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2-19. P.

NORMAL SOLUTION TO EQUATIONS OF THE KINETIC THEORY FOR FLUID MIXTURE WITH A MULTISTEP POTENTIAL

Y.A. Humenyuk[1] and M.V. Tokarchuk[1,2],
[1]Institute for Condensed Matter Physics of the NAS of Ukraine, 1 Svientsitskii Str., Lviv, Ukraine, UA–79011
[2]National University "Lvivska Politekhnika", 12 Bandera Str., Lviv, Ukraine, UA–79013

Kinetic theories for systems with the square-well [1,2] or multistep [3,4] potentials predict quite successfully transport properties of real fluids and liquids. Due to instantaneous nature of the interactions, the pair collision approximation introduced into the corresponding collision intergrals can effectively describe processes between particles at distances of intermolecular attraction. These theories satisfy the local energy conservation at the kinetic level of description by adding the equation for dynamics of the potential energy density to the kinetic equation for the one-particle distribution function (d.f.).

We search for the normal solution to the kinetic-level equations for the many-component version of the kinetic theory for a fluid mixture with the multistep interparticle potential [5]. For the first order in gradients of the modified Chapman-Enskog method used in [2] we find out corrections to one-particle d.f.'s and the inverse potential quasi-temperature. The latter turns out to be linear in the divergence of the hydrodynamic velocity and is coupled to the bulk-viscosity corrections to the d.f.'s.

We demonstrate that diffusional forces appearing in integral equations for the first-order diffusion corrections obey the Onsager reciprocity relations of the linear irreversible thermodynamics, similarly to the case of hard-sphere mixture [6]. The first-order contributions to the potential energy density are shown to vanish. This distinguishes our analytical estimation for the bulk viscosity from that reported for the square-well [2] and truncated-tail [7] fluids. Expressions for transport coefficients of shear and bulk viscosity, thermal conductivity, and diffusion are obtained from the first-order contributions to the stress tensor, the heat and mass diffusion fluxes.

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2-20. P.

VISCOSITY OF THE FE-SI MELTS WITH MAJOR SILICON CONTENT

V. I. Lad'yanov, A. I. Shishmarin, A. L. Bel'tyukov
Physical-Technical Institute, Ural Division RAS, 132 Kirov Str., 426000 Izhevsk, Russia
E-mail: las@pti.udm.ru

The temperature and concentration dependences of kinematic viscosity of the Fe-Si binary system melts with silicon content up to 45 at.% have been studied. The viscosity of the melts was measured by the method of damped torsional vibrations in the protective atmosphere of purified helium. The measurements were carried out under heating and subsequent cooling in the temperature interval from liquidus to 1970 K. The general root-mean-square error of the viscosity measurement does not exceed 3 % with the single measurement error of 1 %.

The viscosity of investigated Fe-Si melts monotonously decreases with rise in temperature. Values of ν, received in the heating and the subsequent cooling, coincide in all investigated interval of temperatures (the hysteresis is absent) and are well described by equation of Arrenius.

Nonmonotonic concentration dependence of viscosity and activation energy of the viscous flow of Fe-Si melts with maximal values of ν in the interval from 20 to 30 at.%Si has been revealed.

The presence of the maximum in concentration dependences point to realization in the Fe-Si melts short-range ordering of Fe_3Si type that direct diffraction methods of investigation of the Fe-Si melts structure is certified [1,2].

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