SHOCK05-2005-020018

Abstract for an Invited Paper
for the SHOCK05 Meeting of
the American Physical Society

High-Pressure Strength Measurements Under Isentropic Loading

TRACY VOGLER, Sandia National Laboratories

Recent advances in magnetic loading techniques have permitted quasi-isentropes to be measured to unprecedented levels. However, the relevant equations for planar waves provide no information about transverse stresses, leaving the deviatoric (strength) behavior of an isentropically loaded material unknown. Because materials are much cooler under isentropic loading than under shock loading, they can remain solid and thus retain strength to very high pressures. Thus, to improve our ability to model material behavior under isentropic loading, techniques to measure strength are needed. In this paper, existing techniques for determining high-pressure strength will discussed along with their limitations. A technique for assessing the strength of isentropically loaded materials will be presented and used to determine the strength of an aluminum alloy using data from the Z machine and gas gun experiments. These results will be compared to existing models for material strength. Finally, limitations of the technique and future work needed will be discussed. *Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.*