SHOCK13-2013-000902

Abstract for an Invited Paper
for the SHOCK13 Meeting of
the American Physical Society

Shock and Release of Duocel$^{\textbf{textregistered}}$ Aluminum Foam & Polyvinylidene Fluoride Composite Up to 20 GPa

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Considerable interest in characterizing the dynamic response of heterogeneous materials under dynamic loading conditions exists because of their energy absorption and dissipation qualities. In the present study,4 pores per centimeter 6101 T-6 aluminum foam, which was initially at 6-8% relative density of solid aluminum, was later compressed longitudinally to 20% relative density, (11 pores per centimeter) and filled with polyvinylidene fluoride (PVDF). The composite was then shocked up to 20GPa using AFRL's 60mm smooth bore powder gun. Results of these experiments will be compared to that of porous aluminum that was not filled. Further, computations at the meso-scale, which tracked well with experiments, highlighted the range of velocity distributions, as well as the damping caused by the addition of plastic. In particular, due to filler that was fairly close in density to the aluminum, the particle velocity variation was relatively low compared to porous foams from previous studies. The behavior of the composite was dominated by the presence of the plastic filled material, which demonstrated dissociation at pressures greater than 8 GPa.