International Journal on Emerging Technologies (Special Issue on ICRIET-2016) **7**(2): 404-410(2016)

ISSN No. (Print) : 0975-8364
ISSN No. (Online) : 2249-3255

A Detailed Literature Survey Pertaining to the Mathematical Analysis of Viscous and Visco-Elastic Flows with Heat and Mass Transfer on continuous solid surfaces

Ashokkumar Koti, Jagadish V. Tawade, Omkar. C. Kadale and B. Vijayshree
Department of Mathematics,
Bheemanna Khandre Institute of Technology, Bhalki, Karnataka, INDIA

(Corresponding author: Ashokkumar Koti)
(Received 28 September, 2016 Accepted 29 October, 2016)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Fluid dynamics is a branch of mechanics, which deals with the study of fluid in motion and the subsequent effect of the fluid on the boundaries, which may be either solid surface or other fluids. The essence of the subject of fluid flows is that of judicious compromise between theory and experiments, its fundamental principles which are based on Newton's laws of motion, the indestructibility of matter and also conservation of energy. The important physical quantities such as the coefficients of skin-friction, the heat and mass transfer are obtained from visco-elastic fluid (Walter's liquid B′) past a stretching surface / sheet with an applied suction embedded in a porous medium having power law temperature and power law concentration is studied in this paper.

Keywords: Heat Transfer; Boundary Layer; Newtonian and Non- Newtonian Fluids ; Stretching Sheet; Viscoelastic; Free Convection; laminar; porous.

I. INTRODUCTION

Development, objectives, motive and Scope of fluid dynamics Related to the Mathematical Analysis of Viscous and Visco - Elastic Flows with Heat and Mass Transfer on continuous solid surfaces.

II. LITERATURE SURVEY

The literature survey plays a very important role in the research process. It is asource from where research ideas are drawn and developed into concepts and finally theories. It also provides the researcher a bird's eye view about the research done inthat area so far. In this chapter, we have reviewed the works done in the field of non Newtonian fluid which are related to the present work. The formulation of rheological equation of state was studied by Oldroyd (1950). Oldroyd (1958) has studied the effect of visco-elasticity of some idealized visco-elastic fluids under steady state motion. The motion of a visco-elastic fluid contained between co-axial cylinders has been studied by Walters (1960) and the solution of problem has been given by him in case of materials with short memories (1962). Rajeswari and Rathna (1962) have studied the flow behavior of a particular class of visco-inelastic and visco-elastic fluid near a stagnation point. The flow of a visco-elastic fluid in a curved pipe under pressure gradient has been discussed by Thomas and Walters (1963) and they (1965) have also generalized this result by considering the curved pipe of elliptic cross section. Soundalgekar (1978) has investigated the flow of a visco-elastic fluid past an oscillating plate (1978). Johri and Sharma (1980) have studied the free convection laminar flow of an incompressible visco-elastic fluid. The study of free convective flow of non-Newtonian fluid in presence of heat sources has been studied by Jha (1990). Nanousis (1993) has investigated the MHD flows in rotating viscoelastic fluid. The flow nature of visco-elastic fluids through a porous channel has been studied by Ariel (1993). Labropulu *et al*. (1993) have demonstrated the pattern ofvisco-elastic fluid flow impinging on a wall with suction or blowing. Ariel (1997) hasstudied the flow pattern of visco-elastic fluid flow past a porous plate. Kim (1997) hasshown the natural convection along a wavy vertical plate to non-Newtonian fluids. Payver (1997) has discussed the heat transfer in laminar flow of visco-elastic fluid through rectangular ducts. The study of heat transfer of a visco-elastic fluid over a flat plate in presence of magnetic field and pressure gradient has been worked out byKumari*et al*. (1997). The effect of radiation on visco-elastic fluid flow has beenanalyzed by Raptis (1999).

The concept of Newtonian and non-Newtonain fluid flowsthrough concentric annulus with centre body rotation has been given by Naser (1997). Andrienko*et al*. (2000) have explained the resonance behavior of visco-elastic fluids in Poiseuille flow. Ghosh *et al.* (2000) have analyzed the hydromagnetic flow of dusty non-Newtonian fluid. Singh and Thakur (2002) have worked out the exact solution of unsteady MHD non-Newtonian fluid flows. The influence of eccentricity and inner cylinder rotation on fully developed laminar flow of non-Newtonian fluids through annuli has been explained by Escudier *et al*. (2002). The permeability of periodic arrays of cylinders for visco-elastic flows has been investigated by Alococer and Singh (2002). Hayat *et al.* (2002) have studied the behavior of MHD flow of an Oldroyd-B fluid. A study on MHD flow of non-Newtonian visco-elastic fluid through a porous medium near an accelerated plate has been investigated by Eldabe *et al*. (2003). The flow behavior of a visco-elastic fluid near a rotating disk has been studied by Ariel (2003). The effects of free convection on the oscillatory flow of a visco-elastic fluid with thermal relaxation in presence of transverse magnetic field have been analyzed by Zakaria (2003). The study of free convection boundary layer over a vertical cone in non-Newtonian fluid in presence of internal heat generation has been explained by Grosan*et al*. (2004). The investigation on visco-elastic boundary layer flow through a porous medium in presence of heat transfer has been carried out by Pillai *et al*. (2004). Liu (2005) has studied the unsteady unidirectional MHD flow of a non-Newtonian fluid saturated in a porous medium. Hashemabadi *et al.* (2005) have given an analytical solution of visco-elastic fluid flow and heat transfer through an annulus. Khan an Sanjayanand (2005) have studied the visco-elastic boundary layer flow and heat transfer over an exponential stretching sheet. The solution of free convective viscoelastic boundary layer flow past a vertical porous plate with internal heatgeneration/absorption has been derived by Khan and Pop (2006). The effects of free convective flow of visco-elastic fluid past an infinite vertical plate in presence of transverse magnetic field has been explained by Choudhury and Das (2006). The studyof elastico-viscous fluid flow past a stretching sheet with partial slip has been analyzed by Ariel *et al.* (2006). Kumar and Singh (2006) have discussed the motion of viscoelastic fluid heated from below in a porous medium. The behavior of non-Newtonian fluid flow through a channel in presence of suction or injection has been investigated by Kamlsll (2006). The hydromagnetic fluctuating flow of a visco-elastic fluid in aporous channel has been studied by Ghosh (2007). Veena *et al.* (2007) have given anon-similarity solution for heat and mass transfer flow of electrically conducting viscoelastic fluid over a stretching sheet embedded in a porous medium. The study of heat transfer in a visco-elastic boundary layer flow over a stretching sheet with viscous dissipation and non-uniform heat sources has been discussed by Abel *et al.* (2007).Visco-elastic MHD flow and heat transfer over a stretching sheet with viscous and ohmic dissipations has been discussed by Abel *et al.* (2008). Reza and Gupta (2008)have studied the momentum and heat transfer of a visco-elastic fluid past a porous plate subject to suction or blowing. The Hydromagnetic visco-elastic fluid flow due to the oscillatory stretching surface has been demonstrated by Abbas *et al.* (2008). The influence of mixed convective boundary layer flow of a visco-elastic fluid over a horizontal circular cylinder has been studied by Anwar *et al*. (2008). Magnetohydrodynamic flow and heat transfer of a visco-elastic fluid in a channel with stretching walls has been investigated by Misra *et al*. (2008). Norouzi *et al.* (2009) have investigated the convective heat transfer of a visco-elastic fluid in a curved duct. At periodic temperature, the study of free convective elastico-viscous fluid flow past a uniformly accelerated plate has been investigated by Chaudhary and Jain (2009). Nandeppanavar *et al.* (2010) have studied the heat transfer in a Walters B fluid over an impermeable stretching sheet with non-uniform heat source/sink and elastic deformation. Koti et al have studied MHD flow of a visco-elastic fluid over a stretching sheet with power law temperature and power law concentration embedded in porous medium(2009). Jagadish Tawade *et al*, have studied on the Heat transfer in a liquid film over an unsteady stretching surface with viscous dissipation (2009). Abel et al, investigated the Effect of non-uniform heat source on MHD heat transfer in a liquid film over an unsteady stretching sheet(2009).A numerical study on the motion of unsteady free convective heat and mass transfer in a Walters-B visco-elastic flow along a vertical cone has been shown byMohiddin*et al*. (2010). A study on hydromagnetic boundary layer flow and heat transfer in visco-elastic fluid over a continuously moving permeable stretching surface with non-uniform heat source/sink embedded in fluid-saturated porous medium has been explained by Abel *et al.* (2010). The influence of fully developed mixed convection on a visco-elastic fluid between permeable parallel vertical plates has been described by Sajid *et al*. (2010). Prasuna *et al.* (2010) have explained the results of unsteady flow of a visco-elastic fluid through a porous media between two impermeable parallel plates. Unsteady MHD mixed convection stagnation point flow of a visco-elastic fluid on a vertical surface has been derived by Ahmad and Nazar (2010).

Hsiao (2010) has investigated the heat and mass transfer of a mixed convective MHD flow of a visco-elastic fluid past a stretching sheet with ohmic dissipation. The problem of heat and mass transfer in magneto hydrodynamic visco-elastic fluid flow through aporous medium over a stretching sheet with chemical reaction has been analyzed by Alharbi *et al.* (2010). The effects of chemical reaction and heat transfer on the MHD flow of visco-elastic fluid through a porous medium over a horizontal stretching flatplate has been discussed by Eldabde *et al.* (2010). The nature of free convection on thevisco-elastic fluid (Walters liquid B type) flow past an infinite vertical plate accelerating inits own plane with constant heat flux has been examined analytically by Singh *et al.*(2010). Effects of heat and mass transfer on an oscillatory flow of a visco-elastic fluid with thermal relaxation have been derived numerically by Ambethkar (2010). Hsiao and Lee (2010) have studied the MHD flow behavior of mixed convective visco-elastic fluid with conjugate heat and mass transfer with viscous dissipation and radiation past astretching sheet. Nadeem and Akbar (2010) have described the peristaltic flow of Walters B fluid in a uniform inclined tube. Prakash *et al.* (2010) have shown the effects of thermal diffusion and chemical reaction on MHD flow of dusty visco-elastic(Walters liquid, Model B) fluid. The nature of thermal convection of a visco-elastic fluid in an open top porous layer heated from below has been presented by Niu *et al.* (2010). Joneidi *et al.* (2010) have described the motion of Walters B fluid in a verticalchannel with porous wall. The behavior of heat transfer characteristics on visco-elastic fluid in a porous medium over an impermeable stretching sheet with viscous dissipation has been studied by Nandeppanavar *et al.* (2010). A number of fluid flow problems considering Walters liquid have been investigated by Biswas and Choudhury (2010). MHD viscoelatic fluid flow and heat transfer with temperature gradient dependent heat sink in a porous medium past a stretching sheet has studied by *Koti et al(2011),*Effect of slip conditions and hall current on unsteady MHD flow of a visco-elastic fluid past an infinite vertical porous plate through porous medium has been analyzed by Kumar *et al.* (2011). The numerical study of transient free convective mass transfer in a Walters B visco-elastic flow with wall suction has analyzed by Chang *et al.* (2011). Tawade *et al* have studied on MHD flow and heat transfer for the upper convected Maxwell fluid over a stretching sheet (2011). Abel et al discussed. The effects of MHD flow and heat transfer for the UCM fluid over a stretching surface in presence of thermal radiation (2012). The flow nature of Walters liquid B and its behavior under valid and suitable boundary conditions has beendiscussed by *Choudhury and Dey (2012),*Choudhury and Debnath (2012). Effects of visco-elasticity on free convective flow confined between a longvertical wavy wall and a parallel flat wall of equal transpiration has been described byChoudhury and Das (2012). Moreover a number of visco-elastic fluid flow problemshave been discussed by Choudhury and Purkayastha (2012), Choudhury andBhattacharjee (2013) to study the flow behavior of Walters liquid under different geometries and suitable boundary conditions.

The effects of mass transfer on MHD unsteady free convective Walters memory flow with constant suction and heat sink through porous media has been investigated by Reddy *et al.* (2012).Visco-elastic MHD oscillatory horizontal channel flow and heat transfer with heatsource has been studied by Choudhury and Das (2013).Choudhury and Das (2014)have discussed the visco-elastic MHD free convective flow through porous media inradiation and chemical reaction with heat and mass transfer.Koti et al (2014) discussed about Thin film flow and Heat transfer over an unsteady stretching sheet with thermal radiation, internal heating in presence of external MagneticAfield. Further our Survey of literature is major ingredient of research work on which the researcher has to rely to understand and analyze the subject of research. In our paper, we have reviewed the works done in the field of non-Newtonian fluid which are related to our research work. The formulation of rheological equations of state was studied by *Oldwypi.*Soundalgekar has studied the flow of an elastico-viscous fluid past an oscillating plate. Johri and Sharma have discussed the free convection laminar flow of an incompressible visco-elastic fluid. The study of free convective flow of non-Newtonian fluid in presence of heat sources was done by Jha. Thien *et. al* have discussed the similarity solution of Oldroyd B fluid in a curved channel. Magneto hydrodynamic flows in rotating elastic-viscous fluid was demonstrated by Nanousis. The flow behavior of visco-elastic fluids through a porous channel has been given by Ariel. Labropulu *et. al.* have studied the flow pattern of visco-elastic fluid impinging on a wall with suction of blowing. Mixed convective power law fluid past two dimensional or exisymmetric bodies was explained by Meissner *et. al.* Magnetohydrodynamic boundary layer flow of power law fluid with variable electrical was governed by Helmy. Ariel has showed the nature of visco-elastic fluid flow past a porous plate. Kim has explained the natural convection along a wavy vertical plate to non-Newtonian fluids. The discussion of heat transfer in laminar flow of visco-elastic fluids through rectangular ducts was given by Payver.

Kumari *et. al.* have analysed the heat transfer of a visco-elastic fluid over a flat plate in presence of magnetic field and pressure gradient. Nasser has given the prediction of Newtonian and non-Newtonian fluid flow through concentric annulus with centre body rotation. Andrienko *et. al.* has discussed the resonance behavior of visco-elastic fluids in Poiseuille flow. Ghosh *et.al.* have discussed the hydromagnetic flow of dusty non-Newtonian fluid. The flow of non-Newtonian fluid in a helical pipe with elliptical cross section was explained by Ahmed *et.al.* Singh and Thakur have studied exact solution of unsteady MHD non-Newtonian fluid flows. Effect of eccentricity and inner-cylinder rotation on fully developed laminar flow of non Newtonian fluids through annuli was studied by Escudier *et.al.* AIococer and Singh have explained the permeability of periodic arrays of cylinders for viscoelastic flows. The behavior of MHD flow of an Oldroyd-B fluid was shown by Hayat *et. al.* Magnetohydrodynamic flow of non-Newtonian visco-elastic fluid through a porous medium near an accelerated plate was explained by Eldabe *et.al* lAriel has discussed the flow of an elastico-viscous fluid near a rotating disk. Zakaria has studied the free convection effects on the oscillatory flow of a visco-elastic fluid with thermal relaxation in presence of transverse magnetic field.

The behavior of free convection boundary layer over a vertical cone in non-Newtonian fluid in presence of internal heat generation was given by Grosen *et. al.* The visco-elastic boundary layer flow through a porous medium in presence of heat transfer was examined by Pillai et.al. Liu has discussed the unsteady unidirectional MHD flow of a non Newtonian fluid saturated in a porous medium. The analytical solution of viscoelastic fluid flow and heat transfer through an annulus was obtained by Hashemabadi *et. al.* Effects of free convective flow of visco-elastic fluid past an infinite vertical plate in presence of transverse magnetic field were derived by Choudhury and Das. Ariel et.al. have discussed the flow of an elastico-viscous fluid past a stretching sheet with partial slip. Kumar and Singh have studied the motion of visco-elastic fluid heated from below in a porous medium. The flow behavior of non-Newtonian fluid through a channel in presence of suction or injection was discussed by Kamlsll Oscillatory motion of an electrically conducing visco-elastic fluid over a stretching sheet in a saturated porous medium with suction or blowing was examined by Rajagopal et.al. Ghosh has studied the hydromagnetic fluctuating flow of a visco-elastic fluid in a porous channel. The heat transfer in a visco-elastic boundary layer flow over a stretching sheet with viscous dissipation and non-uniform heat sources was explained by Abel et. al Reza and Gupta have discussed the momentum and heat transfer of a viscoelastic fluid past a porous plate subject to suction or blowing. Abbas et.al haveanalysed the hydromagnetic flow in visco-elastic fluid due to the oscillatory stretching surface. The mixed convective boundary layer flow of a visco-elastic fluid over a horizontal circular cylinder was explained by Anwar *et. al.* Misra *et.al.* have discussed the MHD flow and heat transfer of a visco-elastic fluid in a channel with stretching walls. Norouzi *et.al.* have discussed the convective heat transfer of a visco-elastic fluid in a curved duct. The behavior of non-Newtonian fluid flow through three dimensional disordered porous media was studied by Morais *et.al.* Biomagneticvisco-elastic fluid flow in a channel with stretching walls was derived by Misra *et.al.* Choudhury and Jain have investigated the influence of periodic temperature on free convective elastic-viscous fluid flow past a uniformly accelerated plate. The study of heat transfer in a Walters liquid B over an impermeable stretching sheet with non-uniform heat source/sink and elastic deformation was shown by Nandeppanavar *et.al.* Mohiddin *et.al.* have analysed numerically the motion of unsteady free convective heat and mass transfer in a Walters-B visco-elastic flow along a vertical cone. Hydromagnetic boundary layer flow and heat transfer in visco-elastic fluid over a continuously moving permeable stretching surface with non-uniform heat source/sink embedded in fluid-saturated porous medium was described by Abel et. al. Effect of fully developed mixed convection on a visco-elastic fluid between permeable parallel vertical plates was shown by Sajidet.al.Ahmed and Nazar have derived the unsteady magnetohydrodynamic mixed convection stagnation point flow of a visco-elastic fluid on a vertical surface. Behaviour of free convection on the visco-elastic fluid (Walters - B ' type) flow past an infinite vertical plate accelerating in its own plane with constant heat flux was examined analytically by Singh et-al. Xiong *et.al.* have described the drag enhancement and drag reduction in visco-elastic fluid flow around a cylinder. Analysis of visco-elastic fluid flow with temperature dependent properties in plane couette flow and thin annul was done by on Hashemabadi and Mirnajafizadeh. The behavior of thermal convection of a viscoelastic fluid in an open top porous layer heated from below was studied by Niu et. al. The motion of Walters B fluid in a vertical channel with porous wall was studied by Joneidi *et. al.* The study of heat transfer characteristics of visco-elastic fluid in a porous mediumover an impermeable stretching sheet with viscous dissipation was performed by Nandeppanavar et. al.

Moreover, a number of flow problems have been disused by Choudhruy and Debnath Choudhury and Dey to study the flow patterns of Walters liquid (Model B') and analyze their behaviours under different valid and suitable boundary conditions some of which are included here. From the above study, it is noticed that the results reveal various aspects of the additional terms in the constitutive equation as compared to Newtonian fluid. In our present study, we have accommodated six models of visco-elastic fluid to investigate the flow behaviors in specific problems.

III. CONCLUSION

Based on all the above literatures, it is encountered in many Engineering. applications such as materials manufactured by polymer extrusion process , polymer processing , wire and fibre coating of metallic sheets , melt spinning , cooling of electronic chips and crystal growing.

The industrial applications in the manufacture of plastic films and artificial fibre materials, in recent years has lead to a renewed interest in the study of visco – elastic boundary layer flow with heat and mass transfer over a stretching sheet.

In the present century ,which is a century of technological advancement exploration of industries using latest technologies in extrusions ions in manufacturing process and melt spinning processes , the extradite is stretched into a filament when it is drawn from the dye and solidifies in the desired shape through a controlled cooling system, glass blowing, hot rolling, crystal growing. Some of the Engineering. applications related to our research work such as materials manufactured by polymer extrusion process , polymer processing Aero foils , wire and fibre coating of metallic sheets, melt spinning , cooling of electronic chips , crystal growing and toughen glasses are being depicted in the following figures. (a , b , c and d) respectively.

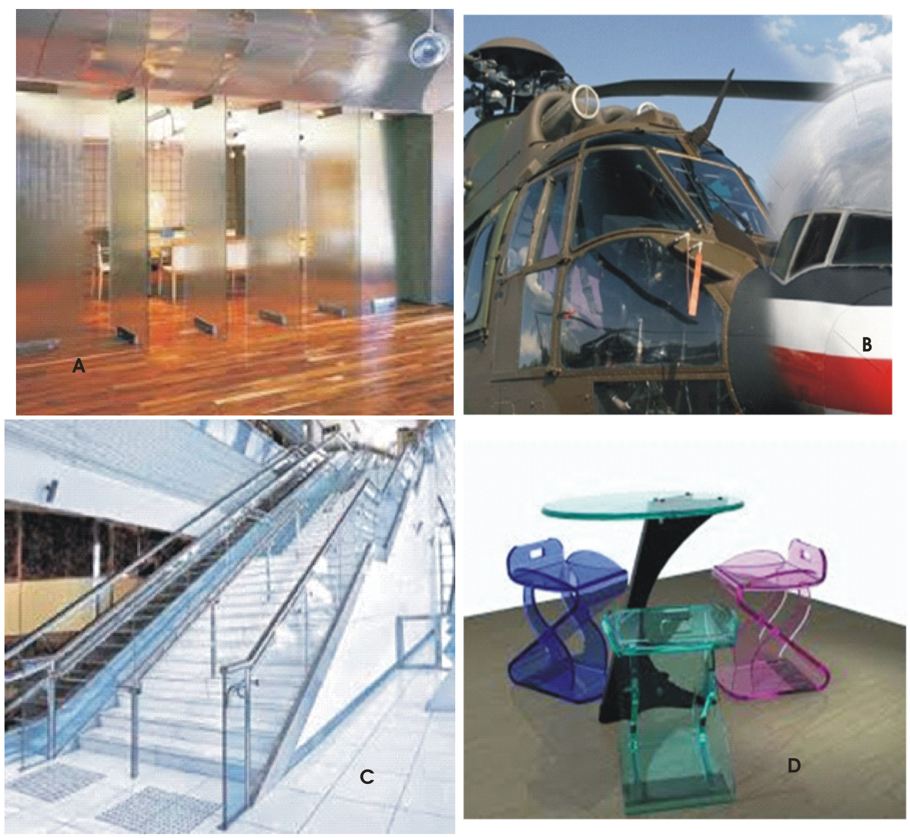

Fig. 1.

REFERENCES

[1]. B.C. Sakiadis Boundary-layer behavior on continuous solid surfaces: I. Boundary-layer equations for two-dimensional and axisymmetric flow, *AIChEJ7*(1961)221.

[2]. F.K Tsou, E M Sparrow and R J Goldstein Flow and heat transfer in the boundary layer on a continuous moving surface *IntJ Heat Mass Transfer***10**(1967) 219.

[3]. P.D. McCormack and L. Crane, (1973*),Physical Fluid dynamics*, Academic Press, New York.

[4]. L.J. Crane Axial Flow Past a Cylinder with Suction, *Ingr-Archiv* **43** (1974) 203.

[5]. P.S. Gupta and A.S. Gupta,(1977), Heat and mass transfer on a stretching sheet with suction or blowing, *The Canadian Journal of Chemical Engineering*, **55**,744-746.

[6]. B. Siddappa and P.S Hiremath, (1980). Rivlin-Ericksen fliud flow past stretching plate with suction, *Kyungpook Mathematical Journal*, **20**, 267-272.

[7]. Gupta et al. (1984). Flow of viscoelastic fluid over a stretching sheet, *Rheological Acta*, **23**, 213- 215.

[8]. N.M. Bujurke, S.N. Biradar and P.S. Hiremath Second-order fluid flow past a stretching sheet with heat transfer *ZAMP*, **38** (1987) 653

[9]. Rollins, D. and Vajravelu K: Heat transfer in a second order fluid over a continuous stretching surface. *Acta. Mech.,* 89, pp 167-178 (1991).

[10]. K.R. Rajagopal and R. K. Bhatnagar, Exact solutions for some simple flows of an Oldroyd - B fluid, *Acta Mechanica*, vol. **113**, no. 1–4, pp. 233–239, (1995)

[11]. Subhas, A. M, A. Joshi, and R. M. Sonth (2001). Heat transfer in MHD visco-elastic Fluid flow over a stretching surface. *Zeitschriftfrangewandte Mathematikund Mechanik.* **81**,10, 691-698

[12]. Sonth. R. M., S. K. Khan, M. S. Abel, and K. V.Prasad (2002). Heatand mass transfer in a visco-elastic flow over an accelerating surface with heat source/sink and viscous dissipation. *Heat and Mass Transfer.* **38**(3), 213-220.

[13]. Kandasamy, R., K. Periasamy, and K. K. S. Prabhu (2005). Chemical reaction, heat and mass transfer on MHD flow over a vertical stretching surface with heat source and thermal stratification effects. *Int.J. Heat and MassTransfer.***48**, 4557- 4561.

[14]. Ariel, P.D., Hayat, T. and Asghar, S. (2006). The flow of anelastico- viscous fluid past a stretching sheet with slip. *Acta Mech*.,**187**, 29-35.

[15]. P.H. Veena, V.K. Pravin and K. Ashok Kumar, MHD flow of a visco-elastic fluid over a stretching sheet with power law temperature and power low concentration embedded in a porous medium. *Pacific Asian J. of Mathematics* **2** (2008), 11.

[16]. Abel, M. S, P. G. Siddheshwar, and M. M. Nandeeppanavar (2007). Heattransfer in a visco-elastic boundary layer flow over a stretching sheet with viscous dissipation and non-uniform heat source. *Int. J. Heat and Mass Transfer*. **50**(5-6), 960-966.

[17]. Singh, P., A. Jangid, N. S. Tomer, S. Kumar, andD. Sinha (2010).Effects of Thermal Radiation and Magnetic Field on Unsteady Stretching Permeable Sheet in Presence of Free Stream Velocity. *Int. J. of Information and Mathematical Sci.* **6**(3),63-69.

[18]. Sidde Shwar, P.J., Mahabaleshwar, U.S.: Effect of radiation and heat source on MHD flow of a visco-elastic liquid and heat transfer over astretching sheet. Int. J. Non-linear Mechanics, **40**, 807 (2005)

[19]. Khan, S.K. and Sanjayanand, E.: Visco-elastic boundary layer flow and heat transfer over aexponential stretching velocity. *Int. J. of Heat and Mass Transfer,* **48**, 811, (2005).

[20]. Cortell, R (2005): Flow and heat transfer of a fluid through a porous medium over astretching surface with internal heat generation/absorption and suction/*blowing Fluid Dynamics : Res.,* **37**, 231-245.

[21]. Ishak, A., Nazar, R., Pop, : (2007) : Boundary layer on a moving wall with suction and injection. *Chin. Phys. Lett.* **24** (8) , 2274-2276.

[22]. Sadeghy, K., Najafi, A. H., Saffaripour, M., (2005): Sakiadis flow of an upper- convicted Maxwell – fluid. *Int. J . Non-linear Mech*. **40**, 1220 – 1228

[23]. Vajravelu, K., (2001) : Viscous flow over a non-linearly stretching sheet. *Appl. Math. Comput.* **124**, 281-288

[24]. Elbashbeshy, E.M.A.(2001) : Heat transfer over an exponentially stretching continuous surface with suction Arch. Mech. 53, 643-651.

[25]. Sanjayanand, E., Khan S.K., (2006) : On heat and mass transfer in a visco-elasticboundary layer flow over an exponentially stretching sheet *Int. J. Thermal. Sciences.* **45** , 819-828.

[26]. Chauhan , D.S. and Takhar, P.K. (2002) : Non-Newtonian stretching coupled flow in a channel bounded by a highly porous layer. Modeling Measurement and control, B, **71** (4), 33-40.

[27]. Labropulu, F., Husain, I. and Chinichain, M. (2004). Stagnation-point flow of the Walters' B'fluid with slip. *IJMMS*, **61**, 3249-3258.

[28]. Hayat, T., Khan, M. and Ayub, M. (2007). The effect of the slip condition on flows of an Oldroyd 6-constant fluid. *J. Comput. Appl. Math.,* **202**, 402-413.

[29]. Ajadi, S.O., Adegoke, A. and Aziz, A. (2009). Slip boundary layer flow of non-Newtonian fluid over a flat plate with convective thermal boundary conditions. *Int. J. of Non-Linear Science*, **8**(3), 300-306

[30]. Ariel, P.D., Hayat, T. and Asghar, S. (2006). The flow of an elastico- viscous fluid past a stretching sheet with slip. Acta Mech., **187**, 29-35.

[31]. Khan, M., Hayat, T. and Wang, Y. (2008). Slip effects on shearing flows in a porous medium. *Acta Mech. Sin.,* **24**, 51-89.

[32]. Singh. A. K : Heat Transfer and Boundary Layer Flow past a stretching porous Wall with Temperature gradient Dependent Heat sink JEHMT, **28** (2006), 109-225.

[33]. Veena, P.H., Pravin. K., and J.K. Nagbhooshan : MHD Visco-elastic Flow and Heat Transfer with Temperature Gradient Dependent Heat Sink in a Porous Medium pasta stretching Sheet. *Int. J. Math. & Applications* **3**, (2010), 65-81

[34]. Veena, P.H., V.K. Pravin and Rafia Begum : Free and Forced MHD Convective Mass Transfer Flow with Heat Source and Thermal Diffusion embedded in a porous mediumwith Variable Thermal Conductivity. *Int. J. Mathematics and Analysis*, **5**, (2007) 267-280.

[35]. Veena, P.H., Pravin, V.K., and Shahjahan, M : Non-Similar Solutions for Heat and Mass Transfer Flow in an Electrically conducting Visco-elastic fluid over a Stretching Sheet embedded in a porous Medium. *Int. J. Modern Mathematics,* **2** (2007) 9-26.

[36]. Veena, P.H., V.K.Pravin., and Padashetty, S. : Non-Similar Solutions in Visco-Elastic MHD Flow and Heat Transfer over a porous Stretching Sheet with Internal Heat Generation and Stress Work. IJMM, **2** (2007), 267-281.

[37]. Veena P.H. Praveen H, Ashokkumar Koti, MHD flow of a visco-elastic fluid over a stretching sheet with power law temperature and power law concentration embedded in porous medium, Published in *Pecific-Asian Journal of Mathematics*, Vol. **3**, No 1-2, Jan-Dec 2009.

[38]. M. Subhas Abel, Mahesha N, Jagadish Tawade, have studied on the Heat transfer in a liquid film over an unsteady stretching surface with viscous dissipation in presence of external magnetic field. *Published in Applied Mathematical Modeling* **33** (2009) 3430-3441.

[39]. M. Subhas Abel, Jagadish Tawade, Mahantesh M. N investigated the Effect of non-uniform heat source on MHD heat transfer in a liquid film over an unsteady stretching sheet. Published in *Int. J. Non-Linear Mechanics* **44** (2009) 990-998.

[40]. M. Subhas Abel, Jagadish Tawade, Mahantesh M. N, have studied on MHD flow and heat transfer for the upper convected Maxwell fluid over a stretching sheet. Published in the Meccanica 12th July 2011, pp 1-9.

[41]. Veena P.H. Praveen H, Ashokkumar Koti, MHD viscoelatic fluid flow and heat transfer with temperature gradient dependent heat sink in a porous medium past a stretching sheet, Published in *International Journal of Chemical Engineering*, Vol.**4**, 2, 2011, 133-146.

[42]. M. Subhas Abel, Jagadish Tawade, Jyoti N. Shinde, have discussed The effects of MHD flow and heat transfer for the UCM fluid over a stretching surface in presence of thermal radiation. Published in Advances in Mathematical Physics Volume 2012 (2012), Article ID 702681, 21 pages.

[43]. Jagadish V Tawade and Ashokkumarkoti, Thin film flow and Heat transfer over an unsteady stretching sheet with thermal radiation, internal heating in presence of external, Published in Int. J. of Adv. In Apply. *Mat., and Mech.,* (2014).