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Thermal history sensing of post-detonation environments with thermoluminescent microparticles M. MAH, P. ARMSTRONG, UMN, J. LIGHTSTONE, NSWC, Indian Head Div., J. TALGHADER, UMN — Thermoluminescent (TL) particles show promise as robust direct-contact thermal history sensors for explosive events. Research with microheaters has shown that TL microparticles can measure temperature excursions of hundreds of degrees; however, microheaters do not generate the severe pressure and shock stimuli present in post-detonation environments. To address this, TL particles were tested under conditions produced by the detonation of an aluminized explosive formulation. TLD-100 (LiF:Mg,Ti) powder was irradiated with 220 Gy of gamma radiation from a ^{167}Cs source before being exposed to the free field detonation of a 20 gram charge. Particles were recovered post-detonation from two separate tests and their TL glow curves measured. At least two TL emission peaks 50 °C apart are clearly distinguishable in both samples, with peak intensity ratios decreasing 33.7% and 60.0% from an original 8.88:1, indicative of distinct carrier traps emptying at rates depending on the trap energy. These ratios agree well with thermocouple measurements from within the post-detonation fireball.

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