

## **COMPARISON OF THE FLOW CHARACTERISTICS OF GOLD AND GRAPHENE NANOPARTICLES IN A STENOSED ARTERY USING OPTIMAL HOMOTOPY ANALYSIS METHOD**

**A.M.H.I. Attanayake<sup>1\*</sup>, W.H.D.T. Karunarathna<sup>2</sup> and M.T.M. Dewasurendra<sup>1</sup>**

<sup>1</sup>*Department of Mathematics, University of Peradeniya, Peradeniya, Sri Lanka.*

<sup>2</sup>*Department of Mathematical Sciences, Wayamba University of Sri Lanka, Kuliyapitiya, Sri Lanka.*

\*harshikaattanayake@gmail.com

This study examines the flow characteristics of human blood containing gold and graphene nanoparticles through stenosed arteries. The primary objective is to compare the effects of these nanoparticles on the velocity and temperature profiles of blood flow. The governing boundary layer equations, along with suitable boundary conditions that describe the physical phenomena, are transformed into a dimensionless form using similarity transformations. The resulting nonlinear ordinary differential equations are then solved using the Optimal Homotopy Analysis Method (OHAM), a robust analytical technique based on topological concepts, which involves the construction of linear operators, initial approximations, and deformation equations. Numerical simulations are performed using the Mathematica package BVPH 2.0, developed by Liao. In 2021, Sarwar and Hussain analyzed only the flow characteristics of gold blood nanofluid under stenotic artery using MATLAB software numerically. This work is an extension of the above study performed by comparing flow characteristics of human blood with both gold and graphene nanoparticles present separately under stenosed artery. The analysis explores the impact of key physical parameters, including the Prandtl number, nanoparticle volume fraction, and the blood flow parameter. The results demonstrate the convergence of OHAM, producing higher-order approximations with minimal residual errors. These findings offer valuable insights into the thermophysical behavior of nanoparticle-enhanced blood flow and hold significant potential for biomedical applications, particularly in the diagnosis and treatment of atherosclerosis.

**Keywords:** Gold nanoparticles, Graphene nanoparticles, Optimal Homotopy Analysis Method, Similarity transformations, Stenosed artery