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Analysis of steady compaction waves in polyurea aerogel MATTHEW A. PRICE, TARIQ D. ASLAM, JAMES J. QUIRK, Los Alamos National Laboratory — Steady compaction waves in an inert porous material are investigated using a $p - \alpha$ model. In a steady traveling wave reference frame, the one-dimensional Euler equations are reduced to a set of ordinary differential equations. A Mie-Grüneisen equation of state (EOS) is used with parameters calibrated for polyurea aerogel (PUA). Analytic solutions for non-equilibrium compaction are developed which compliment numerical models and are able to predict the complete wave structure, including the compaction wave speed, zone length, and final compacted solid volume fraction. The dynamic compaction of PUA is studied for a range of piston velocities. Three regions of behavior are identified: supersonic, subsonic-complete, and subsonic-partial compaction. Below a critical piston velocity, a subsonic compaction wave is produced without a leading shock. At even lower piston velocities, there is partial compaction and a greater dependence on the dynamic compaction relation. Some features and limitations of the current model are discussed.

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