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Anisotropic plasticity in NiAl alloy under dynamical loading ALEJANDRO STRACHAN, Theoretical Division. Los Alamos National Laboratory, SHENG-NIAN LUO, Physics Division. Los Alamos National Laboratory — We use molecular dynamics with a first principles-based interatomic potential to characterize the orientational dependence of shock-induced plasticity in NiAl B2 alloy. For all directions studied plasticity starts with the nucleation of superpartial loops encircling 1/2<111> slip but the subsequent events exhibit marked anisotropy. For shocks in the [110] direction we find an intricate pattern of <111>{110} and <100>{110} slip with the plastic wave moving at the shock velocity. In the case of [111] shocks plastic deformation is dominated by <100>{110} slip that forms when trailing superpartials nucleate inside the initial 1/2<111> loops. For shocks in the [100] direction (the hard direction) much stronger shocks [(uniaxial stress almost twice larger than for [110] and [111]] are required before plastic deformation is observed; we find almost simultaneous, nucleation of multiple 1/2<111> superpartials, leading to frequent intersections that severely limit their mobility and even lead to local amorphization. In the [100] and [111] shocks we find an elastic precursor separating the leading shock front and the plastic wave.

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