Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Frictional sliding at a compressed polycrystalline 50 nm grain size Al-Al interface[1] J.E. HAMMERBERG, Los Alamos National Laboratory, R.J. RAVELO, University of Texas, El Paso, T.C. GERMANN, Los Alamos National Laboratory — We present the results of large-scale NEMD simulations for a polycrystalline Al-Al interface sliding at a relative velocity of 60 m/s and a pressure of 15 GPa with a boundary temperature of 300K. The sample consisted of annealed grains, 125 grains on either side of the initial sliding interface, with dimensions of 2x(236) nm in the normal direction and 236 nm in the periodic sliding and transverse directions. Simulation times were of order 20 ns and the sample had 1.8B atoms interacting with an Al-EAM potential. The initial grain structure evolves to a complex dynamic steady state grain morphology that is very different from the initial grain structure and is characterized by large plastic strains and strain rates in a deformation region of thickness 150 nm at the interface in the normal direction. The steady state shows a sequence of grain growth and refinement and a highly strained graded microstructure. This behavior is similar to that seen in simulations for 13 and 20 nm grains and a mesoscale model that takes into account the large plastic strains and strain rates, and the size of the deformation region is able to reproduce the values of the frictional force per unit area.

[1]This work was performed under the auspices of the U.S. Dept. of Energy under contract DE-AC52-06NA25396. The support of the LANL ASC-PEM program is gratefully acknowledged.

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Date submitted: 13 Nov 2014 Electronic form version 1.4