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Observation of ion temperature enhancement in shock-driven N2-D2 gas-filled OMEGA implosions[1] MARIA GATU JOHNSON, PATRICK ADRIAN, JOHAN FRENJE, NEEL KABADI, JUSTIN KUNIMUNE, CHIKANG LI, FREDRICK SEGUIN, GRAEME SUTCLIFFE, RICHARD PETRASSO, MIT, CHAD FORREST, VLADIMIR GLEBOV, OWEN MANNION, CHRISTIAN STOECKL, LLE, HONG SIO, LLNL, BRIAN HAINES, LANL, MEGAN MCCRACKEN, BHUVANA SRINIVASAN, Virginia Tech — The physics of shock heating as it applies to ICF implosions is a rich topic with many unanswered questions, including the nature of shock heating (collisional vs collisionless), the differential heating of ion species with different mass and charge and their subsequent equilibration, the impact of kinetic effects, and the impact of electron viscosity. Here, we address these questions with data from a shock-driven OMEGA experiment where the performance of thin CH-shell implosions filled with either 100% D_2 or 50:50 D_2:N_2 gas is compared. The D_2-only implosions outperform the mix-fill implosions by a factor of 10 in yield, while the mix-fill implosions show 40% higher ion temperature (Tion) than the pure D_2 implosions as inferred from DD-neutron spectra. This is consistent with enhanced shock heating of the N than D ions. However, the Tion difference observed is smaller than predicted by average-ion HYADES simulations (80%), and the Tions are also lower than predicted by HYADES (50%). The impact of multi-ion effects or electron viscosity on these results is addressed.

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