Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Modeling Normal Shock Velocity Curvature Relation for Heterogeneous Explosives SUNHEE YOO, Jacobs, MICHAEL CROCHET, University of Dayton Research Institute, STEVE PEMBERTON, Air Force Research Laboratory — The normal shock velocity and curvature, $D_{\mathrm{n}}(\kappa)$, relation on a detonation shock surface has been an important functional quantity to measure to understand the shock strength exerted against the material interface between a main explosive charge and the case of an explosive munition. The $D_{\mathrm{n}}(\kappa)$ relation is considered an intrinsic property of an explosive, and can be experimentally deduced by rate stick tests at various charge diameters. However, experimental measurements of the $D_{\mathrm{n}}(\kappa)$ relation for heterogeneous explosives such as PBXN-111 [D. K. Kennedy, 2000] are challenging due to the non-smoothness and asymmetry usually observed in the experimental streak records of explosion fronts. Out of the many possibilities, the asymmetric character may be attributed to the heterogeneity of the explosives, a hypothesis which begs two questions: (1) is there any simple hydrodynamic model that can explain such an asymmetric shock evolution, and (2) what statistics can be derived for the asymmetry using simulations with defined structural heterogeneity in the unreacted explosive? Saenz, Taylor and Stewart [JFM, 2012] studied constitutive models for derivation of the $D_{\mathrm{n}}(\kappa)$ relation on porous 'homogeneous' explosives and carried out simulations in a spherical coordinate frame. In this paper, we extend their model to account for 'heterogeneity' and present shock evolutions in heterogeneous explosives using 2-D hydrodynamic simulations with some statistical examination. (96TW-2015-0004)

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Date submitted: 15 Jan 2015 Electronic form version 1.4