Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Plasma kinetic effects on atomistic mix in one dimension and at structured interfaces (I)[1] L. YIN, B. J. ALBRIGHT, E. L. VOLD, W. TAITANO, L. CHACON, A. SIMAKOV, Los Alamos National Laboratory — Kinetic effects on interfacial mix are examined using VPIC simulations. In 1D, comparisons are made to the results of analytic theory in the small Knudsen number limit. While the bulk mixing properties of interfaces are in general agreement, differences arise near the low-concentration fronts during the early evolution of a sharp interface when the species' perpendicular scattering rate dominates over the slowing down rate. In kinetic simulations, the diffusion velocities can be larger or comparable to the ion thermal speeds, and the Knudsen number can be large. Super-diffusive growth in mix widths ($\Delta x \tilde{} t^a$ where $a \geq 1/2$) is seen before transition to the slow diffusive process predicted from theory ($a = 1/2$). Mixing at interfaces leads to persistent, bulk, hydrodynamic features in the center of mass flow profiles as a result of diffusion and momentum conservation. These conclusions are drawn from VPIC results together with simulations from the RAGE hydrodynamics code with an implementation of diffusion and viscosity from theory and an implicit Vlasov-Fokker-Planck code iFP. In perturbed 2D and 3D interfaces, it is found that 1D ambipolarity is still valid and that initial perturbations flatten out on a-few-ps time scale, implying that finite diffusivity and viscosity can slow instability growth in ICF and HED settings.

[1]Work supported by the LANL ASC and Science programs.

Lin Yin
Los Alamos National Laboratory

Date submitted: 12 Jul 2017 Electronic form version 1.4