

Boundary Effect on Marangoni Convection in a Variable Viscosity Fluid Layer

Abstract

The onset of Marangoni convection in a horizontal fluid layer with a free surface overlying a solid layer heated from below is studied. Problem is focused on the effect of the solid layer depth or its conductivity. The viscosity group, R_v , Biot number, Bi , depth ratio, dr and conductivity ratio, kr , are significant on determining the critical Marangoni number Mc with the corresponding critical wavenumber ac . The characteristics problem is solved numerically. Results show that the temperature-dependent viscosity destabilizes the fluid system but it behaves oppositely when a higher relative thermal conductivity ratio or higher depth ratio is taken.

Keyword: Marangoni convection, temperature-dependent viscosity