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Afterburn modeling of nanothermite composites SERENE CHAN, Nanyang Technological University, SUCESKA MUHAMED, University of Zagreb, QINGLING ZHANG, KWEE LIANG YEO, HUEY HOON HNG, Nanyang Technological University — Typical approaches in modeling detonation in hydrocodes do not account for afterburn. The Jones-Wilkins-Lee (JWL) equation of state (EOS) captures detonation energy release but not the energy release from secondary combustion, known to increase overall energy output. There is a need for a modified EOS to account for burn mechanism of detonation and combustion products. One such modification was developed by Miller et al. [A reactive flow model with coupled reaction kinetics for detonation and combustion in non-ideal explosives, MRS Proceedings, 1995; p 413] whose reactive flow model caters for highly non-ideal explosives containing large amounts of metal, and display reaction kinetics characteristic of fast detonation and slow metal combustion chemistry. In this work, Miller's time-dependent JWL EOS was calibrated using a small scale test setup in which an explosive in contact with a nanothermite composite is detonated, and the wave propagation in water monitored using high speed camera. Based on thermochemical calculations of combustion and afterburn, and the calibration of reaction rate parameters from experimental results, a system-specific EOS can be determined. This methodology can potentially be applied to study the afterburning of other energetic materials.

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