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A path to materials science above 10 Mbar on the NIF laser[1] B. REMINGTON, H.-S. PARK, S.T. PRISBREY, S.M. POLLAINE, R.M. CAVALLO, A.G. MACPHEE, R.E. RUDD, B. MADDOX, Lawrence Livermore National Laboratory, M.A. MEYERS, University of California at San Diego — Solid state dynamics experiments at extreme pressures, P = 5-25 Mbar, and strain rates (1.e6 - 1.e8 1/s) are being developed for the NIF laser, using a ramped pressure drive. Velocity interferometer measurements establish the high pressure conditions. Constitutive models for solid state strength are being tested by comparing 2D continuum simulations with experiments measuring perturbation growth from the Rayleigh- Taylor instability in solid state samples of vanadium and tantalum at $\sim$ 1 Mbar pressures. Simulations using the PTW strength model or a new multi-scale V strength model, suggest that the deformation is largely in the phonon drag regime. Radiography techniques using bursts of 20-40 keV x-rays have been developed to diagnose this perturbation growth in Ta foils. Methods for inferring deformation mechanism (slip vs. twinning, thermal activation vs. phonon drag) will be discussed.

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