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Detonation Shock Dynamics for Porous Explosives and Energetic Materials[1] JUAN SAENZ, D. SCOTT STEWART[2], University of Illinois, Urbana, Illinois — An explosive powder subjected to mechanical or thermal loading undergoes microstructural changes that cause the density to increase and the material to be compacted. The energy that drives compaction is absorbed by the material as the microstructure changes and the specific internal energy of the solid-void mixture increases due to the increase in density as voids become occupied by solids. These changes affect the reactive properties of the material and the mechanics and dynamics of detonation waves in explosive powders. The effects of explosive powder compaction on detonation wave dynamics have not been well characterized. Here we use the theory of Detonation Shock Dynamics (DSD) to analyze the effects of compaction on the dynamics and geometry of detonation waves in explosive powders. We apply DSD theory using a simplified equation of state (EOS) that has been shown to represent the effects of compaction that lead to deflagration to detonation transition in explosive powders. We will show results from the numerical solution of the DSD theory equations as well as from asymptotic DSD theory.

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