Onset of Benard-Marangoni instabilities in a double diffusive binary fluid layer with temperature-dependent viscosity

ABSTRACT

The effect of temperature-dependent viscosity in a horizontal double diffusive binary fluid layer is investigated. When the layer is heated from below, the convection of Benard-Marangoni will start to exists. Linear stability analysis is performed and the eigenvalues from few cases of boundary conditions were obtained. Galerkin method were used to solve the numerical calculation and marginal stability curve is obtained. Results shows that an increase of temperature-dependent viscosity will destabilized the system. The impact of double diffusive coefficients are also revealed. It is found that the effect of Soret parameter exhibits destabilizing reaction on the system while an opposite response is noted with an increase of Dufour parameter.

Keyword: Temperature-dependent viscosity; Binary fluid; Double diffusive; Galerkin method; Convection