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Microstructural Effects on Initiation Behavior in HMX CHRISTOPHER MOLEK, ERIC WELLE, BARRETT HARDIN, Air Force Research Laboratory, JIM VITARELLI, University of Dayton, RYAN WIXOM, Sandia National Laboratory, PHILIP SAMUELS, Army Research Development and Engineering Center
— Understanding the role microstructure plays on ignition and growth behavior has been the subject of a significant body of research within the detonation physics community. The pursuit of this understanding is important because safety and performance characteristics have been shown to strongly correlate to particle morphology. Historical studies have often correlated bulk powder characteristics to the performance or safety characteristics of pressed materials. We believe that a clearer and more relevant correlation is made between the pressed microstructure and the observed detonation behavior. This type of assessment is possible, as techniques now exist for the quantification of the pressed microstructures. Our talk will report on experimental efforts that correlate directly measured microstructural characteristics to initiation threshold behavior of HMX based materials. The internal microstructures were revealed using an argon ion cross-sectioning technique. This technique enabled the quantification of density and interface area of the pores within the pressed bed using methods of stereology. These bed characteristics are compared to the initiation threshold behavior of three HMX based materials using an electric gun based test method. Finally, a comparison of experimental threshold data to supporting theoretical efforts will be made.

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