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Density-dependent Acoustic Properties of PBX 9502 GEOFFREY BROWN, DARLA THOMPSON, RACCI DELUCA, Los Alamos National Laboratory — The acoustic properties of a material can be used to tune models of the material's dynamic response since sound velocities and material density provide dynamic mechanical moduli. Ideally, density-dependent response is desired but often too little data exists to infer the relation between density and modulus. There is also no guarantee that a material's strength will be the same for a density obtained in different ways. In this work we explore the relation between density, acoustic properties, and moduli in PBX 9502, a plastic bonded explosive made of TATB (95% by weight) in Kel-F binder (5% by weight). Under thermal cycling, PBX 9502 undergoes irreversible volume expansion, called "ratchet growth", in which the density can drop by several percent. We have compared ratchet-grown parts to as-pressed parts of the same density and observe lower acoustic velocities in the ratchet-grown parts, implying lower moduli. This is consistent with our quasi-static testing results and implies a correlation between the material's void distribution and its mechanical properties. We will examine several scenarios that may account for decreased velocities.

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