Hard sphere dynamics and justification of the Enskog equation

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Abstract

In this work we represent a rigorous formalism for the description of the kinetic evolution of infinitely many hard spheres. It is established that for initial states which are specified in terms of a one-particle distribution function the description of the evolution of states by the Cauchy problem of the BBGKY hierarchy and by the Cauchy problem of the generalized Enskog kinetic equation together with a sequence of explicitly defined functionals of a solution of stated kinetic equation are equivalent. To justify such approach, we formulate certain type of the cluster expansions for cumulants of groups of operators which are determined the solution expansion for the BBGKY hierarchy. For the initial-value problem of the generalized Enskog equation the existence theorem is proved in the space of integrable functions.

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