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Simulations of multi-component explosives using simplified geometric arrangements of their constituents GEORGE BUTLER, Applied Research Associates, STEVEN PEMBERTON, AFRL — Modeling and simulation is extremely important in the design and formulation of new explosives and explosive devices due to the high cost of experiment-based development. However, the efficacy of simulations depends on the accuracy of the equations of state (EOS) and reactive burn models used to characterize the energetic materials. We investigate the possibility of using the components of an explosive fill as discrete elements in a simulation, based on the relative amounts of the constituents. This is accomplished by assembling a mosaic, or "checkerboard", in which each cell comprises the relative amounts of the constituents as in the mixture; it is assumed that each constituent has a well-defined set of simulation parameters. We do not consider the underlying microstructure, and recognize there will be limitations to the usefulness of this technique. We are interested in determining whether there are applications for this technique that might prove useful. As a test of the concept, two binary explosives were considered. We considered shapes for a periodic cellular structure and compared results from the checkerboards with those of the baseline explosives; detonation rates, cylinder expansion, and gap test predictions were compared.

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