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Development of Optical Diagnostics to Probe Post-Detonation Processes

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Recent developments have spurred a need to recognize processes that occur after the detonation of energetic materials. Understanding enhanced explosive effects whereby substantial energy releasing steps happen nanoseconds to milliseconds after a detonation is a critical need. Optical diagnostic methods are promising because they can meet stringent requirements inherent in detonation events. Optical sensors can monitor fast events and can be remotely placed to be immune from the heat and pressure inherent in a detonation. They thus complement electrical gauges currently in use. We have applied time-resolved emission spectroscopy in monitoring the transient chemical processes in several detonating formulations. Gauges using refractive index to measure pressure have also been developed. Optical fibers have also been tremendously useful in determining shock velocities. These measurements of transient chemistry, pressure and particle flow are essential in unraveling these complex post detonation processes. Other optical techniques in development will be discussed. The scope of applications for these gauges and their limitations will be presented.