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Abstract

An experimental study on the effect of channel height on dielectrophoresis manipulation of particles

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Abstract:
A critical parameter in DEP-based manipulation is the channel height. Previous studies have examined the effect of the height on the levitation distance and capture time of particles. However, the reported effects depend on specific conditions and methods implemented. This paper experimentally investigates the effect of the microfluidics channel height on nDEP continuous manipulation of particles using co-planar electrodes, which are chosen based on our previous studies. Particles enter the micro-device, while a sheath flow pushes them towards one side of the channel. As the particles reach the electrodes, the DEP force pushes them laterally towards a target outlet. The particles also experience drag force, which acts against the DEP force. As the channel height decreases, the particles are expected to experience greater DEP and drag forces. The experimental, using the setups, goal was to determine the maximum throughput as a function of the applied voltage resulting in a particle collection efficiency of more than 99%. Each of the tests was repeated three times to make sure that the experiments were reproducible. Figure 4 shows the effect of the applied voltage on the maximum effective throughput for four different particle sizes and 25 μm micro-channel height. The results illustrated that for larger particles, the DEP force is stronger; hence, the effective flow rate is higher. The same trend was observed for larger heights. Figure 5 compares the maximum flow rates obtained from the largest voltage for different particle sizes as a function of the channel height. As the height increased the throughput decreased. Taken together these results can lead to the selection of an optimal channel height to achieve the desired throughput based on the applied voltage and the particle sizes in applications that require efficient manipulation of particles/cells.

Biography:
Hoorfar is a Professor in the School of Engineering at the University of British Columbia Okanagan and the head of the Advanced Thermo-Fluidic Laboratory (AFTL). After joining UBC, Dr. Hoorfar established a microfluidics group specializing in the development of portable devices for biomedical applications ranging from DNA purification from saliva, acetone detection from the exhale breath of a diabetes patient, circulating tumor cells detection from the blood of a metastatic patient, and cell patterning on the digital microfluidic platforms for tissue engineering. She has published more than 200 papers in reputed journals.

Recent Publications:
- Mina Hoorfar, ACS Nano. 2020
- Mina Hoorfar, Small. 2020
- Mina Hoorfar, Adv Colloid Interface Sci. 2020
- Mina Hoorfar, J Mater Sci Mater Med. 2020
- Mina Hoorfar, J Breath Res. 2020

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