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Time-sequenced X-ray observation and modeling of a thermal explosion[1] JOSEPH TRINGE, JOHN MOLITORIS, Lawrence Livermore National Laboratory, LAURA SMILOWITZ, Los Alamos National Laboratory, JAMES KERCHER, KEO SPRINGER, Lawrence Livermore National Laboratory, BRIAN HENSON, Los Alamos National Laboratory, DANIEL GREENWOOD, RAUL GARZA, BRADLEY WONG, JAN BATTEUX, JON MAIENSCHEIN, Lawrence Livermore National Laboratory — The evolution of a thermally-initiated explosion is studied using a multiple-image x-ray system. PBX-9501 is used in this work, enabling direct comparison to recently-published data obtained with proton radiography. For each observed explosion, four x-ray images of the explosive are obtained, each image spaced by tens of microseconds. The multi-physics code, ALE3D, is used to model the pre-ignition thermal profile and post-ignition deflagration of the solid explosive. The model incorporates chemical decomposition, thermal transport, and implicit hydrodynamics to enable accurate prediction of ignition time and temperature. A convective burn model is also implemented in ALE3D to simulate the post-ignition deflagration of thermally-damaged solid energetic materials.

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