

On the stability of thermosolutal convection in a Voigt-fluid layer: Effect of temperature-dependent solubility

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The linear instability and a weakly nonlinear stability of a thermosolutal reaction-convection in a Voigt-fluid layer are investigated. A linear instability analysis is performed to investigate how the dissolution or precipitation of reactive component affects the onset of convection. The effect of reaction rate, Lewis number, solute Rayleigh number, Prandtl number and Voigt fluid parameter on the instability of the system is investigated. By performing a weakly nonlinear stability analysis, a cubic Landau equation for the amplitude corresponding to oscillatory convection is derived. It is found that the bifurcating oscillatory solution is either supercritical or subcritical, depending on the choice of the physical parameters. Heat and mass transfers are estimated in terms of area-averaged thermal and solute Nusselt numbers.