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Momentum Transport and Associated Scale Lengths in ICF Plasma ERIK VOLD, LESLIE WELSER-SHERRILL, Los Alamos National Laboratory — Inertial Confinement Fusion (ICF) research suggests that experimental performance lags that predicted in "clean" (unmixed) single fluid Lagrange simulations. In this study, viscosity and diffusion in a binary mixture of ion species are considered using a plasma diffusion approximation based on Braginskii plasma transport under various simplifying assumptions. Results are given over a range of ICF conditions and in a specific ICF example by post-processing an ICF Lagrange simulation. Viscosity in the fuel is estimated and viscous diffusive scale lengths are found to be large compared to the fuel size suggesting viscosity may be an important dissipation mechanism at small scales in turbulent or unstable mixing. Plasma species mass flux and diffusion approximations include effects of the local electric field, thermal gradients and mixture averaged pressure gradients (barodiffusion). Plasma species mass flux estimates applied to the fuel-capsule interface are found to contribute a small but significant amount of "mix" leading up to ICF burn, and reduce the "clean" fuel volume by 30% in this example. Transport of high Z impurities, used in the capsule or fuel for experimental diagnostics, are considered. Plasma transport is likely to be an important mechanism in explaining some experimental observations.

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