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# On heat and mass transfer analysis for the flow of a nanofluid between rotating parallel plates

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**Abstract:** In the present study, We have considered the three dimensional heat and mass transfer with magnetic effects for the flow of a nanofluid between two parallel plates in a rotating system. The reduced governing equations (in a system of ordinary differential equations) are solved by applying Homotopy Analysis Method (HAM). To see the validity of analytical solution, a numerical solution using RK-4 method coupled with shooting method has also been sought. Both the solutions are found to be in excellent agreement. To capture the effects of involved physical parameters graphical representation of the flow are included with comprehensive discussions. It has been observed that the thermophoresis and Brownian motion parameters are directly related to heat transfer but are inversely related to concentration profile. It is also recorded that the higher Coriolis forces decrease the temperature boundary layer thickness.

**Key words:** Nanofluid; Homotopy analysis method (HAM); rotating system; parallel plates; heat transfer; MHD.

## 1. Introduction

After the ground breaking effort by Choi [1], a novel thermo-fluid term appeared as the nanofluid; it is a liquid- solid mixture comprising of a base fluid and nanometer sized solid particles called nanoparticles. Commonly these nanoparticles are made of metals, oxides, carbides and carbon nanotubes, whereas widely used base fluids are water, engine oil, glycol etc. Due to low heat transmission property, base fluids have restricted heat transfer rate, in contrasts tiny size and large specific surface area of the nanoparticles play an important role in the nanofluids to have properties like good heat conductivity [2].

In recent years new methods are adopted to enhance the rate of heat transfer by making use of dilute suspension of nanoparticles (of size smaller than 100nm). In literature significant works related to higher rate of thermal conductivity, convective heat transfer