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Micron scale molecular dynamics simulation of shocks in low density structures TOMAS OPPELSTRUP, JIM GLOSLI, DAVID F. RICHARDS, ERIK DRAEGER, LIAM KRAUSS, Lawrence Livermore National Laboratory —
Engineered porous materials, such as solid foams and nano-structured materials, present novel structural and functional materials in previously inaccessible ranges of strength-density and surface to volume ratios. Shock responses reveal strength and phase-diagram data for materials under extreme conditions. Shocking or ramp compression of porous materials in particular can result in very complex behavior. Besides exhibiting shock- and sound-waves through the dense regions, crush-up of the material can result in ejection of fast particles and liquid jets through the material. Thus shocks in porous materials is a multiphase phenomenon with several energy transport mechanisms. Understanding the interplay between these mechanisms is important for more accurate interpretation of experimental shock data and better macroscopic modeling of shock response of porous materials. To characterize the asymptotic behavior of shocks in porous materials, we performed micron scale molecular dynamics simulations of shocking of copper foams and truss structures. We will present simulation results and analysis of different modes of energy transport. Note: This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Tomas Oppelstrup
Lawrence Livermore National Laboratory

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