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A connection between mix and adiabat in ICF capsules¹ BAO-LIAN CHENG, THOMAS KWAN, YI-MING WANG, SUNGHUAN (AUSTIN) YI, STEVEN BATHA, Los Alamos National Laboratory — We study the relationship between instability induced mix, preheat and the adiabat of the deuterium-tritium (DT) fuel in fusion capsule experiments. Our studies show that hydrodynamic instability not only directly affects the implosion, hot spot shape and mix, but also affects the thermodynamics of the capsule, such as, the adiabat of the DT fuel, and, in turn, affects the energy partition between the pusher shell (cold DT) and the hot spot. It was found that the adiabat of the DT fuel is sensitive to the amount of mix caused by Richtmyer-Meshkov (RM) and Rayleigh-Taylor (RT) instabilities at the material interfaces due to its exponential dependence on the fuel entropy. An upper limit of mix allowed maintaining a low adiabat of DT fuel is derived. Additionally we demonstrated that the use of a high adiabat for the DT fuel in theoretical analysis and with the aid of 1D code simulations could explain some aspects of the 3D effects and mix in the capsule experiments. Furthermore, from the observed neutron images and our physics model, we could infer the adiabat of the DT fuel in the capsule and determine the possible amount of mix in the hot spot (LA-UR-16-24880).

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