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Computer Simulations to Study the Effects of Explosive and Confinement Properties on the Deflagration to Detonation Transition (DDT)[1] JOHN REAUGH, Lawrence Livermore National Laboratory, JOHN CURTIS, MARY-ANN MAHESWARAN, Atomic Weapons Establishment, UK — We have augmented the HERMES model (High Explosive Response to MEchanical Stimulus) by adding a modification to the CREST (Computational Reaction Evolution dependent on Entropy (S) and Time) detonation model. We have applied the combined model in ALE 3D to simulate DDT in an experimental configuration comprising an explosive confined in a tube and ignited at one end. We assess the quantitative effects of explosive properties and of tube geometry and material properties on the location of the detonation transition. For a fixed porosity, we find that the specific surface area of the explosive particles, in combination with the explosive's pressure-dependent burn rate, have strong influence on the transition to detonation. The run-to-detonation properties of the explosive powder (given by the Pop-plot) also have strong effect. In our simulations, the speed of the ignition front has less effect on the transition. The ignition front is caused by hot product gas moving through the permeable bed of explosive particles. In our single-velocity, multi-species approximation, we specify the ignition front speed as an input parameter. The results of our simulations help us identify the independent experiments that must be performed and analysed before a model for DDT can be validated.

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