Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

The Response of High-Purity Titanium to Sweeping Detonation Waves LAWRENCE HULL, GEORGE GRAY, PHILLIP MILLER, THOMAS NIZOLEK, Los Alamos National Laboratory — Loading from sweeping detonation waves possess enhanced shear relative to loading from ordinary one-dimensional plane detonation waves. Our experiments use cylindrical detonation waves that are driven into flat samples of high-purity titanium. The waves driven into the sample by the explosive interact obliquely from the free surface as the wave sweeps along the sample, develop toward quasi-steady motion from effectively zero obliquity, and therefore induce a variation of shear along the sample. The type and thickness of the explosive is also varied, from experiment to experiment, in order to access conditions that bridge the alpha to omega phase transition in pure titanium. The primary dynamic diagnostic is Photon-Doppler-Velocimetry (PDV) using a crossed pair of probes directed at each spot with sufficient view direction (vectorial) independence such that the normal and in-surface tangential velocity may be inferred. Various quantities that characterize the dynamic response of the material are derived from the PDV data and reported (e. g. spall strength, etc.). The samples are recovered and metallurgical analysis performed to characterize the deformation mechanics (e. g. twinning) and likelihood of the presence of the alpha to omega phase transition (e.g. retained omega phase) associated with various loading conditions.

Lawrence Hull
Los Alamos National Laboratory

Date submitted: 27 Feb 2019 Electronic form version 1.4