Marangoni convection in a liquid saturated porous medium with internal heat generation.

ABSTRACT

Linear stability analysis was used to investigate the effect of internal heat generation on the stability of the Marangoni convection for a liquid saturated porous medium. The lower surface of the layer is assumed to be a perfect conductor and the upper surface is nondeformed and subjected to a temperature-dependent surface tension. The Darcy law and the Brinkman model are used to describe the flow in the porous medium heated from below. The linear stability theory and the normal mode analysis are applied and 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 and Darcy number. The results show that the internal heat generation always has a destabilizing effect on the Marangoni convection in the porous medium.

Keyword: Marangoni convection; Heat generation; Porous medium; Convective instability.