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Stability of evaporating liquid layer with insoluble surfactant[1]
ALEXANDER MIKISHEV, Physics Department, Sam Houston State University, Huntsville, TX 77341, ALEXANDER NEPOMNYASHCHY, Mathematics Department, Technion, Haifa 32000, Israel — A horizontally infinite layer of incompressible Newtonian liquid with insoluble surfactant on the deformable surface is considered. The evaporation process is described by 2D one-side model. Therefore, the assumptions of small density, small viscosity and small thermal conductivity of the gaseous phase compared to the same properties of the liquid phase are accepted. Surface tension of the liquid-vapor surface linearly depends on temperature and concentration of surfactant. Using the long-wave approximation and assumption of slow time evolution the system of nonlinear equations is obtained. That system describes the spatiotemporal behavior of the layer interface and the field of the surfactant concentration. The equations retain all relevant physical effects which take place in the system. Linear stability analysis of the base state in the case of quasi-equilibrium evaporation, when the interfacial temperature equals the saturation one, is performed.

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