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WGT: toward a microstructure-aware reactive burn model MAXIME REYNAUD, REMY SORIN, VINCENT DUBOIS, NICOLAS DESBIENS, CEA/DAM/DIF, F-91297 Arpajon, France — Polymer bounded explosives (PBX) consist of energetic crystals coated in a polymer binder. These materials exhibit a highly heterogeneous microstructure. The initiation of the detonation phenomenon in PBXs is believed to be generated at the microstructure scale through hot spots. Hence, many of the explosives properties are understood as a direct consequence of their microstructure. Mesoscale modeling directly addresses the physics of hot spots formation. Unfortunately, the high computational cost prevents their use on laboratory-sized experiments. In practice, continuum-scale models remain mandatory. We describe a new reactive burn model, named WGT, aimed at representing at the continuum scale some of the complexity of the PBXs microstructure. The initiation regime is driven by the shock temperature and results from a surrogate modeling of the kinetics of heterogeneous nucleation and growth model proposed by Maillet et al. The other regimes follow the formulation of the WSD(T) reactive burn model and are driven by the local temperature. This model was calibrated on data for PBX 9502 available in the literature, such as celerity-curvature laws, popplot data or electromagnetic velocity gauge signals. The model was also tested against desensitization and propagation data.

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