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Semi-analytic treatment of the Rayleigh-Taylor instability in a material with strength PHILIP D POWELL, THOMAS LOCKARD, KARNIG MIKAELIAN, DAMIAN SWIFT, Lawrence Livermore Natl Lab — Dynamic loading of samples with rippled interfaces has been used to infer material strength via measurement of the Rayleigh-Taylor instability driven growth. Typically, this analysis relies on two dimensional simulations of the driven assembly's response, varying strength models or other assembly parameters until measurements are reproduced. For materials exhibiting viscosity rather than strength, the growth rate can be expressed analytically. This approach has previously been extended to materials with strength by interpreting it as an effective viscosity. Here we report an alternative approach, incorporating the flow stress directly into the analytic expression for instability growth. Idealized two dimensional simulations were used to test and calibrate the growth rate. The rate relation can then be used to predict instability growth given the history of density ratio and acceleration at the interface, which can be obtained from one-dimensional simulations.

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