World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:11, No:02, 2017

Effect of Joule Heating on Chemically Reacting Micropolar Fluid Flow over Truncated Cone with Convective Boundary Condition Using Spectral Quasilinearization Method

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Abstract : This work emphasizes the effects of heat generation/absorption and Joule heating on chemically reacting micropolar fluid flow over a truncated cone with convective boundary condition. For this complex fluid flow problem, the similarity solution does not exist and hence using non-similarity transformations, the governing fluid flow equations along with related boundary conditions are transformed into a set of non-dimensional partial differential equations. Several authors have applied the spectral quasi-linearization method to solve the ordinary differential equations, but here the resulting nonlinear partial differential equations are solved for non-similarity solution by using a recently developed method called the spectral quasi-linearization method (SQLM). Comparison with previously published work on special cases of the problem is performed and found to be in excellent agreement. The influence of pertinent parameters namely Biot number, Joule heating, heat generation/absorption, chemical reaction, micropolar and magnetic field on physical quantities of the flow are displayed through graphs and the salient features are explored in detail. Further, the results are analyzed by comparing with two special cases, namely, vertical plate and full cone wherever possible.

Keywords : chemical reaction, convective boundary condition, joule heating, micropolar fluid, spectral quasilinearization method
Conference Title : ICFSFMAD 2017 : International Conference on Flow Sciences, Fluid Mechanics and Aerospace Design
Conference Location : Melbourne, Australia
Conference Dates : February 02-03, 2017