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Fast-Ignition Fuel Assembly: Theory and Experiments C. ZHOU, R. BETTI, W. THEOBALD, C. STOECKL, V.A. SMALYUK, Fusion Science Center, Laboratory for Laser Energetics, U. of Rochester — Scaling relations for fast-ignition fuel assembly are derived both analytically and numerically. The stagnation properties of fuel assembly exclusively depend on the in-flight adiabat, implosion velocity, and driver intensity and energy. Since both density and areal density increase with decreasing adiabat, a high-density and areal-density fuel assembly can be generated by a low-adiabat, low-velocity implosion. This requires massive capulses with an initial aspect ratio of about 2. The implosion of such thick shells leads to high energy gains. Implosions driven by 25 kJ to 2 MJ of UV laser energy are simulated in one and two dimensions. Based on the scaling laws, an optimized laser pulse is designed to perform low-speed, low-adiabat implosions on OMEGA. CH shells of 40-μm thickness and 0.86-mm diameter filled with various gas pressures are imploded to reach a peak areal density of 0.3 g/cm^2. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement Nos. ER54789 and DE-FC52-92SF19460.

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