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Microstructural

Effects on the Reactivity of Nano-Aluminum/Iodine (V) Oxide Films B.K. LITTLE, E.J. WELLE, L.M. MARTINEZ, J.C. NITTINGER, M.B. BOGLE, S.B. EMERY, C.M. LINDSAY, A.M. SCHRAND, Air Force Research Laboratory, Munitions Directorate, Eglin AFB — Recent efforts investigating the self-ignition mechanism of nanoaluminum blended with iodine (V) oxide in the form of powders with and without additives suggests that ignition begins below the decomposition point of either reactant and takes place at the alumina shell surrounding the aluminum nanoparticle. As observed in previous studies of powder composites, microstructural features such as particle morphology are expected to strongly influence properties that govern the combustion behavior of this energetic material (EM). In this study, highly reactive composites containing amorphous and/or crystalline iodine oxide and micron/nano-sized Al was blended with an additive and deposited as films. Physiochemical techniques such as thermal gravimetric analysis, scanning calorimetry, X-ray diffraction, electron microscopy, high-speed imaging and planar doppler velocimetry were employed to characterize these EMs with emphasis on correlating the reaction rate (burn rate) with inherent microstructural features (porosity, thickness, TMD, etc). This work was a continuation of efforts to probe the self-ignition mechanism of Al-iodine (V) oxide composites.

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