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Thermal Impulse Sensors for use in Explosions. HERGEN EILERS, RAY GUNAWIDJAJA, BENJAMIN ANDERSON, Washington State Univ — We have developed temperature and thermal impulse (temperature and duration) sensors for use in explosive fireballs. These sensors are seeded into an explosive fireball and record temperature and duration via morphological phase changes that are optically probed. The thermal impulse sensors include two sensor materials with different phase transition kinetics, and may include a reference material which does not undergo temperature-induced phase changes, and can aid in the optical analysis. Analyzing the sensor materials allows us to determine heating temperature and heating duration of an explosion. The temperature sensors and thermal impulse sensors were recently tested and showed promising results. However, we found that the different components of the thermal impulse sensors tend to get separated during the explosion. We are now evaluating several approaches for redesigning our thermal impulse sensors so that the components remain together during the explosion. These approaches include a core/shell assembly, crosslinking, and co-synthesis. The integrity of the chemically bonded components is evaluated by subjecting the sensors to dispersing forces, while temperature-dependent phase changes of these sensors are assessed by rapid heating using a CO_2 laser.

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