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DERIVATION OF EQUATIONS OF MULTIMOMENT HYDRODYNAMICS FOR A GAS OF PARTICLES WITH INTERNAL STRUCTURE

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Abstract

The equations for pair distribution functions are used to derive the equations of multimoment hydrodynamics for a gas of particles with internal structure. The equations for pair functions are derived in terms of semi-classical approximation. The basic property of the pair functions is established. In conformity with basic property, these functions remain unchanged in time along the trajectory of the inertia center of pair. The basic property of the pair distribution functions reveals the existence of infinite number of principle hydrodynamic values. The equations of multimoment hydrodynamics are constructed using limited number of principle hydrodynamic values. Selected principle values specify measurable moments. The measurable moments are represented by linear combination of principle and non-principle hydrodynamic values. The general structure of constructed multimoment conservation laws is identical to the structure of appropriate multimoment conservation laws in a gas of structureless particles. Each of the multimoment conservation laws is divided into two separate equations. The first group of conservation equations corresponds to convective phenomena. The second group of conservation equations corresponds to dissipative phenomena. Derived equations of multimoment hydrodynamics are designed for interpreting the behavior of medium states, which are far removed from the state of statistical equilibrium. Classic hydrodynamics encountered the problems when interpreting the unstable phenomena. The possibility of improvement of classic hydrodynamics equations for a gas of particles with internal structure is sought on the way toward an increase in the number of principle hydrodynamic values.

Keywords: Multimoment Hydrodynamics, Pair Distribution Functions, Instability