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Grain dynamics in compressed polycrystalline Al interfaces sliding at high velocities[1] J.E. HAMMERBERG, R. RAVELO, J. MILHANS, T.C. GERMANN, Los Alamos National Laboratory — We discuss the relationship between grain structure and the frictional force for polycrystalline Al interfaces with grain sizes of 13, 20 and 50 nm as seen in large scale NonEquilibrium Molecular Dynamics (NEMD) simulations at nominal pressures of 15 GPa. Simulation sizes were 138 M atoms for the 13 and 20 nm grain size samples and 1.8 B atoms for the 50 nm samples with times to 30 ns. We find that the frictional force in the steady state is independent of the initial grain size and that the grain distribution evolves to a dynamical steady state characterized by a sequence of grain growth and refinement events at very large local plastic strains and strain rates. Based upon these simulations, a meso/macro-scale model has been developed that reproduces the NEMD results for over two orders of magnitude in sliding velocity encompassing both solid and fluid regimes.

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