

A Comparative study on hybrid nanoparticles with Newtonian/ non-Newtonian base fluids over a spinning cone

S. Kirusakthika^{a,*}, B. Ganga^b, A. K. Abdul Hakeem^{c,*}

^a Department of Mathematics, Sri Krishna Arts and Science College, Affiliated to Bharathiar University, Coimbatore - 641 008, Tamil Nadu, India.

^b Department of Mathematics, Providence College for Women, Affiliated to Bharathiar University, Coonoor – 643 104, Tamil Nadu, India.

^c Department of Mathematics, Sri Ramakrishna Mission Vidyalaya College of Arts and Science, Affiliated to Bharathiar University, Coimbatore - 641 020, Tamil Nadu, India.

*Email: kirusakthikas@gmail.com, drabdulmaths@gmail.com

ABSTRACT

Purpose:

Due to their massive application in engineering scrupulous, hybrid nanofluids have become a prevailing substance of consideration in mathematical and physical research. The investigation of this study is to examine the sundry base fluids and the stream of the 2D, steady, laminar flow of a hybrid nanofluids completed a rotating vertical cone has been explored.

Methodology:

To obtain solutions, the PDEs with surface temperature boundary conditions that describe the flow are converted into ODEs with appropriate transformations using a numerically based technique known as the 4th order Runge-Kutta technique with shooting procedure. The existing work analyzes the permitted convective boundary layer flow of hybrid nanofluids over a rotating cone.

Findings:

In the hybrid nanofluid flow, which consists of Aluminum oxide – Titanium oxide, Titanium oxide – Copper and Aluminum oxide – Copper hybrid nanoparticles with Newtonian (H₂O) and non-Newtonian (NaC₆H₉O₇) base fluids. Here, $\phi_{np1} = 0.005$, $\phi_{np2} = 0.015$ nanoparticle volume fraction are introduced to the base fluids. The consequence of the governing parameter on the velocity and heat profile distribution is graphically depicted along with the physical quantities are analyzed beside the table. The results indicate that the tangential velocity profile is improved and also noted that Newtonian base fluid is enhanced by enhancing the Spin parameter. It is explored to ensure that the current results are in excellent agreement with the outcomes stated in earlier works.

Keywords: Hybrid nanofluid, cone, Newtonian fluid, non-Newtonian fluid, base fluid.

REFERENCES

1. N. A. Ahamad, “Study of natural convection of heat transfer in a vertical cone embedded with porous medium”, *Int. J. Eng. Res. Tech.*, **3** (6), pp. 610 – 623, 2014.
2. S. U. S. Choi and J. A. Eastman, “Enhancing thermal conductivity of fluids with nanoparticles”, No. ANL/MSD/CP – 84938; CONF – 951135 – 29; Argonne National Lab.: Argonne, IL, USA, 1995.
3. N. V. Ganesh, A. K. A. Hakeem and B. Ganga, “A comparative theoretical study on Al₂O₃ and γ – Al₂O₃ nanoparticles with different base fluids over a stretching sheet”, *Adv. Powder Tech.*, **27** (2), 2016.
4. M. Aghamajidi, M. E. Yazdi, S. Dinarvand and I. Pop, “Tiwari – Das nanofluid model for magnetohydrodynamics (MHD) natural – convective flow of a nanofluid adjacent to a spinning down – pointing vertical cone”, *Prop. Power Res.*, **7** (1), pp. 78 – 90, 2018.