

Abstract Submitted
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The Role of Binder in Deflagrating HMX-based Explosives¹ J.W. TRINGE, H.W. LEVIE, E.A. GLASCOE, D.W. GREENWOOD, M.R. DE HAVEN, J.D. MOLITORIS, H.K. SPRINGER, Lawrence Livermore National Laboratory — Deflagration rates are known to be a strong function of temperature and pressure, but chemical reactions facilitated by the explosive's binder can also play an important role. Here we report a study of two HMX-based formulations, PBX-9501 (HMX 95%, estane 2.5%, bdnpa 1.25%, and bdnpf 1.25%) and LX-10 (HMX 95%, Viton-A 5%), which we use to investigate the origins of violence in thermal explosions. We employ flash x-ray radiography to directly image the rates at which reaction fronts proceed in a confined vessel. Photonic Doppler velocimetry (PDV) characterizes the vessel wall motion as a function of time. Our results show that thermal explosions of PBX-9501, with its more reactive binder, are more violent than explosions of LX-10. In LX-10, we observe quenched deflagration and limited violence. In PBX-9501, however, a higher deflagration rate is developed and sustained even after vessel rupture. Thermal explosions of initially-confined PBX-9501 therefore are more complete and significantly more violent.

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