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Toward Improved Fidelity of Thermal Explosion Simulations[1]
ALBERT NICHOLS, RICHARD BECKER, ALAN BURNHAM, W. MICHAEL HOWARD, JAREK KNAP, AARON WEMHOFF, Lawrence Livermore National Laboratory — We present results of an improved thermal/chemical/mechanical model of HMX based explosives like LX04 and LX10 for thermal cook-off. The original HMX model and analysis scheme were developed by Yoh et.al. for use in the ALE3D modeling framework. The improvements were concentrated in four areas. First, we added porosity to the chemical material model framework in ALE3D used to model HMX explosive formulations to handle the roughly 2% porosity in solid explosives. Second, we improved the HMX reaction network, which included the addition of a reactive phase change model base on work by Henson et.al. Third, we added early decomposition gas species to the CHEETAH material database to improve equations of state for gaseous intermediates and products. Finally, we improved the implicit mechanics module in ALE3D to more naturally handle the long time scales associated with thermal cookoff. The application of the resulting framework to the analysis of the Scaled Thermal Explosion (STEX) experiments will be discussed.

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