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Ion concentration diffusion in inertially confined plasmas[1] GRIGORY KAGAN, XIAN-ZHU TANG, Los Alamos National Lab — Optimizing fusion yield in inertial confinement fusion (ICF) experiments requires number densities of the reactants to be equal throughout the fuel assembly. This condition can be easily satisfied during target fabrication. However, dynamical process of implosion gives rise to the inter-ion-species transport, resulting in these species' concentrations being perturbed from their initial values. In particular, classical, baro-, electro- and thermo-diffusive mechanisms of such a transport should be distinguished. Baro- and electro-diffusion ratios are obtained from ion fluid equations without invoking a kinetic calculation. Interestingly, plasma baro-diffusion is found to be identical to its neutral counterpart. On the other hand, thermo-diffusion ratios appearing in front of the ion and electron temperature gradients, as well as the classical diffusion coefficient, are intrinsically non-thermodynamic quantities. Their evaluation therefore does require a kinetic approach. By employing such an approach explicit dependence of the diffusion coefficients on the species' concentrations is found numerically for selected pairs of ion species. Initial implications of these newly obtained results are discussed.

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