

General Equation of the Fluid Viscosity

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Gas and liquid viscosity [1] were presented in earlier work in the form of two terms: a momentum transport term in a system of hard spheres by Enskog, and a second term (excess viscosity) for the momentum transport by 'field' interaction. Excess viscosity is a one-term function of the interaction energy density of the thermodynamic system. The resulting equation was given for the fluid viscosity of normal substances over a wide region of state parameters (up to 1000 K and 100 MPa) within the limit of experimental error. Later we found [2] that all well-known equations for viscosity are special cases of this equation. However, use of this equation has been hampered by the fact that data on internal energy is lacking. One way to do this is to use an equation of state. The equations of state of real gases [3] and dense fluids were deduced from a combined spherical symmetric potential of interaction. These equations allow one to calculate internal energy and the interaction energy of thermodynamic systems as a function of temperature and density within the limit of experimental error. For the substitute interaction energy relation for the viscosity equation we obtained the viscosity equation in relation to temperature and density. This equation describes fluid viscosity of normal substances over a wide region of state parameters (up to 1000 K and 100 MPa) within the limit of experimental error.

- [1] A.B. Kaplun, *High Temp.* **27**, 884 (1989).
- [2] A.B. Kaplun and A.B. Meshalkin, *HTHP* **33**, 365 (2001).
- [3] A.B. Kaplun and A.B. Meshalkin, *Doklady Physics* **48**, 490 (2003).