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Modeling shocks in periodic lattice materials[1] MARK MESSNER, MATTHEW BARHAM, NATHAN BARTON, Lawrence Livermore National Laboratory — Periodic lattice materials have an excellent density-to-stiffness ratio, with the elastic stiffness of stretch dominated lattices scaling linearly with relative density. Recent developments in additive manufacturing techniques enable the use of lattice materials in situations where the response of the material to shock loading may become significant. Current continuum models do not describe the response of such lattice materials subject to shocks. This presentation details the development of continuum models suitable for representing shock propagation in periodic lattice materials, particularly focusing on the transition between elastic and plastic response. In the elastic regime, the material retains its periodic structure and equivalent continuum models of infinite, periodic truss structures accurately reproduce characteristics of stretch-dominated lattices. At higher velocities, the material tends to lose its initial lattice structure and begins to resemble a foam or a solid with dispersed voids. Capturing the transition between these regimes can be computationally challenging.

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