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Exploring elastic and plastic regimes of Rayleigh-Taylor instability in solids[1] RINOSH POLAVARAPU, ARINDAM BANERJEE, Lehigh University — The elastic-plastic (EP) transition stage of Rayleigh-Taylor (RT) instability in an accelerated non-Newtonian material (soft solid) is investigated. The material exhibits both elastic and plastic behavior when the applied stress is less than yield stress. Different combinations of perturbation amplitude and wavelength are employed at the solid-gas interface. Plastic deformation of a stable interface under various acceleration profiles is analyzed. In addition, the evolution of single mode perturbations at various strain rates is examined by altering the angular acceleration of rotating disk on which the test section is mounted. These findings are used to characterize the effects of strain rate variation on the instability growth rate and the experimental results are compared to several analytical models on RTI in solids. The instability threshold for a perturbation of given amplitude and wavelength is observed to increase with an increase in angular acceleration. The perturbation velocities are measured and used to estimate values of growth-rate parameter in the unstable phase.

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