Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Computational and Experimental Investigation of the Shock Compression Response of Cold-Rolled Ni/Al Multilayers PAUL SPECHT, NARESH THADHANI, Georgia Institute of Technology, TIMOTHY WEIHS, The Johns Hopkins University — Heterogeneities at the meso-scale strongly influence the shock compression response of composite materials. In reactive material mixtures, such as Ni and Al, these heterogeneities greatly affect material mixing, heating, and activation, often initiating a reaction. Cold-rolled multilayered composites of Ni and Al provide a unique and potentially beneficial reactive material system, due to their full density, periodic layering, and intimate particle contacts. The shock-compression response of cold-rolled Ni/Al multilayers was investigated under uniaxial strain loading conditions using plate-impact experiments. Time-resolved diagnostics, including VISAR, PDV, and PVDF stress gauges, were used to obtain the equilibrium Hugoniot response of the multilayers. The experimental results were coupled with a computational investigation using the multi-material, finite-volume, Eulerian hydrocode CTH, developed by Sandia National Laboratories. The computations employed real, heterogeneous microstructures, obtained from optical microscopy, enabling their correlation with the experimental results to provide validation of the models and computational method used for describing the response of the cold-rolled Ni/Al multilayers. Research funded by ONR/MURI grant No. N00014-07-1-0740.

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Date submitted: 22 Feb 2013 Electronic form version 1.4