

Abstract Submitted
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3D Micromechanical Simulation of PBX Composites¹ DAVID WALTERS, DARBY LUSCHER, JOHN YEAGER, Los Alamos National Laboratory — Previous research studied the constitutive response and interface strength of a bonded bicrystal system containing two HMX explosive grains bound with a HTPB polymer binder by performing FE simulations on real geometry imaged with micro Computed Tomography (μ CT). The parameters generated from this past study were successfully applied to 2D mesoscale simulations of μ CT imaged HMX-HTPB polycrystal samples. Presently, the mechanical response of PBXs containing a Nitro-Plasticized Estane (NPE) binder with similar microstructural geometry to the HMX-HTPB polycrystal samples were studied. Imaging of a HMX-NPE bicrystal sample allowed for simulation of the new material pairing. However, imaging using μ CT techniques on the new polycrystal samples was difficult due to the decrease in contrast between the HMX grains and the NPE binder. Mesoscale polycrystal simulations utilizing a single μ CT imaged microstructure were performed on a 3D SVE comparing the delamination behavior and macroscale mechanical response of both HMX-HTPB and HMX-NPE PBXs. This technique shows the ability to virtually explore the mechanical response of a range of hypothetical materials that share common microstructural geometric characteristics in addition to studying numerically altered geometries.

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David Walters
Los Alamos National Laboratory

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