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A Continuum Mixture Model for Steady Detonation Using a Multiphase-Based Closure MICHAEL CROCHET, University of Dayton Research Institute/AFRL — Continuum mixture models are commonly used to predict the macroscale thermomechanical behavior of energetic materials. These models include evolutionary expressions for mass, momentum and energy conservation, in addition to constitutive relations for equations of state and burn rates. A separate closure relation is also required to obtain a unique solution to the model equations. However, these closure relations are either heuristic in nature, or enforce thermal equilibrium between reactant and product throughout the reaction zone, which has questionable physical merit immediately after ignition. Here, we present a framework for a generalized mixture model closure relation using principles of continuum multiphase modeling. The objective of this work is to determine a closure expression which is valid throughout the reaction process for general mixture burn rates, while enforcing model consistency between the mixture and multiphase formulations. To this end the development of a steady detonation model for the reaction zone is a preliminary step for the characterization of this model closure. Here, a one-dimensional multiphase hydrocode is used to predict the detonation structure of PBX-9501, with the results compared to those obtained from the steady detonation mixture mode

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