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Time dependent mix in a converging burning capsule

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We use time dependent spectroscopy and imaging techniques to gather data, which will constrain the different mix models. The data is collected from implosions as a new tool to measure the mixing of material in an imploding shell with a very thin Ti layer on the inside of the capsule. The interior of the capsule is filled with deuterium gas. During the implosion some of the titanium mixes with the burning deuterium fuel and emits radiation. The present study measures the emission from the titanium material. The titanium that mixes with the fuel reaches a higher temperature compared to the titanium at the edge of the core that is in contact with the pusher shell. Using filter gated x-ray cameras, we are able to distinguish between the hot titanium that mixes and emits the hydrogenic lines and the colder titanium that mostly emits the He-like lines. Similarly, by measuring the time dependent spectrum using streak cameras, we are able to measure the time history of this mix.

We performed such an experiment at the Omega facility using 860 micron OD CH micro baloons filled with deuterium at a pressure of 3 or 15 Atm gas fill and a 0.1-μm thick doped Ti layer. We expect that one of the two fills will in one case be mixed due to the faster implosion of the shell; while for the other case the mix will be minimal. We will discuss the measurement and the spectroscopic techniques that we used. An image of one of the capsules is displayed in Figure 1, where the implosion, burn, and explosion phases have been captured in one shot.

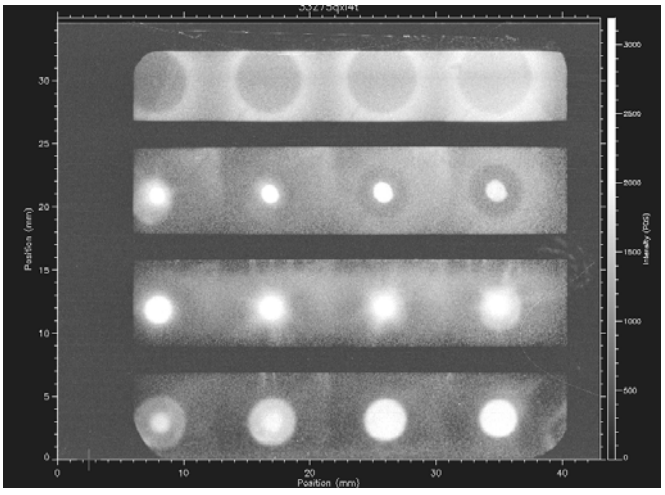

Figure 1. Time gated x-ray images of one imploding burning capsule captured in one shot.