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Radial distribution function of Lennard-Jones fluids in shear flows from intermediate asymptotics LUCA BANETTA, University of Cambridge, ALESSIO ZACCONE, University of Milan, STATISTICAL PHYSICS GROUP TEAM — The microstructure of a suspension of particles is ruled by the probability of finding a reference particle in a position with respect to a target one, the pair correlation function. Its description under shear flow has been a challenge for theoretical methods due to the singularly-perturbed boundary-layer nature of the problem. Previous approaches have been limited to hard-spheres (HS) and suffer from various limitations in their applicability. Here, we present an analytic scheme based on intermediate asymptotics which solves the Smoluchowski equation with shear in spherical coordinates including both intermolecular and hydrodynamic interactions with the intent of describing of the pair correlation function for realistically interacting particles in shear flows. First, the method has been validated through a comparison with the rdf of a HS fluid under strongly sheared conditions. Finally, we have been capable of studying the microstructure of a complex interacting fluid such as the Lennard-Jones at varying values of the attraction strength: a new depletion effect is predicted in the microstructure of the LJ fluid under shear, a feature to our knowledge never discovered before.

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