

Full Paper

Soret effects on unsteady magnetohydrodynamic mixed-convection heat-and-mass-transfer flow in a porous medium with Newtonian heating

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Abstract: Soret effects on unsteady mixed-convection heat-and-mass-transfer flow over an oscillating vertical plate embedded in a porous medium with Newtonian heating in the presence of magnetic field are studied. The governing equations, along with imposed initial and boundary conditions, are first converted into the dimensionless form and then solved using the Laplace transform technique. The numerical results for fluid velocity, temperature and concentration are graphically shown, whereas the skin friction, Nusselt number and Sherwood number are presented in tabular forms. It is observed that the fluid velocity and concentration increase with increasing values of Soret number. The conjugate parameter of Newtonian heating increases the temperature as well as the concentration and velocity distributions. It is also found that the rates of the heat-and-mass transfer increase as the conjugate parameter increases.

Keywords: Soret effects, magnetohydrodynamic flow, heat-and-mass-transfer flow, porous medium, Newtonian heating

INTRODUCTION

Recently the study of magnetohydrodynamic (MHD) flow, together with heat-and-mass transfer, has received the attention of a large number of researchers because of its diverse applications in many branches of science and technology as well in industry. Some of the important applications are found in stellar and solar structures, cooling of nuclear reactors, interstellar matter,