Radiochemical Signatures of Interfacial Areal Density and Mix in NIF Implosions

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Recent experimental results from the Radiochemical Analysis of Gaseous Samples (RAGS) diagnostic facility fielded at the National Ignition Facility (NIF) have demonstrated $^{13}$N production from charged particle nuclear reactions. This radiochemical product is very sensitive to the fuel-ablator interface areal density. Two specific reactions dominate $^{13}$N production: $^{12}$C(d,n)$^{13}$N and $^{13}$C(p,n)$^{13}$N. The short range of the energetically up-scattered deuterons from the cold DT fuel layer restricts the production to the proximate ablator interface thus providing high sensitivity to the interfacial configuration. Although the proton-mediated reaction is almost equally favorable, the small natural abundance of $^{13}$C suppresses this contribution to $^{13}$N production. Representative HYDRA simulations are used to illustrate these observed effects.

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