Stability of Marangoni Convection in Superposed Fluid and Porous Layers

ABSTRACT

Linear stability analysis was used to investigate the onset of Marangoni convection in a two-layer system. The system comprised a saturated porous layer over which was a layer of the same fluid. The fluid was heated from below and the upper free surface was deformable. At the interface between the fluid and the porous layer, the Beavers-Joseph slip condition was used and in the porous medium the Darcy law was employed to describe the flow. Predictions for the onset of convection were obtained from the analysis by the perturbation technique. The effect of surface deformation and depth ratio, z (which is equal to the depth of the fluid layer/depth of the porous layer) on the onset of fluid motion was studied in detail.