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Thermal Cycling and Ratchet Growth of As-Pressed TATB Pellets CAITLIN WOZNICK, DARLA GRAFF THOMPSON, RACCI DELUCA, JAMIE STULL, Los Alamos National Laboratory — The explosive 2,4,6-triamino-1,3,5-trinitrobenzene (TATB) has unique crystals that impart a degree of texture to their compactions and to compactions of their formulated plastic bonded explosives (PBXs), thus inducing anisotropy to the mechanical and thermal properties of these materials. In addition, the plate-like TATB crystals possess very anisotropic coefficient of thermal expansion (CTE) values. The CTE in the through-plate direction is ˜10 times greater than in the other two directions. Although the mechanism is not well-understood, in solid compactions of TATB and TATB-based PBXs, the highly-anisotropic CTE gives rise to an irreversible volume expansion that accompanies thermal cycling. This growth is believed to arise from internal stresses induced by thermal expansion. TATB was die-pressed into cylindrical pellets 5 mm long by 5 mm in diameter. These pellets were thermal cycled using thermal mechanical analysis (TMA) to measure the coefficient of CTE and specimen growth after thermal cycling to hot and cold temperatures. The results were compared to the ratchet growth response of PBX 9502, performed in a previous study, to highlight the role of the Kel-F binder in the ratchet growth phenomenon. The comparison is somewhat complicated by the effects of texture due to the difference in sample preparation (i.e. isostatically machined versus "as-pressed" parts), however, the detailed evaluation of porosity changes, before and after ratchet growth, is much easier in the absence of binder.

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