Abstract Submitted
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Microstructural Evolution and Grain Growth at High Speed Frictional Interfaces[1] J.L. MILHANS, J.E. HAMMERBERG, R. RAVELO, T.C. GERMANN, B.L. HOLIAN, Los Alamos National Laboratory — We have examined the effect of evolution of grain morphology on the frictional force at polycrystalline Al-Al interfaces as a function of grain size and sliding velocity in the velocity range 40-250 m/s for grain sizes of 13.5 and 20 nm. Sample sizes for NonEquilibrium Molecular Dynamics (NEMD) simulations ranged from 10 - 140 M atoms. 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 morphhology characterized by grain growth and breakup at time scales greater than 5-10 ns. We find that the frictional force is insensitive to the initial grain size distribution that evolves to this new nonequilibrium steady state. We discuss mechanisms for grain size and shape evolution and the emergence of a dynamic length scale and compare these results to single crystal simulations in the same sliding regime.

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