

## Documents

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### **Numerical exploration of magnetohydrodynamic nanofluid flow suspended with magnetite nanoparticles**

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#### **Abstract**

In general, magnetite ( $\text{Fe}_3\text{O}_4$ ) nanoparticles move randomly within the base fluid. By applying an external magnetic field, the movement of those nanoparticles becomes homogeneous. This is very useful in heat transfer processes. In addition, applied magnetic fields are capable to set the thermal and physical natures of the nanofluids with magnetic properties. The heat and mass transfers of non-Newtonian fluids play a major role in technology and in nature due to its stress relaxation, shear thinning, and thickening properties. With this incentive, we investigate the momentum, thermal, and concentration boundary layer behavior of liquid-film flow of water-based non-Newtonian nanofluids dispensed with magnetite nanoparticles. For this investigation, we propose a mathematical model, which deals with the flow of Jeffrey and Oldroyd-B nanofluids past a stretched plate with transverse magnetic field, space and temperature-dependent heat source/sink, thermophoresis, and Brownian movement effects. Numerical results are carried out by employing the Runge–Kutta and Newton's methods. The influence of pertinent parameters on common profiles (velocity, temperature, and concentration) along with the reduced Nusselt number is presented graphically. It is found that suspending the magnetite nanoparticles effectively enhances the thermal conductivity of the Jeffrey nanofluid when compared with the Oldroyd-B nanofluid. © 2017, The Brazilian Society of Mechanical Sciences and Engineering.

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