Parametric study of an Electro-hydrodynamic conduction pump with a washer-type geometry.

Sachin Modh*, Christophe Louste, Philippe Traoré
Universite de Poitiers
e-mail: sachin.jagdish.modh01@univ-poitiers.fr

***Abstract* — This paper presents the results of a parametric study of an electrohydrodynamic pump with a washer–type geometry. In an ElectroHydroDynamic pump, liquids are pumped or mixed without any mechanical parts. Three types of Electrohydrodynamic pumps can be founded in the literature: the ion drag pump, the electro-osmosis pump and the conduction pump. In a conduction pump, heterocharge layers develop on the electrode surfaces. These charge layers are created by the process of dissociation of neutral electrolyte species into ions and the recombination of the generated ions. In the presence of an electric field, a Coulomb force is produced inside the heterocharge layers, and the liquid is set in motion. In the present work, the conduction pumping mechanism is experimentally investigated with four different washer-type electrode geometries (Inner diameter 0.5mm to 3mm, outer diameter 12mm, thickness 1mm,) and five different types of spacers (Inner diameter 10mm, outer diameter 12, thickness 5mm to 1mm,). In this paper, the working fluid is a dielectric liquid (HFE-7100). The maximum static pressure difference achieved with one electrode pair is 600Pa at 14KV. Measured pressure heads and current levels are compared for different sizes of circular holes and spacers. The generated pressure makes conduction pumping attractive for mass transport and heat transfer applications.**