Boundary effect on the onset of Marangoni convection with internal heat generation

ABSTRACT

he onset of Marangoni convection in a horizontal fluid layer with internal heat generation overlying a solid layer heated from below is studied. The upper free surface of a fluid is nondeformable and the bottom boundary are rigid and no-slip. The resulting eigenvalue problem is solved exactly. The critical values of the Marangoni numbers for the onset of Marangoni convection are calculated and the latter is found to be critically dependent on the internal heating, depth ratio and conductivity ratio. The effects of the thermal conductivity and the thickness of the solid plate on the onset of convective instability with internal heating are studied in detail.