Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Shock initiation of reactive nanolaminates SERGEY MATVEEV, DANA DLOTT, University of Illinois at Urbana-Champaign, PETRA HANUSOVA, JON-PAUL MARIA, Penn State University — In this study, reactivity at the fuel-oxidizer interface under shock compression is studied. We studied the model system consisting of only one metal/metal oxide bilayer, in this case Zr/CuO. The samples were fabricated via magnetron sputtering with a mask to make 50 individual 3-mm sample spots on 2"-square glass substrates. Magnetron sputtering provides a nearly-perfect planar interface between the thermite components that is ideal for further shock compression study. High-throughput tabletop shock-system launches 500 m-diameter flyer plates with velocities of 0.5-4.6 km s^{-1}. High-speed nanosecond-gated photography and optical pyrometry were utilized to detect regions of intense thermal emission and indicate temperatures of these areas respectively. This work demonstrates that RNLs show almost no reactivity under planar shock, whereas the shear wave spreading radially-out from the center of impact starts the reaction between metal and metal oxide. The brightest, and therefore hottest, thermal emission was observed at about 80 ns. Temporal and spatial reaction propagation was shown to depend on amount of metal fuel and number of interfaces.

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Date submitted: 26 Feb 2019 Electronic form version 1.4