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Thermophoresis Particle Precipitate on Heated Surfaces

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Abstract : This work deals with heat and mass transfer by steady laminar boundary layer flow of a Newtonian, viscous fluid over a vertical flat plate with variable surface heat flux embedded in a fluid saturated porous medium in the presence of thermophoresis particle deposition effect. The governing partial differential equations are transformed into no-similar form by using special transformation and solved numerically by using an implicit finite difference method. Many results are obtained and a representative set is displaced graphically to illustrate the influence of the various physical parameters on the wall thermophoresis deposition velocity and concentration profiles. It is found that the increasing of thermophoresis constant or temperature differences enhances heat transfer rates from vertical surfaces and increase wall thermophoresis velocities; this is due to favourable temperature gradients or buoyancy forces. It is also found that the effect of thermophoresis phenomena is more pronounced near pure natural convection heat transfer limit; because this phenomenon is directly a temperature gradient or buoyancy forces dependent. Comparisons with previously published work in the limits are performed and the results are found to be in excellent agreement.

Keywords : thermophoresis, porous medium, variable surface heat flux, heat transfer
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