Abstract Submitted
for the SHOCK07 Meeting of
The American Physical Society

Twinning and Dynamic Strength of Copper During High-Rate Strain VICTOR RAEVSKY, RFNC-VNIIEF — The authors will present the results of a study of the conditions under which microstructural changes involving the formation of complex bi-periodic twin structures occurs in copper during shock wave and high strain rate ($\dot{\varepsilon} > 10^7$ s^{-1}) shock-less loading. The overall morphology of the observed twin structures is rather complex, consisting of what we shall refer to as "packages," with each "package" being composed of two sets of parallel twins aligned in a quasi-herringbone pattern. The effects of these complex twin structures are also complex. It is widely accepted that deformation twinning results in increased shear strength in samples recovered after shock wave loading. We have observed in this work a significant temporal component to the effect that these complex twin structures have upon shear strength. We have observed, for example, that the formation of these bi-periodic (herringbone-type) twin structures results in an initial loss of shear strength that is significant over a time period of about 0.2 to 0.4 μs. Following the initial loss of shear strength, deformation hardening produces an increase in shear strength that can be as great as several multiples of the initial value.

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Date submitted: 13 Feb 2007 Electronic form version 1.4