

Simulation of the Geometric Design Parameters' Impact on the Performance of EHD Ion-Drag Micropump

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Abstract

A two-dimensional numerical simulation study has been performed to model an electrohydrodynamic (EHD) micropump. The emphasis of this study was on simulating the effect of the different geometric design parameters on the micropump pressure head and volume flow rate. The simulated design parameters are the channel height, the emitter and collector electrodes heights and widths, and the interelectrode spacing and the spacing between the electrode pairs. The micropump consisted of several electrode pairs which each can be considered as a pumping stage. The simulated working fluid was HFE-7100 3M® thermal fluid. One pumping stage were simulated where the total pressure of the pump can be calculated as pressure of one stage multiplied by the number of stages. The numerical results were first validated with published experimental data then were used to identify the influence of the different design parameters on the pump performance to obtain an optimum design.

Figures used in the abstract

Figure 1: Surface: Velocity magnitude

Figure 2

Figure 3

Figure 4