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Series solutions of nano boundary layer flows by means of the homotopy analysis method.

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Summary: We present a ‘similar’ solution for nano boundary layers with nonlinear Navier boundary condition. Three types of flows are considered: (i) the flow past a wedge; (ii) the flow in a convergent channel; (iii) the flow driven by an exponentially-varying outer flows. The resulting differential equations are solved by homotopy analysis method. Different from the perturbation methods, the present method is independent of small physical parameters so that it is applicable to not only weak but also strong nonlinear flow phenomena. Numerical results are compared with available exact results to demonstrate the validity of the present solution. The effects of the slip length ℓ , the index parameters n and m on the velocity profile and tangential stress are discussed.

MSC:

76D10 Boundary-layer theory, separation and reattachment, higher-order effects

Cited in **43** Documents

76M55 Dimensional analysis and similarity applied to problems in fluid mechanics

Keywords:

Navier boundary condition; slip length; index parameters; tangential stress

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