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Examining Different Regimes of Explosives Handling Sensitivity VIRGINIA MANNER, NICHOLAS LEASE, MARC CAWKWELL, CLAYTON TIEMANN, GEOFFREY BROWN, JOHN YEAGER, LISA KAY, DAVID CHAVEZ, Los Alamos National Laboratory — The handling sensitivity of explosives is controlled by factors that span from fundamental intramolecular effects to mesoscale structure and defects. Although the drop-weight impact test has been used to characterize energetic material sensitivity for over 50 years, there is still very limited understanding on which features of explosives influence or control impact sensitivity. It is critical to understand and mitigate for explosive sensitivity, from applications related to stockpile maintenance and development, to law enforcement safety, to basic research. We have developed derivatives of common explosives such as pentaerythritol tetranitrate (PETN), erythritol tetranitrate (ETN), and trinitrobenzene (TNB), and examined them experimentally and theoretically in order identify correlations between their properties and sensitivity. Because previous results have indicated that different size regimes appear to influence important properties, we will discuss how factors such as basic chemistry of functional groups, intermolecular interactions like hydrogen bonding and crystal packing characteristics, and larger-scale effects such as particle size contribute to the overall picture of handling sensitivity within an explosive system.

Virginia Manner
Los Alamos National Laboratory

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