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Mitigation of Hydrodynamic Instabilities in Direct-Drive ICF Targets Through the Use of High-Z Overcoats and Prepulses LEE PHILLIPS, NRL — The most successful means of reducing the impact of hydrodynamic instabilities in ICF targets are to decrease the Rayleigh-Taylor growth rate by shaping the adiabat and to reduce the seeds of R-T growth. The latter can be accomplished to a great extent by target manufacture and optical laser smoothing, but the residual R-T seeds are still unacceptably large, and a subject to Richtmeyer-Meshkov amplification during the target compression stage, before R-T growth begins. We report here on simulations of targets incorporating a thin, high-Z (metallic) overcoat. The overcoat converts incident UV laser energy to soft X-rays, which produce a higher ablation velocity and consequently smaller Richtmeyer-Meshkov growth and a smaller seed for the R-T instability. Penetration of X-rays from the overcoat into the ablator also shapes the adiabat and reduces the R-T growth rate, but more effective adiabat shaping can be accomplished through the use of laser prepulses or spikes, as has been widely reported. Here we explore new target designs that combine the use of overcoats with laser spikes in an attempt to both reduce the seed for the R-T instability as well as its growth rate. We examine in detail as well the situations in which both overcoats and prepulses can worsen target stability in order to arrive at a set of constraints for optimal target design. Supported by the US DOE.

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