Thermal radiation effects on MHD convection flow along a vertical cylinder embedded in a porous medium

Machireddy Gnaneswara Reddy

Abstract. The numerical solution of transient natural convection MHD flow past a vertical cylinder embedded in a porous medium with surface temperature and concentration along with thermal radiation is presented. The temperature and concentration level at the cylinder surface are assumed to vary as power-law type functions in the stream-wise coordinate. The governing boundary layer equations are converted into a non-dimensional form. A Crank–Nicolson type of implicit finite-difference method is used to solve the governing non-linear set of equations. Numerical results are obtained and presented with various thermal and mass Grashof numbers and power law variations. Transient effects of velocity, temperature and concentration are analyzed. Local and average skin-friction, Nusselt number and Sherwood number are shown graphically. The numerical predications have been compared with the existing information in the literature and good agreement is obtained.

Contents

MHD flow and heat transfer over a plate in a Darcy porous medium in presence of thermal radiation

Iswar Chandra Mandal, Swati Mukhopadhyay

Abstract. A mathematical model is presented for analyzing the effects of MHD on boundary layer forced convective flow and heat transfer of an incompressible fluid past a porous plate embedded in a Darcy porous medium. Thermal radiation term is considered in the energy equation. The similarity solutions for the problem are obtained and the reduced nonlinear ordinary differential equations are solved numerically. The surface shear stress increases with magnetic parameter. It is noted that Lorentz force helps to enhance the rate of heat transfer. In case of porous plate, fluid velocity increases whereas non-dimensional temperature decreases for increasing values of suction parameter. The rate of heat transfer increases with the increasing values of Prandtl number. The effect of thermal radiation on temperature field is also analyzed.

Contents

MHD flow of a non-Newtonian power-law fluid over a stretching sheet with thermal radiation, viscous dissipation and slip boundary conditions

Pagdipelli Kavitha, Naikoti Kishan

Abstract. A non-Newtonian boundary layer magneto-hydrodynamic flow and heat transfer characteristics over a vertical stretching sheet with momentum slip boundary conditions under the influence of radiation and viscous dissipation are investigated. The governing partial differential equations are reduced to self-similar nonlinear ordinary differential equations by scaling group transformations. First, obtained non-linear momentum equation is linearized by Quasi-linearization technique and solved numerically using implicit finite difference scheme. The solution is found to be dependent on various governing parameters which includes magnetic field parameter, power-law index, modified Prandtl number, Eckert number, thermal radiation parameter, slip parameter and mixed convection parameter. The skin friction coefficient and heat transfer coefficient are shown in tables. Good agreement is found between the numerical results of this paper with published results for both Newtonian and non-Newtonian flows.

Contents

Effects of chemical reaction and heat radiation on unsteady MHD elastico-viscous flow past a porous plate embedded in a porous medium

Rita Choudhury, Saswati Purkayastha

Abstract. An analysis is carried out to study the effects of chemical reaction and heat radiation on an unsteady two-dimensional mixed convective MHD boundary layer flow of an elastico-viscous fluid past a porous plate embedded in a porous medium. The Rosseland approximation is used to describe the radiative heat flux in energy equation. A magnetic field of uniform strength is applied transversely to the direction of flow. The governing equations of motion are solved analytically by using multi-parameter perturbation scheme. The velocity, temperature and concentration fields are and illustrated with physical interpretation of various flow parameters included in the solution. This type of problem has important applications in geothermal reservoir and geothermal energy extraction.

Contents

Mobility of charge carriers in SF_6 and SF_6-N_2 gas mixture at high pressure

Ahcene Lemzadmi , Assia Guerroui,
Andre Denat, Nelly Bonifaci

Abstract. An alternative method for determining mobilities of charge carriers SF_6 and SF_6-N_2 using corona discharge in point–plane geometry is proposed. It consists of measuring the current–voltage characteristics of the corona discharge under high pressures and in highly inhomogeneous fields. The results show that the ionic mobility is inversely proportional to the gas density and increases with the decrease of the amounts of SF_6 in the SF_6-N_2 gas mixture.

Contents

Dual wideband N-shaped patch antenna loaded with shorting pin for wireless applications

Md. Samsuzzaman, Mohammad T. Islam,
Jit S. Mandeep, Mst. K. Nahar, Md. M. Islam

Abstract. A compact N-shaped dual band patch antenna loaded by shorting pin is designed. The lessening in patch size is achieved by perturbing the surface current path on the edge of a circular patch antenna by two triangular slots which make the patch as N-shaped. The dual wideband is achieved by combining two triangular slots and shorting pin. Simulated results carried out by the Finite Element Method (FEM)-based simulator HFSS such as antenna impedance bandwidth, input impedance and radiation characteristics are presented and discussed. The lower impedance bandwidth 1.46 GHz covers from 2.89 GHz to 4.35 GHz and the upper impedance bandwidth 2.17 GHz covers from 7.69 GHz to 9.86 GHz. The overall dimensions of the antenna are $13 \times 13 \times 1.575$ mm^3.

Contents

Mathematical models of fine grained materials based on chaotic systems

Jiří Lahoda, Michal Zemko

Abstract. Strongly nonlinear dynamic systems with suitable parametrization can exhibit chaotic oscillations. These irregular oscillations have bounded amplitude but no period. Therefore it is natural to use them for modelling irregularities in microscopic structure of metals. In this work, chaotic sequences of numbers generated by these systems were used for definition of metal grains properties such as their size, misorientation, position on the surface etc. Basic model can meet characteristics of real specimen. It is possible to widely modify the basic model to depict specific qualities of more complicated metal structures. Obtained mathematical model is compared with results of ultra-fine grained titanium sample and carbon steel sample microstructure observation and measurement.

Contents