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Experimental Results of Tantalum Flow Stress at 5 Mbar from NIF[1] HYE-SOOK PARK, A. ARSENLIS, L.R. BENEDETTI, R. CAVALLO, C.M. HUNTINGTON, B.R. MADDOX, J.M. MCNANEY, S. PRISBREY, R.E. RUDD, S.V. WEBER, C.E. WEHRENBERG, B.A. REMINGTON, LLNL — We present our first experimental results from the NIF laser to test Ta strength models at high pressures ($\sim$ 5 Mbar), high strain rates ($\sim 10^7$ s^{-1}) and high strains (>30%). We use 800 kJ of laser energy to create a ramped drive via a 4-layer reservoir - gap configuration. The target package includes sinusoidal Ta surface ripples that are used to infer the plastic flow stress of the sample from a measurement of the Rayleigh-Taylor instability ripple growth. The inferred flow stress is approximately twice greater than predictions by the multiscale strength model. It is conjectured that homogeneous nucleation behind the leading shock at $\sim$ 1 Mbar promptly generates a very high dislocation density, thus increasing the strength through the work hardening term. It was also observed that larger initial amplitude ripples grow more than smaller initial amplitude ripples at the same wavelength, suggesting the so-called Drucker effect for solid-state flow due to the Rayleigh-Taylor instability [D. C. Drucker, Mechanics Today, 5, 36 (1980)].

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