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Reactive Burn Model Calibration for PETN Using Ultra-High-Speed Phase Contrast Imaging. CARL JOHNSON, KYLE RAMOS, CINDY BOLME, NATHANIEL SANCHEZ, JOHN BARBER, DAVID MONTGOMERY, Los Alamos Natl Lab — A 1D reactive burn model (RBM) calibration for a plastic bonded high explosive (HE) requires run-to-detonation data. In PETN (pentaerythritol tetranitrate, 1.65 g/cc) the shock to detonation transition (SDT) is on the order of a few millimeters. This rapid SDT imposes experimental length scales that preclude application of traditional calibration methods such as embedded electromagnetic gauge methods (EEGM) which are very effective when used to study 10 - 20 mm thick HE specimens. In recent work at Argonne National Laboratory's Advanced Photon Source we have obtained run-to-detonation data in PETN using ultra-high-speed dynamic phase contrast imaging (PCI). A reactive burn model calibration valid for 1D shock waves is obtained using density profiles spanning the transition to detonation as opposed to particle velocity profiles from EEGM. Particle swarm optimization (PSO) methods were used to operate the LANL hydrocode FLAG iteratively to refine SURF RBM parameters until a suitable parameter set attained. These methods will be presented along with model validation simulations. The novel method described is generally applicable to 'sensitive' energetic materials particularly those with areal densities amenable to radiography.

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