Abstract Submitted
for the SHOCK09 Meeting of
The American Physical Society

Explosive Compaction of Intermetallic-forming Powder Mixtures for Fabricating Structural Energetic Materials SIWEI DU, KELLI RETTEW, ERIC HERBOLD, NARESH THADHANI, School of Materials Science and Engineering, Georgia Tech, Atlanta, GA 30332-0245, JOHSUA MUNOZ, CHUNG-TING WEI, KENNETH VECHIO, MARC MEYERS, Dept. of Mechanical and Aerospace Engineering, University of California at San Diego, La Jolla, CA 92093-0411 — A double-tube implosion geometry is used to explosively shock consolidate Ni-Al, Ta-Al, Nb-Al, Mo-Al and W-Al powder mixtures for fabricating bulk structure energetic materials, with both mechanical strength and the ability to undergo impact-initiated exothermic reactions. The shock consolidated compacts are characterized based on the uniformity of the microstructure including degree of densification and variation in constituent volume fraction as a function of the axial and longitudinal dimensions of the compacts. Near full density compacts are achieved with minor variations in mixing of constituents, and no evidence of intermetallic reaction taking place during compaction. Differential thermal analysis was performed to determine the thermal reactivity of the compacts and compare with that of unshocked statically-pressed powder compacts. The dynamic mechanical properties of the compacts are characterized using the split-Hopkinson bar, and the reactivity under impact loading was determine using rod-on-anvil experiments.

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Date submitted: 14 Apr 2009 Electronic form version 1.4