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Shock Interactions in Multilayer Explosive Films[1] ROBERT KNEPPER, DAVID KITTELL, MICHAEL MARQUEZ, ALEXANDER TAPPAN, Sandia National Laboratories — Mixing two energetic materials with different properties can be an effective method for controlling performance. However, reactions at material interfaces are poorly understood and performance may be highly dependent on the degree of mixing. In this work, we use vapor-deposited explosive multilayers as a model system to investigate shock interactions between different explosive materials with precisely controlled spacings. Samples consisted of alternating pentaerythritol tetranitrate (PETN) and hexanitrostilbene (HNS) layers, materials that have substantial differences in detonation velocity, with individual layer thicknesses in the vicinity of the critical thickness for detonation propagation of each material (100 – 200 microns). Hydrocode simulations were employed to simulate detonation performance, using an Arrhenius reactive burn model that was parameterized from detonation velocity and failure data from each constituent material. The shape of the detonation front was determined experimentally by streak camera imaging of the breakout surface and compared with hydrocode simulation results. Differences between experimental and simulated results will be discussed in the context of the mechanisms dictating performance at these length scales.

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