Stability of Marangoni convection in a fluid layer with variable viscosity and deformable free surface under free-slip condition

ABSTRACT

The steady marangoni convection is investigated in a horizontal layer of fluid with a free-slip bottom heated from below and cooled from above. Since the viscosity is temperature dependentthe consequences of relaxing oberbeck-boussinesq approximation and free surface deformability are theoretically examined by means of small disturbance analysis. Prediction forthe onset of convection are obtained from the analysis by numerical technique. The effect of variable viscosity and surface deformation on the onset of fluid motion is investigated in detail.It is shown that the critical values of marangoni and wave number depend strongly on the viscosity variation and surface deformation.

Keyword: Marangoni convection; Heat generation; Free-slip