Abstract Submitted
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Mechanisms of high strain, high strain rate plastic flow in the explosively driven collapse of Ni-Al laminate cylinders KARL OLNEY, PO-HSUN CHIU, University of California, San Diego, ANDREW HIGGINS, MATTHEW SERGE, McGill University, GREGORY FRITZ, ADAM STOVER, Johns Hopkins University, DAVID BENSON, VITALI NESTERENKO, University of California, San Diego — Laminate materials composed of thin Ni and Al foils have shown promise as material systems used in reactive material applications due to the ability of the material to support a self-sustaining reaction between the Al and Ni layers. In addition to the traditional ignition methods, ignition may occur in the shear bands developed during mechanical loading. The thick-walled cylinder (TWC) technique was performed on samples of Ni-Al laminate materials with two different mesostructues; concentric and corrugated both constructed using alternating layers of Ni and Al thin foils on the order of 20-30 micron foil thickness. These TWC experiments were performed to examine how these materials accommodated large plastic strain during the collapse which may be used to tailor reactivity in the material system. Large scale numerical simulations of these specimens with mesostuctures digitized from the experimental samples were conducted to provide an insight into the mesoscale mechanisms of plastic flow during collapse of the thick walled laminate material during the explosive loading. Funding was provided by ONR MURI N00014-07-1-0740 (Program Officer Dr. Clifford Bedford)

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