

Abstract Submitted
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Micro-Gap Experiments and Insensitive Explosives RALPH MENIKOFF, LANL — Early research on shock desensitized plastic-bonded explosives (circa 1970) also studied large single crystals of explosive. High quality crystals — free from voids that serve as nucleation sites for hot spots — have been found to be very insensitive to shock initiation. In fact, experiments were not able to initiate a large single crystal of HMX (~ 10 mm) with a detonation wave in PBX 9404, which is 94 weight % HMX and has a Chapman-Jouget pressure of 35 GPa. Yet a single crystal of HMX can be initiated by a flyer plate that drives a shock at a similar pressure. This is especially puzzling since the detonation wave in PBX 9404 has a peak pressure at the von Neumann spike of nearly 60 GPa. An important difference between the two drive systems is a small gap at the PBX 9404/HMX interface due to surface roughness of the PBX; estimated to be 30 to 50 microns. Conceptually, the experiment is equivalent to the gap test used to compare the sensitivity of different explosives; albeit with a micro-gap and a very insensitive explosive. The inability of a PBX 9404 detonation wave to initiate a single crystal of HMX is due to the reaction zone in the PBX 9404 being of comparable length to the gap in the experiment and the rarefaction or Taylor wave behind the detonation wave.

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