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Experimental Technique for Direct Observation of Onset of Reaction in Shocked Powder Mixtures FRANÇOIS-XAVIER JETTÉ, SAM GOROSHIN, ANDREW HIGGINS, DAVID FROST, McGill University, JULIAN LEE, DRDC-Suffield — A new experimental technique was developed to directly observe the onset of shock initiation in powder mixtures contained in recovery capsules over time scales ranging from hundreds of nanoseconds to at least hundreds of milliseconds. Simultaneously with a thermocouple embedded in the test mixture to monitor bulk temperature changes, a photomultiplier tube detected light emissions produced by the reacting sample. A particular window/optic fiber system was developed that remained intact and did not move during the experiment. A T-shaped polycarbonate window was placed into a steel recovery capsule, which was held solidly in place in a heavy steel anvil designed to protect the fiber optic and to prevent motion of the polycarbonate window. Samples of as-blended 5Ti+3Si powders and ball-milled mixtures 5Ti+3Si were tested in this setup. In all experiments, a weak light emission peak was observed upon shock passage followed by much more intense light emissions beginning a few milliseconds to a few hundreds of milliseconds later. The intense light emissions occurred at approximately the same time as a bulk temperature increase measured with the thermocouple. These results suggest that only a very small fraction of the sample was initiated by the shock. This setup shows promise for further studies of shock initiation in reactive powders.

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