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Defect Characterization in Crystalline Explosives CHAD STOLTZ, BRIAN MASON, COLIN ROBERTS, IHDIV Naval Surface Warfare Center, DAVID BLACK, TopographiX, Inc. — While microstructural defects such as dislocations, voids, and impurities may dramatically affect ignition sensitivity of energetic materials, the use of non-destructive techniques to accurately characterize the nature of internal defects and how they correlate to initiation is lacking. The objective of this work is to investigate the application of various defect characterization methods to crystalline explosives. X-ray Topography imaging, performed at on oriented, crystal slabs of RDX, shows that for a $< 210 >$ crystal slab, dislocation structure was only observed in the 020 transmission image compared to the 002, 102, 111, and 021 images. XRT images of the $< 111 >$ sliced sample taken through the 102 and 202 crystal planes show features including dislocations, grain boundaries, and the seed origin. Small and Ultra Small Angle Neutron Scattering experiments were performed on standard grade and reduced sensitivity grade RDX powder samples using the contrast variation method. Significant differences in scattering profiles were observed from these two versions of RDX, likely due to the existence of sub-micron voids or impurity pockets in the standard grade RDX sample. Large Scale Gap Test (LSGT) data from IHDIV NSWC for formulations containing these powder samples were then used to correlate neutron scattering to shock sensitivity.

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