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Frictional Interactions at High Velocity Polycrystalline Ductile Metal Interfaces[1] JAMES HAMMERBERG, JACQUELINE MILHANS, RAMON RAVELO, TIMOTHY GERMANN, Los Alamos National Laboratory — We have examined the effect of evolution of grain morphology on the frictional force at polycrystalline Al-Al and Al-Ta interfaces as a function of grain size and sliding velocity. We present the results of 8M, 26M and 138M particle NonEquilibrium Molecular Dynamics (NEMD) simulations for grain sizes of 13.5, 19.3 and 20 nm. Sample sizes consisted of 3x3x3 and 5x5x5 grains on each side of a sliding interface. We have considered sliding velocities of 42, 50, 100, 140, and 240 m/s. For velocities below a size dependent critical velocity above which a fluid layer forms, we find enhanced grain coarsening leading to a highly strained, graded final steady state microstructure that exhibits a dynamic morphology for times greater than 5-10 ns. We find that the frictional force is insensitive to the initial grain size distribution due to the evolution of the initial distribution to a new nonequilibrium steady state. We discuss the relationship of these results to single crystal interfaces and the mechanisms for grain size and shape evolution.

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