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Interspecies Ion Diffusion Studies using DT, DT(^{3}He), and DT(H) Implosions Y. KIM, H.W. HERRMANN, M.J. SCHMITT, G. KAGAN, A.M. MCEVOY, N.M. HOFFMAN, Los Alamos National Laboratory, S. GALES, A. LEATHERLAND, Atomic Weapons Establishment, M. GATU JOHNSON, J. FRENJE, Massachusetts Institute of Technology, V.YU GLEVOV, C. FORREST, Laboratory for Laser Energetics — Anomalous ICF yield degradation has been observed from gas fills containing mixtures (i.e., D(^{3}He), DT(^{3}He), D(Ar), and even DT). Interspecies ion diffusion theory has been suggested as a possible cause resulting from gradient-driven diffusion (i.e., pressure, electric potential, and temperature) which forces lower mass ions away from core and higher mass ions toward core. The theory predicts hydrogen addition to deuterium or tritium should result in increased yield compared to expected yield, which is opposite to ^{3}He addition. At Omega laser facility, we have tested hydro-equivalent fills of DT, DT(^{3}He), and DT(H) with the assumption that same fuel mass and particle pressure will provide identical convergence. Preliminary results verify a factor of 2 yield reduction relative to scaling when ^{3}He added to DT. At DT(H) case, however, no significant yield degradation or a slight yield enhancement was observed which agrees with the interspecies ion diffusion theory. Detailed experiment results and simulation are needed to confirm the initial observation.

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