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Stabilizing effect of anisotropic thermal diffusion on the ablative Rayleigh-Taylor instability LAURENT MASSE, CEA, CEA/DAM TEAM — For more than twenty years, numerous analyses have been devoted to the instability of the ablation front in the context of inertial confinement fusion. It has been shown by several authors that the ablative Rayleigh-Taylor instability (RTI) is stabilized during the linear stage in contrast to the classical RTI. The physical origin of the dominant stabilizing effect has been attributed to blow-off convection or dynamical pressure correlated with the rocket effect. First, the work presented here clearly recalls that the main stabilizing effect can be understood as a transversal diffusive mechanism. This understanding suggests that anisotropic diffusion could be used to reduce the ablative RTI growth. In this Letter, we show, both on the basis of a linear theory of the ablative RTI and 2D hydrodynamic simulations, that anisotropic diffusion leads to a strong reduction of the ablative RTI growth rates, the mean flow being left unchanged. We then provide a simple method to produce such an anisotropy, using a laminated structure of the ablated material made up of successive layers of high and low conductivities. Finally, we present numerical simulations of the ablative RTI in a planar experimental configuration, confirming the theoretical predictions.

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