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Effects of Damage on Non-Shock Initiation of HMX-Based High Explosives DANIEL PRESTON, PAUL PETERSON, KIEN-YIN LEE, DAVID CHAVEZ, RACCI DELUCA, GABRIEL AVILUCEA, STEPHANIE HAGELBERG, LANL, DYNAMIC AND ENERGETIC MATERIALS DIVISION, LOS ALAMOS NATIONAL LABORATORY TEAM — Structural damage in energetic materials plays a significant role in the probability of non-shock initiation events. Damage may occur in the form of voids or cracks either within crystals or in binder-rich regions between crystals. These cracks affect whether hotspots generated by impact will quench or propagate. For this study, we have separately engineered intra-crystalline and inter-crystalline cracks into PBX 9501, an HMX-based explosive. Intra-crystalline cracks were created by subjecting HMX to forward and reverse solid-to-solid phase transformations prior to formulation. Inter-crystalline cracks were induced by compressing formulated samples of PBX 9501 to 1% strain. Both sets of pre-damaged explosives were then impact tested using the LANL Type 12 Drop Weight-Impact Machine and their sensitivities compared to non-damaged PBX 9501. Results of these tests clearly show significant differences in impact sensitivity between damaged and non-damaged PBX 9501.

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