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Rayleigh-Benard instability in multicomponent mixtures with the Soret effect[1] ILYA RYZHKOV, Institute of Computational Modelling SB RAS — Convection in multicomponent mixtures can show a variety of flow patterns due to several heat and mass transfer mechanisms: convection, heat conduction, main and cross diffusion, and the Soret effect. Convective stability of multicomponent fluids has not been widely investigated so far. The use of simplifying assumptions (e.g. the absence of cross-diffusion) may lead to the disagreement between theory and experiment. We study the stability of a plane multicomponent fluid layer heated from above/below in gravity field. In the basic state, the fluid is at rest and temperature gradient induces concentration gradients due to the Soret effect. The problem is reduced to that without cross-diffusion and Soret effect by a special transformation. Several types of boundary conditions are considered: 1) free, permeable 2) rigid, permeable 3) rigid, impermeable. The theorems, which generalize the exchange of stability principle to multicomponent fluids, are proved for boundary conditions 1 and 2. An explicit formula for critical Rayleigh numbers is obtained for boundary conditions 1. The stability problem for boundary conditions 3 was solved numerically for a ternary mixture. The stability maps are constructed in a wide range of parameters.

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