World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:17, No:04, 2023

Magneto-Hydrodynamic Mixed Convective Fluid Flow through Two Parallel Vertical Plates Channel with Hall, Chemical Reaction, and Thermal Radiation Effects

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Abstract : Magneto-hydrodynamic mixed convective chemically reacting fluid flow through two parallel vertical plates channel with Hall, radiation, and chemical reaction effects are examined. The fluid is assumed to be chemically reactive, electrically conducting, magnetically susceptible, viscous, incompressible, and Newtonian; the plates are porous, electrically conductive, and heated to a high-temperature regime to generate thermal rays. The flow system is highly interactive, such that cross/double diffusion is present. The governing equations are partial differential equations transformed into ordinary differential equations using similarity transformation and solved by the method of Homotopy Perturbation. Expressions for the concentration, temperature, velocity, Nusselt number, Sherwood number, and Wall shear stress are obtained, computed, and presented graphically and tabularly. The analysis of results shows, amongst others, that an increase in the Raleigh number increases the main velocity and temperature but decreases the concentration. More so, an increase in chemical reaction rate increases the main velocity, temperature, rate of heat transfer from the terminal plate, the rate of mass transfer from the induced plate, and Wall shear stress on both the induced and terminal plates, decreasing the concentration, and the mass transfer rate from the terminal plate. Some of the obtained results are benchmarked with those of existing literature and are in consonance.

Keywords : chemical reaction, hall effect, magneto-hydrodynamic, radiation, vertical plates channel
Conference Title : ICTACM 2023 : International Conference on Trends in Applied and Computational Mathematics
Conference Location : Lisbon, Portugal
Conference Dates : April 13-14, 2023

Open Science Index, Mathematical and Computational Sciences Vol:17, No:04, 2023 publications.waset.org/abstracts/161571.pdf