

## MATHEMATICAL ANALYSIS OF AG-TiO<sub>2</sub>/BLOOD HYBRID NANOFLUID WITH INCLUSION OF VISCOUS DISSIPATION OVER A PERMEABLE SURFACE

(Analisis Matematik Nanobendalir Hibrid Ag-TiO<sub>2</sub>/Darah dengan Lesapan Likat  
Terhadap Permukaan Telap)

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### ABSTRACT

The remarkable efficiency of hybrid nanofluids in heat transfer has made them a prominent research topic. This study investigates the boundary layer flow and heat transfer of Ag-TiO<sub>2</sub>/blood hybrid nanofluid while taking viscous dissipation into account. The governing partial differential equations of the hybrid nanofluid are transformed into ordinary differential equations using the requisite similarity transformations. The *bvp4c* function is then used in Matlab to generate numerical and graphical output. The accurate initial guessing values are then used to calculate the dual solutions. The existence of viscous dissipation considerably reduces the rate of heat transfer in this model. The effects of nanoparticle concentration have also been studied. The thickness of the boundary layer diminishes as the suction parameter rises, whereas different patterns of results are obtained as the concentration of argentum and titania nanoparticles changes.

*Keywords:* hybrid nanofluid; viscous dissipation; dual solutions

### ABSTRAK

Keberkesanan nanobendalir hibrid yang menakjubkan dalam pemindahan haba menjadikannya topik kajian yang utama. Penyelidikan ini mengkaji aliran lapisan sempadan dan pemindahan haba nanobendalir hibrid Ag-TiO<sub>2</sub>/darah dengan mempertimbangkan kesan lesapan likat. Persamaan pembezaan separa bagi nanobendalir hibrid ditukarkan kepada persamaan pembezaan biasa dengan menggunakan penjelmaan keserupaan. Kemudian fungsi *bvp4c* dalam Matlab digunakan untuk menjana keputusan berangka dan grafik. Nilai-nilai tekaan awal yang tepat pula digunakan untuk mendapatkan penyelesaian dual. Kewujudan lesapan likat mengurangkan kadar pemindahan haba di dalam model ini. Kesan kepekatan nanozarah turut dikaji. Ketebalan lapisan sempadan semakin berkurangan dengan peningkatan sedutan, manakala corak hasil kajian yang berbeza-beza diperoleh apabila kepekatan nanozarah argentum dan titania berubah.

*Kata kunci:* nanobendalir hibrid; lesapan likat; penyelesaian dual

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