Robert Gogsadze, Archil Prangishvili, Paata Kervalishvili, Rafael Chikovani, Vakhtang Gogichaishvili and Nodar Jibladze

Formulation and solution of the boundary value problem of viscous liquid flow in a nanotube taking external friction into account

ABSTRACT. The problem of viscous fluid flow in a nanotube is considered. A boundary value problem relative to the flow velocity of the fluid has been defined by considering the main peculiarities of the problem, in particular, taking into account the Debye electric double layer and external friction (friction between the viscous fluid and the nanotube wall). An analytical solution of the boundary problem has been determined in the form of an infinite series. Statistical (equilibrium) processes take place in the Debye electrical double layer and they ensure the existence of nonzero drift and diffusion currents, such that their densities are different from zero. However, in the case of statistical equilibrium, the sum of the densities of these currents is equal to zero at any point in the double electrical layer. This paper considers the case when the diffusion coefficient and ion mobility satisfy the Einstein relation.

Nanotechnology Perceptions **9** (2013) 57–69