

MULTI-FLUID PLASMA MODELING FOR INERTIAL CONFINEMENT FUSION

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Inertial confinement fusion (ICF) experiments performed at the Omega laser facility and at the National Ignition Facility (NIF) suggest the potential role of collisional effects in plasmas during implosion. Recent theoretical and numerical work has indicated the importance of viscosity and thermal conductivity as well as the associated diffusion effects in the presence of multiple ion species. This provides the motivation to adequately develop multi-fluid plasma models capable of capturing collisional physics including concentration diffusion and ion species separation driven by the ion concentration gradient, the ion pressure gradient, the electron and ion temperature gradients, and the electric field. The multi-fluid plasma equations with the relevant collisional terms included will be presented along with details of the numerical implementation. Benchmark between the newly developed code and analytical simulations will be demonstrated for varying number of ion species. Simulations of the multi-species plasma shocks relevant to fuel-ion separation in ICF will be presented.