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Non-Equilibrium Volumetric Response of Shocked Polymers[1]

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Polymers are well known for their non-equilibrium deviatoric behavior. However, recent investigations involving both high rate shock experiments and equilibrium measured thermodynamic quantities have reminded us that the volumetric behavior also exhibits a non-equilibrium response. An area where this work should be important is the impact of glassy polymers. At the time of impact and near the impact surface, the polymer's volumetric response will be described as being Hugoniot-like, *i.e.*, standard shock Hugoniot jump conditions apply. However, at later times, release waves from neighboring free surfaces will cause the polymer's volumetric response to be far from Hugoniot. In this talk, experiments showing the non-equilibrium behavior will be described. Following that discussion, a continuum-level theory is proposed that will allow us to bridge the equilibrium and non-equilibrium behaviors with a single model that can go seamlessly from one regime to the other.

In collaboration with Philip Rae and Dana Dattelbaum, Los Alamos National Laboratory.

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