Mathematical Solution on MHD Stagnation Point Flow of Ferrofluid

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This study presents a numerical investigation on Magnetohydrodynamic (MHD) stagnation point flow of ferrofluid with Newtonian heating. The black oxide of iron, magnetite (Fe_3O_4) as magnetic materials and water as a base fluid are considered. The two dimensional stagnation point flow of cold ferrofluid against a hot wall under the influence the uniform magnetic field of strength located some distance behind the stagnation point. The effect of magnetic and volume fraction on the velocity and temperature boundary layer profiles are will be obtained with formulated the governing equations. The governing equations which is in the form of dimensional non-linear partial differential equations are reduced to dimensionless non-linear ordinary differential equations by using appropriate similarity transformation. Then, solved numerically by using Keller-box method which programmed in Matlab software. It is found the cold fluid moves towards the source of magnetic close to the hot wall which can lead the better cooling rate and enhance the heat transfer rate. Meanwhile, an increase the volume fraction of magnetite nanoparticles, increase the ferrofluid capabilities in thermal conductivity and consequently enhance the heat transfer.