UDC 536.75

ANALYSIS OF MULTICOMPONENT HYDRODYNAMICS AND HEAT TRANSFER MEDIUM ON THE BASIS OF LINEAR PHENOMENOLOGICAL RELATIONS

B. Draganov, A.Khalatov

Everywhere around us, irreversible processes in which time symmetry is broken. The study of these processes is based on the concept of non-equilibrium thermodynamics, which is a section of the macroscopic, the phenomenological physics. The research results are essential in solving practical problems.

The purpose of research - analysis of fluid flow and heat transfer multi-media based on linear phenomenological relations.

Materials and methods. At the thermodynamic equilibrium the entropy production is zero, and thus, independent components of scalar forces and associated kom¬ponenty scalar streams simultaneously also obra¬schayutsya zero. This condition, as well as the most common link between independent streams and expression-zhayutsya forces in the linear approximation by linear constitutive equations of kinematic Onsager.

Coefficients Onsager are functions of the local state parameters:.. Temperature, pressure, chemical potentials, depending on the concentration, or perhaps the magnetic field intensity, etc. However, in the linear theory of factors are considered independent of the flows and forces within the constitutive linear equation t. e. from a local gradient state parameters.

Due to the possible spatial symmetry in anisotropic systems in the number of coefficients of linear equations is reduced so that not all streams Cartesian components depend on the component forces. This principle is particularly important in the case of isotropic systems. As shown by de Groot and Mazur, in isotropic systems Cartesian components of thermodynamic forces tenzor¬nogo different grade and type are converted during the rotation and in¬versii so that saved only the links between flows and forces of the same rank tensor.

For isotropic systems Curie principle can be formulated as follows: in isotropic systems phenomenon, which describes the thermodynamic forces and flows of different tensor rank and type (at least in the case of interactions that are described by constitutive of linear equations), do not affect each other.

Using Curie principle possible using the spatial symmetry of the system, to reduce the number of independent coefficients basic linear equations. The relations of reciprocity of Onsager - Casimir, which follow from the invariance of both classical and quantum mechanical equations of motion of individual particles under time reversal, pri¬vodyat to further reduce the number of coefficients in linear laws.

In conclusion, we note that for the local steady state turbulent field, when the turbulence structure there is some inner balance, the most complete description of heat and mass transfer in a multicomponent medium can receive the Stefan-Maxwell relations for multicomponent diffusion and the corresponding expression for the heat flux in turbulize continuum.

It should be emphasized that the analysis of hydrodynamic processes and teplomassovyh phenomenological approach (based on the provisions of non-equilibrium thermodynamics) provides a ratio for determining the thermodynamic diffusion and heat fluxes, as well as convenient to calculate the algebraic formulas relating the molecular process factors.