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Measurement of mix at the fuel-ablator interface in indirectly-driven capsule implosions on the NIF

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The interface between the capsule ablator and fuel ice layer is susceptible to hydrodynamic instabilities. The subsequent mixing of hot ablator material into the ice reduces fuel compression at stagnation and is a candidate for reduced capsule performance. The ability to diagnose ice-ablator mix is critical to understanding and improving stability at this interface. Combining the Crystal Backlighter Imager with the Single Line of Sight camera on the NIF provides multiple quasi-monochromatic 7.2keV radiographs of layered capsule implosions per experiment, with high spatial and temporal resolution. The narrow bandwidth of this diagnostic platform allows radiography of the inner edge of the capsule limb close to stagnation without capsule self-emission contaminating the data, providing a wealth of information that can be used to assess the stability of the ice-ablator interface. An important factor which affects the stability of the ice-ablator interface is preheating of the ablator adjacent to the fuel by energetic components of the x-ray drive, destabilizing the interface. Adding a high-Z dopant layer to the ablator mitigates this effect. Results will be presented from a campaign in which this radiographic technique was used to measure the effect of tungsten dopant concentration on the ice-ablator interface for a series of 3-shock High Density Carbon implosions. These measurements reveal that while the addition of dopant provides an overall stabilizing effect, there are significant differences between the equatorial and polar regions of the capsule. It is hypothesized that this is due to the anisotropy of the energetic components of the x-ray drive, suggesting that this must be considered when addressing preheat.
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