

Numerical Study on the EHD Pump with a Recirculating Channel

Authors : Dong Sik Cho, Yong Kweon Suh

Abstract : Numerical study has been conducted on the electro-hydrodynamic (EHD) pumping method in terms of a recirculating channel. The method relies on the principle of EHD generated by the electric-field dependent electrical conductivity (Onsager effect). Before considering the full three-dimensional simulation, we solved the two-dimensional problem of EHD flow in a circular channel like a doughnut shape. We observed that when dc voltage was applied a fast and regular flow was produced around electrodes, which is then used as a driving force for the fluid pumping. In this parametric study, the diameters of circular electrodes are varied in the range 0.3mm~3mm and the gap between the electrodes pair is varied in the range 0.3mm~2mm. We found that both the volume flow rate and the pumping efficiency are increased as the distance between the electrodes is decreased. Finally, we also performed the numerical simulation for the three-dimensional channel and found that the averaged flow velocity is in the same order of magnitude as the two-dimensional one.

Keywords : electro-hydrodynamic, electric-field, onsager effect, DC voltage

Conference Title : ICMEAM 2014 : International Conference on Mechanical Engineering and Applied Mechanics

Conference Location : Istanbul, Türkiye

Conference Dates : February 17-18, 2014