Abstract Submitted
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Mechanisms of Dynamic Friction GRAHAM BALL, AWE, Aldermaston, UK — Oblique shock loading at metal/metal interfaces produces differential tangential acceleration, resulting in sliding with dynamic friction. Here a 1D continuum code is used to predict time-dependent behaviour of the sliding interface. Processes represented are shear deformation, work hardening, thermal softening, melting, heat conduction and frictional heating. Friction is controlled by the von Mises yield limit, in pure shear, of the weaker material at the interface, and is therefore strongly coupled to thermal softening and work hardening. Results are presented for aluminium/steel in the 100 kBar range. Two behaviours are predicted, depending on the initial relative velocity. At high velocity, thermal softening dominates - after an initial warm-up transient the aluminium approaches its melt temperature asymptotically with decaying friction, while plastic deformation is confined to a thin sub-surface layer. Below a critical velocity, after an initial period of sliding, runaway work hardening reduces the relative velocity abruptly to zero, giving sustained high shear stress and deep plastic deformation. These predictions are shown to be consistent with recent HE-driven recovery experiments.

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