring, H., Powell, R.E., Duffy, G.H., and Parlin, R.B., “The stability of detonation,” Chem. Rev. 45, 69-181 (1949).

[2] Haskins, P.J., Cook, M.D., and Wood, A.D., “On the dependence of critical diameter and velocity decrement at failure on the burn law,” in proceedings of the 33rd International Pyrotechnics Seminar, Fort Collins, Co, USA, 385-391 (2006).

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