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Microfluidic Channels under Magnetohydrodynamic (MHD) Convection YOGENDRA M. PANTA, HYUN W. KIM, Youngstown State University, SHIZHI QIAN, Old Dominion University — Magnetohydrodynamic (MHD) effects have been widely known since many years. MHD effects are used to propel, stir, and pump fluids in various fluid applications especially in the field of microfluidics and Lab On a Chip (LOC) technology. Orthogonally aligned electric flux density and magnetic flux density were applied to straight and torroidal micro-channels both aligned perpendicular to the desired direction of fluid flow. Microfluidic MHD channels in straight and torroidal shapes were fabricated from a thin brass sheet sandwiched between two polycarbonate sheets patterned with two platinum electrodes in the channel walls from inside. When a potential difference of low magnitude ($\sim$ 1 mV) is applied across the electrodes, a current density J transmitted through the electrolyte solution results. In the presence of a magnetic field B, the orthogonal interaction between the resulting current density J and the magnetic field B induces Lorentz forces F (=J$\times$B) which induce and drive fluid motion in the channel. This effect was applied to propel and pump the fluid in presence of a current carrying species both in a straight and torroidal micro-channels. Flow velocities were obtained linearly increasing with the higher magnetic flux densities. A drop of dye was placed into the solution to trace the path of moving fluid under MHD convection.

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