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Can we predict how nano-scopic voids affect explosive performance? W. LEE PERRY, AMANDA DUQUE, JOHN YEAGER, XIA MA, BRAD CLEMENTS, LARRY HILL, VON WHITLEY, BRIAN PATTERSON, Los Alamos National Laboratory — We know that microstructure and density affect the shock initiation of an insensitive high explosive (IHE), such as PBX 9502 (95% TATB). We suspect that those factors also affect some performance and propagation metrics, especially curvature effects and the explosive's ability to turn corners. A recently developed hydrodynamic burn model, πSURF, provides insight and predictive capability for the initiation regime of shock response based partly on a statistical characterization of the microstructure. Here we examine the ability of the πSURF model to predict the effects of microstructural features on the propagation regime characteristics of curvature and corner turning of the IHE PBX 9502. Specifically, we explore the hypothesis that informing the model about the presence or absence of intra-granular porosity (the 'nano-scopic' voids, as opposed to the larger, inter-granular 'micro-scopic' voids), as revealed by a void size distribution, will predict the corner turning behavior observed in the Enhanced COrner Turning experiments for these two classes of PBX 9502. Indeed, we learned that the model does show the expected behavior. We also learned that the model smoothly predicts, without adjustment, both the initiation and propagation regimes of shock response (other models require mathematical or code switching between the regimes).

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