or right-handed, which can be efficiently used for cooling purposes involving effective heat transfer. The Oberbeck convection arising when temperature gradient is applied perpendicular to gravity in ordinary fluid saturated porous media has been investigated but much attention has not been given to its study in chiral fluids through a vertical channel in spite of its applications in many practical problems. The study of it, in the presence of transverse magnetic field, convective current and viscous dissipation, is the objective of this paper. The governing equations are solved analytically using regular perturbation method valid for small values of buoyancy parameter N. The velocity and temperature, mass flow rate, skin friction and rate of heat transfer are obtained for various values of electromagnetic thermal number w_1. We found that an increase in w_1 increases the velocity and the effect of N is to decrease the skin friction, heat transfer and the mass flow rate.

W-4F-2. EXPERIMENTAL INVESTIGATION ON MICRO HEAT PIPES OF DIFFERENT CROSS-SECTIONS HAVING SAME HYDRAULIC DIAMETER

S. L. MAHMOOD, *IUT, Bangladesh,* M. A. R. AKHANDA, *IUT, Bangladesh,* Effect of micro heat pipe (MHP) cross-sections and orientations on its thermal performances are experimentally investigated in this study. Evaporator section of MHP is heated by electric heater and the condenser section is cooled by water circulation in an annular space between condenser section of MHP and water jacket. Temperatures at different locations of MHP are measured using five calibrated K type thermocouples. Heat supply is varied using a voltage regulator which is measured by a precision ammeter and a voltmeter. Tests are conducted using five different cross-sections (circular, semicircular, elliptical, semi elliptical and rectangular) of micro heat pipes having same hydraulic diameter of 3 mm placed at three different inclination angles (0^o, 45^o, 90^o). Among all cross-sections of MHP circular cross-section exhibits the best thermal performance followed by semi elliptical, semicircular, elliptical and rectangular cross-sections. Moreover, maximum heat transfer capability tends to deteriorate as the flatness ratio is increased. Maximum heat transfer capability also decreases with decreasing of inclination angle. This implies that the action of gravity, which serves to speed up the flow of fluid from condenser to evaporator increases with increasing of inclination angle. A correlation is developed using all the gathered data of the present study to predict the heat transfer coefficient of micro heat pipes of different cross-sections placed at different inclination angles which correlates all the data within $\pm 7\%$.

W-4F-3. PLANFORM PLUME STRUCTURES IN HIGH RAYLEIGH NUMBER HIGH PRANDTL NUMBER NATURAL CONVECTION

Vivek N. PRAKASH, K. R. SREENIVAS, *EMU, JNCASR, Bangalore, India,* Jaywant H. ARAKERI, *Mechanical Engineering Dept., IISc, Bangalore, India,* High Rayleigh number (Ra) convection is important both in natural processes like in mantle-convection, atmospheric convection and in engineering applications like metallurgy. Very high Prandtl number (Pr) limit will be relevant in the geophysical context like mantle convection (Pr of the order of millions is common). Convection in the Earth's Mantle is responsible for volcanism, plate-tectonics and orography. The condition under which Rayleigh-Benard Convection (RBC) occurs in the mantle corresponds to a large Rayleigh number and in a medium of large Prandtl number. We are also motivated to study RBC in the limit of large Pr and high Ra to develop and extend the validity of the existing Nu-Ra correlations to the high Pr range. Using concentration difference to drive the convection, we simulate large Rayleigh number convection and study the effect of Prandtl number on the dynamics of convection and its structures. We create a viscosity contrast between the two fluid systems having different densities to mimic Mantle convection. The Ra covered in the present study are in the range of 10^9 to 10^{11} and Sc are in the range of 10^3 to 10^5. At low Sc, the near-membrane flow structures consist of line plumes. The planforms of these line plumes show a marked change in morphology as the viscosity of the upper fluid layer is increased. With the increase in viscosity the plume spacing increases and also there is a transition from line plumes to discrete blobs. We believe that the analysis of these planform convection structures leads to a better geophysical understanding of the dynamics of convection in the mantle offering better explanations to plate tectonics and the distribution of orographic features like hotspots on the surface of earth.

W-4F-4. A NUMERICAL SIMULATION OF HEAT TRANSFER FROM A CIRCULAR CYLINDER IN TURBULENT FLOW

Mohsen SAGHAFIAN, *Department of Mechanical Engineering, Isfahan University of Technology, Isfahan, Iran,* In this paper, heat transfer from a circular cylinder has been simulated numerically in sub critical Reynolds numbers. A nonlinear eddy – viscosity model with some adjustment is used, assuming incompressible and two dimensional flow. Local and averaged Nusselt numbers are presented and compared to experimental and other numerical results from the literature. The model can predict front stagnation region Nusselt number quite well but over predicts local Nusselt number in the wake region.