

Surface deformation on thermocapillary convection in a binary fluid with internal heat generation and temperature dependent viscosity

ABSTRACT

The effects of temperature dependent viscosity and internal heat generation on the onset of steady Bénard-Marangoni convection in a horizontal binary fluid layer heated from below is investigated theoretically. The upper free surface is assumed to be deformable and the lower boundary is considered to be rigid and perfectly insulated to temperature perturbations. The asymptotic solution of the long wavelength is obtained using regular perturbation method with wave number as a perturbation parameter. It is found that the surface deformation of a binary fluid layer enhances the onset of thermocapillary convection while increasing the value of internal heat generation and temperature dependent viscosity will destabilize the binary fluid layer system.

Keyword: Binary fluid; Convection; Internal heat generation; Surface deformation; Temperature dependent viscosity