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Microstructures produced by dynamic friction CHRIS POULTER, RON WINTER, AWE, Aldermaston, Reading, UK, HONG JIN KIM, Materials Science and Engineering, OSU, Columbus, OH — An experimental technique in which an explosive charge induces sliding between two metals has been developed as part of a study of dry friction at very high sliding velocities and pressures. Aluminium alloy/stainless steel and pure aluminium/pure copper tribo-pairs have been investigated. Optical studies of cross-sections of the aluminium samples have shown that, depending on the stress/sliding velocity conditions, the sub-surface deformation is either deep, suggesting high friction, or concentrated near the surface suggesting low friction. Recent further studies of the microstructure near the surface of the samples are described. Transmission electron microscopy reveals that a clearly delineated layer of nanocrystalline material about 1 micron thick is developed at the surface of the aluminium samples. Spectroscopic analysis shows evidence of interpenetration of the two materials with mixing occurring at a very fine scale. The observations support the contention that, in a mechanism akin to adiabatic shear, thermal softening of the material at the sliding interface plays a key role in shock-induced friction.

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