The Effect of Substrate Curvature on Flexible EHD Conduction Pumping Performance: A Numerical Study

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***Abstract*—Electrohydrodynamics (EHD) pumps enable to manipulate fluids by means of electrical forces. Such electrical forces are driven by the ions transport that arises as a natural response of the fluid subjected to an electric field. EHD pumps, therefore, make possible to act on the fluid at practically our discretion via an appropriate electrodes arrangement. Because of this ability to alter the flow, pumps arouse a wide variety of potential applications from biotechnology to microelectronics, to name but a few. However, although the EHD pumping effect is well-known since 60's, most new generations of applications coming nowadays require a more in-depth insight. Particularly, most of those new applications such as bioreactors, microcooling systems, etc., require being adjustable to the working environment. Flexible pumps are devised to cover this requirement in terms of geometrical versatility, although elucidating the optimal setting in such conditions involve investigating and exploring a wider variety of scenarios. This work is aimed at tackling how the substrate curvature where the electrodes are distributed intervenes in the net pumping effect induced by the EHD force. Our results suggest that, for a moderate curvature, the EHD pumping effect remains unaltered. Nonetheless, more complex curvature and setups, including the possibility of a moving substrate, will need to be considered in future studies.**