Abstract Submitted
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High pressure Hugoniot measurements using Mach waves JUSTIN BROWN, GURUSWAMI RAVICHANDRAN, Caltech — In an effort to dramatically increase the range of pressures which can be accessed by traditional shock loading methods, a composite target assembly is examined. The target consists of two concentric cylinders aligned with the axial direction parallel to the loading, and is designed such that the outer cylinder will initially have a higher shock velocity than the inner material of interest. Conically converging shocks will be generated at the interface between the two materials due to the impedance mismatch. Upon convergence, an irregular reflection occurs and the conical analog of a Mach reflection develops. The Mach reflection will grow until it reaches a steady state, at which point the wave configuration becomes self similar. The resulting high pressure Hugoniot state can then be measured using velocity interferometry and impedance matching. The technique is demonstrated using a planar mechanical impact generated by a powder gun to study the shock response of copper. Two systems are examined which utilize either a low impedance (6061-T6 aluminum) or a high impedance (molybdenum) outer cylinder. A dual-delay multipoint VISAR experiment will be presented to validate the technique, and will be compared to both numerical simulations and a simple hydrodynamic model. The feasibility of measuring an entire Hugoniot curve using full field velocity interferometry (ORVIS) will also be discussed, and initial experiments will be presented.

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