The Analysis of the Onset of Soret-Driven Convection in Nanofluids Heated from Above

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The onset of buoyancy driven convection in an initially-quiescent horizontal nanofluid layer heated from above is analyzed theoretically. In this thermally-stably stratified fluid layer, the Soret diffusion can induced buoyancy-driven motion for the case of negative φ. For the case of high Ra $(Le/\varphi)^{-1}$ the buoyancy-driven motion sets in during the transient diffusion stage and the onset time of this motion is analyzed by employing propagation theory. Here the dimensionless critical condition of τ_c and a_c to mark the onset of convective motion is presented as a function of $Ra(Le/\varphi)^{-1}$. The present stability analysis predicts that τ_c decreases with increasing $Ra(Le/\varphi)^{-1}$ and the finite wave mode is preferred for small time. The visible motion can be detected from a certain time $\tau_m=4\tau_c$. The present predictions are compared with existing experimental results.