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Time resolving the loss of crystallinity during detonation[1]
PAMELA BOWLAN, DENNIS REMELIUS, DAVE OSCHWALD, NATALYA SUVOROVA, BRYAN HENSON, LAURA SMILOWITZ, Los Alamos National Laboratory — There are still significant uncertainties in our ability to predict and control when and how secondary solid explosives release energy, and the initiation of a detonation. This has serious implications for the safety and performance of explosives. One reason is for this uncertainty is that while chemical kinetics are well understood in gases and liquids, much less is known about how chemistry proceeds within a crystalline lattice. Secondly, events like detonation, where a bulk material can go from ambient conditions to pressures of Gigapascals (GPa) and temperatures of about 4000 kelvin (K) within a nanosecond (ns) are extremely difficult to directly observe. To better understand initiation in solid explosives, we developed a technique using visible laser scattering to probe how the morphology of the initial solid changes on a picosecond time scale before and during detonation. We will present our results applying this to commercial exploding bridge wire detonators. These measurements reveal when, during a detonation wave, that the initial crystals change into a less scattering dense fluid.

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