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Optimizing LX-17 Thermal Decomposition Model Parameters with Evolutionary Algorithms[1] JASON MOORE, MATTHEW MCCLELLAND, CRAIG TARVER, PETER HSU, H. KEO SPRINGER, Lawrence Livermore National Lab — We investigate and model the cook-off behavior of LX-17 because this knowledge is critical to understanding system response in abnormal thermal environments. Thermal decomposition of LX-17 has been explored in conventional ODTX (One-Dimensional Time-to-eXplosion), PODTX (ODTX with pressure-measurement), TGA (thermogravimetric analysis), and DSC (differential scanning calorimetry) experiments using varied temperature profiles. These experimental data are the basis for developing multiple reaction schemes with coupled mechanics in LLNLs multi-physics hydrocode, ALE3D (Arbitrary Lagrangian-Eulerian code in 2D and 3D). We employ evolutionary algorithms to optimize reaction rate parameters on high performance computing clusters. Once experimentally validated, this model will be scalable to a number of applications involving LX-17 and can be used to develop more sophisticated experimental methods. Furthermore, the optimization methodology developed herein should be applicable to other high explosive materials.

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