

Abstract Submitted
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Convective instabilities of ternary mixtures in thermogravitational columns ABDELFAH ZEBIB, Rutgers University — Convective instabilities in side heated infinite vertical slots containing a single fluid are stationary, shear driven when the Prandtl number $Pr < 12.5$ while they are oscillatory, buoyancy dominated with $Pr > 12.5$ due to the diminished influence of the thermal diffusivity with increasing Pr . Here we examine the influence of the concentration field generated by thermodiffusion in a ternary mixture of otherwise uniform concentration on this phenomenon. We first derive expressions and calculate the basic steady one-dimensional flow taking into account the vertical concentration gradients caused by thermodiffusion. Linear stability of this basic state is performed and the critical Rayleigh number, wavenumber, frequency, and vertical concentration gradients are determined as function of the two separation ratios, ratio of thermal expansivities, four Lewis numbers, and Pr . The results are in agreement with the base flow of the ternary mixture considered by Leahy-Dios et al., J. Chem. Phys. (2005). Stability results are in agreement with those from a simplified model in the long wave approximation as well as when restricted to binary mixtures. Stability restrictions on the operation of the thermogravitational column will be discussed.

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