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Ratchet Growth Experiments on TATB and PBX 9502 RACCI DELUCA, DARLA THOMPSON, GEOFF BROWN, WX-7, Los Alamos National Lab, BRIAN PATTERSON, MST-7, Los Alamos National Lab, MARY SANDSTROM, STEPHANIE HAGELBERG, WX-7, Los Alamos National Lab — TATB (triaminotrinitrobenzene) crystals are graphitic in structure. In compressed form, with or without binder, TATB undergoes irreversible volume changes upon thermal cycling. This "ratchet growth" can reduce the density by several percent. Independent studies have been conducted by us to analyze and understand ratchet growth mechanisms. Using thermo-mechanical analysis and dilatometry, strain values are measured in real time as temperature cycling protocols are varied. Initial work on PBX 9502 (95 weight% TATB) has led to new studies on dry-pressed TATB cylinders, thus eliminating binder contributions to the thermal response. In another study, PBX 9502 cores were unconfined or axially-confined during the thermal cycling process. The mechanical response of thermal-cycled material was observed to be different than that of as-pressed, equivalent-density material. We have used micro x-ray computed tomography to image dry-pressed TATB specimens (∼3 mm cylinders) before and after extreme thermal cycling to quantify pore size distribution changes. The results of these tests provide a more complete picture of ratchet growth in these materials and the mechanisms involved. LA-UR 11-01097.

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