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| Title | **Multiple slip effects on nanofluid dissipativeflow in a converging/ diverging channel: a numerical study** | | |
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| Abstract |  |
| A mathematical model is developed for viscous slip flow and heat transfer in water/Ethylene glycol-based nanofluids containing metallic oxide nanoparticles, through a converging/diverging channel. We adopt the single-phase Tiwari–Das model. The governing equations are transformed to a set of similarity differential equations with the help of similarity transformation, before being solved numerically using Maple 20 .Validation of the velocity gradient and temperature solutions is achieved with the second order implicit finite difference Keller Box method (KBM). Further validation is included for the special case of no-slip nanofluid flow in the absence of viscous heating. The effects of the parameters, namely velocity slip, thermal jump, channel apex angle, Eckert number, Prandtl number, Reynolds number and nano-particle volume fraction on velocity, temperature, skin friction, and heat transfer rate are investigated in detail*.* It is found that with increasing velocity slip, for water-TiO2 and ethylene glycol-TiO2 nanofluids, the channel bulk flow is decelerated whilst with greater solid (nanoparticle) volume and in the presence of momentum slip, the flow is also retarded. With the increasing semi-vertex angle, the channel flow is generally accelerated. An increase in divergent semi-angle leads to decelerate the flow from the centre line for the core flow region, whereas near and at the channel wall, it results in a *weak acceleration*. Higher temperatures are achieved with greater thermal slip values, for both water-TiO2 and ethylene glycol-TiO2 nanofluids, whereas for greater nanoparticle volume fraction, temperatures are weakly decreased for water-TiO2 whereas a more significant decrease is observed for ethylene glycol-TiO2 nanofluid. With a greater diverging channel angle, a substantial decrease in temperatures is caused by a greater Reynolds numbers, and the reverse effect is computed for converging channel. The novelty of the current work is that it extends previous studies to include multiple slip effects and viscous heating (Eckert number effects) which are shown to exert a significant influence on heat and momentum transfer characteristics. The study is relevant to certain pharmaco-dynamics devices (drug delivery), next- generation 3-D nanotechnological printers, and also nano-cooling systems in energy engineering where laminar flows in diverging/converging channels arise | |