FM14L_10616

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

The Slopped Falling Films with Surfactants: Instability and Nonlinear Waves

Victor Y. Shkadov[(1)], Valentina P. Shkadova[(2)], Andrei K. Takmazian[(1)]

(1) *Department of Mechanics and Mathematics, Moscow State University, Moscow, Russia*
(2) *Institue of Mechanics, Moscow State University, Moscow, Russia*

The film flow of a weak solution of a soluble volatile surfactant in liquid is considered. Diffusion of the surfactant to the film surface from the bulk solute, its evaporation to the gas phase and the adsorption-desorption processes in the near-surface layer are taken into account. The full Navier–Stokes formulation is reduced to the system of nonlinear evolutionary equations. A model for the dynamic surface tension is appropriate for the transition of the freshly formed surface to the old surface to be investigated. A steady state solution for film flow along a slopped wall and instability of the flow are considered for the simultaneous action of the body forces, capillary pressure and Marangoni stresses. The nonlinear effects for the hydrodynamic and diffusion instability modes for non-equilibrium adsorption kinetics in the sorbed sublayer are investigated. The work was financially supported by RFBR (Grants 00-01-00645, 03-01-00042)

View the extended summary