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OCCURRENCE OF CONVECTIVE FLOWS IN TERNARY LIQUID AND GASEOUS MIXTURES UNDER ISOTHERMAL CONDITIONS

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ABSTRACT The stability of mechanical equilibrium in the ternary gaseous mixtures at different pressures was investigated by two flasks method. Visual study of the process in isothermal ternary gaseous and liquid mixtures allowed detecting structural formations that significantly distort the steady diffusion process. Theoretically was studied the stability of isothermal ternary gaseous mixture in a plane vertical channel at boundary conditions, assuming the disappearance of speed and perturbation of the concentrations of components at the vertical planes, restricting the layer of the gaseous mixture. In the terms of diffusion Rayleigh numbers were drawn the maps of stability of ternary gaseous mixtures. The results of the linear analysis on stability are well agreed with the experimental data for the considered gaseous mixtures.

NOMENCLATURE

A_i = dimensionless concentration gradient [-]
D_{ij}^* = "practical" coefficients of three-component diffusion [m^2/s]
K_i = dimensionless parameter [-]
P_{ii} = Prandtl diffusion number [-]
R_i = Rayleigh partial number [-]
c_i = i-th component concentration [-]
d = diameter [m]
j_i = diffusion flux [m/s]
h = height [m]
n = number density [m^{-3}]
m_i = molecular mass [kg]
n = mode of disturbances [-]
r = radius [m]
$\vec{u}$ = weight-average velocity vector [m/s]
u_z = weight-average velocity scalar [m/s]
β_i = coefficient of thermal expansion [m/K]
$\vec{\gamma}$ = unit vector [-]
η = shear viscosity [$Pa \cdot s$]
ξ = bulk viscosity [$Pa \cdot s$]
τ_{ij} = denotes the parameters, which determine relationship between the "practical" diffusion