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Physics-Based Reactive Burn Model: Grain size effects and binder effects XIA LU, YUICHIO HAMATE, University of Florida, YASUYUKI HORIE, AFRL/MNME — We have been developing a physics-based reactive burn (PBRB) model aiming at expanding predictive capability. The PBRB model was formulated based on the concept of a statistical hot spot cell. In the model, thermomechanics and physiochemical features are explicitly modeled. In this paper, we have extended the statistical hot spot model to explicitly describe the ignition and growth of hot spots. In particular, grain size effects are explicitly delineated through introduction of a size-dependent thickness of the hot-region thickness, a size-dependent energy deposition criterion, and a specific surface area. Besides the linear relationships between the run distance to detonation and critical diameter with the reciprocal specific surface area of HE, as discussed in a parallel paper in this meeting, parametric studies have also shown that the PBRB can predict a non-monotonous variation of shock sensitivity with grain size, as observed by Moulard et al. The purpose of this work is to extend the model to include the effects of explosive binders explicitly. As a first step we investigate the thermomechanical effects of a binder by using direct mesoscale simulations. The results will be used in the extending the PBRB model to include binder thermomechanics explicitly.

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