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Rayleigh Taylor growth at an embedded interface driven by a radiative shock[1]

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Radiative shocks are those where the radiation generated by the shock influences the hydrodynamics of the matter in the system. Radiative shocks are common in astrophysics, including during type II supernovae, and have also been observed in the rebound phase of a compressed inertial confinement fusion (ICF) capsule. It is predicted that the radiative heating serves to stabilize hydrodynamic instabilities in these systems, but studying the effect is challenging. Only in recent experiments at the National Ignition Facility has the energy been available to drive a radiative shock across a planar, Rayleigh-Taylor unstable interface in solid-density materials. Because the generation of radiation at the shock front is a strong function of shock velocity (v^8), the RT growth rates in the presence of fast and slow shockas were directly compared. We observe reduced RT spike development when the driving shock is expected to be radiative. Both low drive (225 eV) hydrodynamic RT growth and high drive (325 eV), radiatively-stabilized growth rates are in good agreement with 2D models. This NIF Discovery Science result has important implications for our understanding of astrophysical radiative shocks, as well as the dynamics of ICF capsules.

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