INVESTIGATIONS OF BATTERY EXPLOSION DYNAMICS USING HIGH SPEED INFRARED THERMAL IMAGING

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Abstract: With the prevalence of Li-ion batteries powering everything from handheld devices to electric vehicles, battery explosions are a major concern for both the battery manufacturers and the emergency personnel who respond to such incidents. Understanding the dynamics of Li-ion battery detonation is critical to designing assemblies which are safe for use in commercial products. In this work, we present measurements of controlled Li-ion battery explosions using a high-speed multispectral infrared thermal imaging camera to elucidate the effects of this phenomenon. The camera is equipped with a 640 × 512 focal plane array (FPA) infrared detector and an 8-position filter wheel spinning at 100 rpm equipped with various infrared bandpass filters to provide thermal images at a rate of 100 Hz for each spectral channel. The filters are tuned to assess the presence of specific products of combustion such as H_2O, CO_2, CO, and hydrocarbons, as well a "through-flame" region for the observation of general thermal dynamics. This presentation will focus on the propagation of the explosion immediately after the battery detonation event and the implications of the results for designing safer, more reliable Li-ion battery systems.