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Diffusive tunneling for alleviating Knudsen-layer reactivity reduction under hydrodynamic mix[1] XIANZHU TANG, CHRIS MCDEVITT, ZEHUA GUO, Los Alamos National Laboratory — Hydrodynamic mix will produce small features for intermixed deuterium-tritium fuel and inert pusher materials. The geometrical characteristics of the mix feature have a large impact on Knudsen layer yield reduction. We considered two features. One is planar structure, and the other is fuel cells segmented by inert pusher material which can be represented by a spherical DT bubble enclosed by a pusher shell. The truly 3D fuel feature, the spherical bubble, has the largest degree of yield reduction, due to fast ions being lost in all directions. The planar fuel structure, which can be regarded as 1D features, has modest amount of potential for yield degradation. While the increasing yield reduction with increasing Knudsen number of the fuel region is straightforwardly anticipated, we also show, by a combination of direct simulation and simple model, that once the pusher materials is stretched sufficiently thin by hydrodynamic mix, the fast fuel ions diffusively tunnel through them with minimal energy loss, so the Knudsen layer yield reduction becomes alleviated. This yield recovery can occur in a chunk-mixed plasma, way before the far more stringent, asymptotic limit of an atomically homogenized fuel and pusher assembly.

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