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Advanced Ablator Target Designs for Direct-Drive Experiments
R. BETTI, R. NORA, M. LAFON, J.F. MYATT, K.S. ANDERSON, Laboratory for Laser Energetics and Fusion Science Center, U. of Rochester — A major concern for direct-drive implosions at the National Ignition Facility (NIF) scale is the DT-fuel preheating by hot electrons produced by the two-plasmon-decay instability. Experiments on OMEGA using thick glass targets[1] showed that glass SiO_2 ablators produced a hard x-ray signal from hot electrons that is $40\times$ lower than in plastic shells for the same laser intensity. These results have stimulated research in new ablator materials with higher Z than plastic CH for direct-drive targets. A set of moderate-Z ablators ranging from carbon to silicon has been used to design both hot-spot and shock-ignition targets at laser energies relevant to the NIF. The hydrodynamics of these ablators is studied through single and multimode simulations. Hydro-instabilities exhibit complex behavior in these ablators due to the presence of a double ablation front (thermal and radiative) and a classically unstable interface. It is shown that target designs with reasonably good hydrodynamic properties using moderate-Z ablators are possible for both shock and hot-spot ignition. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement Nos. DE-FC52-08NA28302 and Office of Fusion Energy Sciences under grant DE-FC02-04ER54789.

[1]V. A. Smalyuk *et al.*, Phys. Rev. Lett. **104**, 165002 (2010).

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