A MECHANICAL SENSITIZATION MODEL OF COMPOSITE EXPLOSIVES

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ABSTRACT

The ability of voids, microballoons, and even solids to sensitize explosives has been known and used for many years. This phenomenon has generally been studied and reported under the terminology of "hot spots" because of the increase in local pressure and temperature when a shock wave encounters such sensitizers. A method for treating this phenomenon in detonation theory or in a detonation model has been studied for almost the same length of time. Perhaps because of the complexity and non-linearity of the void, or microballoon collapse, several of these studies have used the expediency of including additional terms in the burn rate law to account for the influence of hot spots. The detonation model proposed here considers the sensitization due to discontinuities in the shock impedance to be a mechanical phenomenon to be accounted for in the mechanical equations governing the detonation and not in the burn rate law. While this is not a new contention, the method for handling this non-linear phenomenon within the proposed model is new. The model also includes a method which accounts for the manufacturing variables of emulsion matrix cell size, microballoon size and type, as well as energetic additives.