SIMULATION OF MULTICOMPONENT HYDRODYNAMICS MEDIA

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Problem of hydrodynamics of multicomponent media can be solved or phenomenological kinetic methods. Phenomenological method based on the application of the laws of continuum mechanics and thermodynamics to the macroscopic volume of the mixture is not associated with a specific microscopic model postulating interactions of particles and is applicable to a wide range of media.

Based on the provisions of nonequilibrium thermodynamics, the principle of reciprocity of Onsager-Casimir can play a significant role in the simulation of real polyatomic gas mixtures. The coefficients of multicomponent diffusion defined as symmetric.

The purpose of research - to bring the basics of modeling multi-laminar and turbulent flows by non-equilibrium thermodynamics.

Materials and methods of research. Before applying the formalism of non-equilibrium thermodynamics of continuous media to describe the processes of heat and mass transfer in the flow of a multicomponent mixture, briefly give the essence of the basic tenets that underlie the theory. They can be used in virtually any thermodynamic analysis of irreversible processes (proceeding, including, in a turbulent continuum).

In linear nonequilibrium thermodynamics as defining relations, which complement the system of hydrodynamic equations of conservation, applied phenomenological relations of irreversible processes (Onsager relations).

For extensive quantities (such as mass, energy), there are conservation laws. Tolerable values (such as heat) associated with the flow in the conservation laws. Fluxes and thermodynamic forces are, in general, of any rank tensor quantities. As mentioned above, in the framework of the phenomenological theory of the explicit form of the kinetic coefficients is not interpreted, but their physical meaning can be

clarified in the molecular-kinetic theory. The number of non-zero kinetic coefficients limited Curie principle, according to which, by virtue of the symmetry properties of the considered material medium components (here the components of the vectors along the coordinate axes) flows will depend not on all components of the thermodynamic forces. Thus, in the particular case of an isotropic (the properties of which are identical in equilibrium in every direction), processes different tensor dimensions do not interact with each other. In addition, when the axiomatic approach is accepted as an independent postulate ratio Onsager symmetry-Casimir (reciprocity).

The results of research. Consider a gas mixture consisting of the components.

Let us analyze the diffusion and heat flows in the developed turbulent flow. In the small-scale turbulence, for which, as a rule, there is a tendency to establish local statistical isotropic, turbulent flow of the statistical properties do not depend on the direction. This methodological approach is easily generalized to the case of anisotropic (large-scale) turbulence.

Phenomenological approach allows to model both laminar and turbulent flow averaged in the atmosphere. In the framework of the phenomenological theory of turbulence multicomponent reactive continuum of the thermodynamic approach to the closure of the averaged hydrodynamic equations of motion at the level of models that allows you to find a more general expressions for the turbulent flows in a multicomponent medium than those derived using the concept of mixing path.