Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Effectiveness of Magnetohydrodynamics in Microdevices for Fluid Flow[1] YOGENDRA PANTA, WEI LIN, Youngstown State University — Magneto-hydrodynamics(MHD) offers an elegant means to control fluid flow in micro- and nano-devices without a need for any mechanical components with the device. In the presence of an external magnetic field in a microchannel filled with ionic sample solutions, the interaction between the electric currents and magnetic fields results Lorentz forces. Electric poential is supplied in the electrodes that patterned on the opposite walls of the channel. The Lorentz forces can be used to propel, stir, mix and/or manipulate fluid flow in the channel. Many works are reported about the MHD micro channel devices for various applications over the last thirty years, but there is still a need for better understanding of flow behavior in these microdevices. Also, there are insufficient studies of flow phenomenon under MHD in microtubules compared to rectangular cross sectioned microchannels. In this work, microtubules and rectangular microchannels are compared with 2D and 3D fluid flow simulation for testing their effectiveness. In presence and absence of external magnetic fields, an extensive parametric study was performed in order to find out the cross dependencies within the various experimental parameters. Numerical simulations were found in a good agreement with published data and esperimental results.

[1]One of the authors (YMP) would like to acknowledge the YSU-School of Graduate Studies and Research for providing support through 2009-2010 URC Grant and 2009-2010 Research Professorship Award.

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Date submitted: 20 Aug 2010 Electronic form version 1.4