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Isothermal Volume Expansion of a TATB-Based Composite and the Effect on Compressive Strength DARLA THOMPSON, RICARDO SCHWARZ, RACCI DELUCA, Los Alamos National Laboratory — It has long been known that compacted composites containing TATB crystals undergo "ratchet growth," an irreversible volume expansion upon thermal cycling. A mechanism has not been established but is believed to arise from the highly-anisotropic CTE of TATB crystals and the interactions caused by compaction. Because explosive performance depends fundamentally on bulk density, the details of this phenomenon are important to understand. PBX 9502 is a plastic bonded explosive containing 95 wt% TATB crystals. We have used a TA Instruments thermal mechanical analyzer (TMA) to monitor uniaxial length changes of PBX 9502 specimens as a function of temperature and thermal cycling. Previous "ratchet growth" work has focused on irreversible expansion as a function of temperature range and number of thermal cycles (1). In the work reported here, we demonstrate that irreversible growth also occurs during extended isothermal conditions and especially at elevated temperatures. We explore PBX 9502 irreversible expansion as a function of time and temperature, in the form of thermal ramps and holds. Post-test specimens are then subjected to quasi-static compression testing to determine whether the mechanical properties correlate with the final bulk density, or depend in a more complex way on the detailed thermal history of the specimen. [1] H.F. Rizzo, J.R. Humphrey, and J.R. Kolb, "Growth of 1,3,5-Triamino-2,4,6- Trinitrobenzene (TATB), Control of Growth by Use of High Tg Polymeric Binders," Propellants and Explosives, 1981, 6, 57-62.

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