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Microstructural Effects on the Ignition Behavior of Various HMX Materials

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The detonation physics community has embraced the idea that initiation of high explosives proceeds from an ignition event through subsequent growth to steady detonation. This construct is the basis for the well-known Lee-Tarver reactive flow model. A weakness of all the commonly used ignition and growth models is that microstructural characteristics are not explicitly incorporated in their ignition terms. This is the case in spite of a demonstrated, but not well-understood, empirical link between morphology and initiation of energetic materials. Morphological effects have been parametrically studied in many ways, with the majority of efforts focused on establishing a tie between bulk powder metrics and ignition of the consolidated material. More recently, there has been a shift toward characterizing the microstructure of consolidated materials in order to understand the underlying mechanisms governing performance. We have assessed the utility of using the James' Ignition model as a tool to quantify effects of bed microstructure on ignition behavior. We have studied the ignition behavior of four types of HMX materials ranging from fine particle fluid energy milled to course particle material. We will also report characterization of the pressed microstructure of each of the various materials and discuss how the measured ignition behavior may have been influenced. DISTRIBUTION A. Approved for public release, distribution unlimited. (96ABW-2013-0063)

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