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TATB Ratchet Growth and Hydrostatically-Confined PBX 9502 CAITLIN WOZNICK, DARLA GRAFF THOMPSON, RACCI DELUCA, Los Alamos National Laboratory — The explosive TATB (2,4,6-triamino-1,3,5-trinitrobenzene) is formulated with various polymeric binders to create plastic-bonded explosives like PBX 9502 (95 wt% TATB and 5 wt% Kel-F binder). TATB crystals are graphitic and plate-like in nature and single crystals exhibit anisotropic thermal expansion where the direction normal to the platelet surface grows 10-20 times more than the in-plane platelet direction. Compactions of TATB, with and without binder, exhibit irreversible volume expansion, also known as ratchet growth, when thermal cycled to hot or cold temperatures. Specifically, when TATB-based compactions return to ambient after a temperature excursion away from room temperature, the volume of the specimen is slightly larger. Repeated thermal cycles can reduce the density by 1 to 2%. Axial confinement on a cylindrical specimen has previously been shown by us to suppress growth in the confining direction but then to increase growth in the unconfined directions. In the current work presented here, PBX 9502 specimens were placed in cup assemblies where they were embedded in Sylgard (an incompressible silicon resin) to provide hydrostatic confinement when the assemblies were placed under different axial loads. The loaded cup assemblies were thermally cycled 10 times to hot and cold temperatures. Results show that increasing the hydrostatic confining pressure causes a decrease in the PBX 9502 volume expansion that occurs.

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