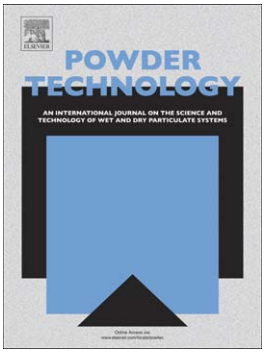

Existence of the multiple exact solutions for nanofluid¡!–[DEL][s]–¿ flow¡!–¡query id="q3" type="boolean" replies="Yes—No"¿¡ce:para¿In the article title, and in other parts of the text, all occurrences of 'nanofluids flow' were changed to 'nanofluid flow'. Please check and confirm if correct.¡/ce:para¿¡/query¿–¿ over a stretching/shrinking sheet embedded in a porous medium at the presence of magnetic field with electrical conductivity and thermal radiation effects

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Existence of the multiple exact solutions for nanofluids flow over a stretching/shrinking sheet embedded in a porous medium at the presence of magnetic field with electrical conductivity and thermal radiation effects

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Abstract

In this research, the author investigated two–dimensional incompressible, laminar and steady boundary–layer flow past a stretching/shrinking sheet which is in a water–based containing metallic and nonmetallic nanoparticles; namely, silver, copper, alumina and titania. Theoretical exact solutions for the dimensionless stream function and dimensionless temperature were obtained. Hence, the detailed analysis of existence those solutions was effectively deduced for the stretching/shrinking sheet; conditionally with the values of permeability, magnetic and suction/injection parameters. Via many tables and graphs, the effects of various included physical parameters on profiles of dimensionless for the stream function, velocity and temperature were studied. These parameters include the solid volume fraction, magnetic, permeability, radiation, surface convection, stretching/shrinking sheet, reduced skin friction coefficient and reduced Nusselt number.

On comparing the present results with those in the literature, a very good agreement was obtained in some special cases for different values of the investigated parameters. In addition, it was shown that the effective electrical conductivity affects considerably and remarkably on the nanofluids flow and, hence, it is mandatory to be taken into account and not to be ignored as in some recent papers, especially with its presence in the solutions' conditions, otherwise, a spurious physical sight is to be obtained. It was therefore indicated that the included parameters have to be re–investigated and we must not depend on the published results that dropped this term. Further, the critical values and curves for obtaining one solution (dual solutions) were successfully secured for stretching sheet (shrinking sheet). For a stretching/shrinking sheet, profiles of the velocity decrease as the solid volume fraction increases in the region $(0, 0.2]$, then, they increase as this parameter increases when its value lies in the region $(0.2, 0.4]$.

Keywords: Nanofluid; Stretching/Shrinking; Magnetic field; Radiation; Exact solutions.

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