

Siddiqa, Sadia; Begum, Naheed; Noor, S.; Hossain, Md. Anwar

Marangoni convection flow along a wavy surface with non-linear radiation. (English)

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Summary: A boundary-layer analysis is presented for steady, two-dimensional, Marangoni convection along an irregular surface. Thick radiation limit is considered to express the radiative heat flux. A coordinate transformation is adopted to convert the physical domain into computational domain. Implicit finite difference method is then used to obtain the solutions of the problem. The main purpose of this study is to demonstrate the radiation effects on the dissipative layers. Numerical solutions are presented in the form of skin friction coefficient, heat transfer coefficient, velocity and temperature profiles, streamlines and isotherms. It is observed that thermal radiation has a pronounced effect on the flow field and amplitude of the harmonic oscillations also decay with R_d . The momentum and thermal boundary-layer thickness increases as R_d gets augmented.

MSC:

76Rxx Diffusion and convection

35Kxx Parabolic equations and parabolic systems

76Dxx Incompressible viscous fluids

Keywords:

thermal radiation; Marangoni convection; boundary-layer

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