Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Microstructure in the Extreme Environment: Understanding and Predicting Dynamic Damage Processes DARCIE DENNIS-KOLLER, ELLEN CERRETA, CURT BRONKHORST, PABLO ESCOBEDO-DIAZ, RICARDO LEBENSOHN, Los Alamos National Laboratory — The future of materials science: strategic application for functionally controlled materials properties is emphasized by the need to control material performance in extreme environments. This study examines the separate effects of kinetics (in the form of dynamic loading rate and shock wave shape) from that of length-scale effects (in the form of microstructural defect distributions). Recently available mesoscale modeling techniques are being used to capture a physical link between kinetic and length-scale influences on dynamic loading. This work contributes innovative new tools in the form of shock-wave shaping techniques in dynamic experimentation, materials characterization, lending insight into 3D damage field analysis at micron resolution, and the physics necessary to provide predictive capabilities for dynamic damage evolution. Experimental are obtained to provide the basis for the development of process-aware material performance models.

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Date submitted: 06 Dec 2012 Electronic form version 1.4