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Rayleigh-Taylor experimental results of dynamic Ta material strength at >1 Mbar pressure[1] HYE-SOOK PARK, K. BLOBAUM, R. CAVALLO, B. MADDOX, M. MAY, S. POLLAINE, S. PRISBREY, B. REMINGTON, R. RUDD, D. SWIFT, R. WALLACE, LLNL, A. NIKROO, E. GIRALDEZ, General Atomics — We have measured the Rayleigh-Taylor (RT) instability growth rate in Ta using Omega and EP joint laser shots. The Ta sample is maintained in the solid state by a ramped drive using a reservoir-gap-sample configuration, reaching peak pressures > 1 Mbar at strain rates of 10^6-10^8 s^{-1}. The Ta sample RT growth factors were measured using a 22 keV backlighter driven by the EP petawatt laser. The material strength can greatly suppress the RT instability growth rate via an effective lattice viscosity [1]. In 2D simulations of these experiments, we find that the various analytic constitutive (material strength) models overpredict the Ta growth by factors of ∼2 or more, whereas a newly developed multiscale model matches the experimental measurements to within ∼30%. This paper will present the details on the experimental results and comparisons with the multi-scale model. Designs that extend this experiment to 5 Mbar on NIF will also be shown [1] J. D. Colvin et al., JAP, 93, 5287 (2003); H.S. Park et al., PRL. 104, 135504 (2010).

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