

HARD SPHERE DYNAMICS AND THE ENSKOG EQUATION

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We consider the problem of the rigorous derivation of the Enskog kinetic equation from hard sphere dynamics. We establish that for initial states which are specified in terms of the one-particle distribution function the evolution of all possible states described by the Cauchy problem of the BBGKY hierarchy for hard spheres can be described in the framework of the Cauchy problem of the generalized Enskog kinetic equation and by a sequence of explicitly defined functionals of a solution of such kinetic equation [1]. To prove this result we develop the method of kinetic cluster expansions of cumulants of groups of operators of the Liouville equations which are determined the every term of a solution expansion of the BBGKY hierarchy. For the initial-value problem of the generalized Enskog equation the existence theorem is proved in the space of integrable functions. We consider also the Markovian approximation of the collision integral of the generalized Enskog equation and establish its links with the collision integrals of the Enskog-type kinetic equations.

- [1] Gapyak I.V., Gerasimenko V.I. "On rigorous derivation of the Enskog kinetic equation", arXiv:1107.5572.