

Robust Design of Electroosmosis Driven Self-Circulating Micromixer for Biological Applications

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Abstract : One of the issues that arises with microscale lab-on-a-chip technology is that the laminar flow within the microchannels limits the mixing of fluids. To combat this, micromixers have been introduced as a means to try and incorporate turbulence into the flow to better aid the mixing process. This study presents an electroosmotic micromixer that balances vortex generation and degeneration with the inlet flow velocity to greatly increase the mixing efficiency. A comprehensive parametric study was performed to evaluate the role of the relevant parameters on the mixing efficiency. It was observed that the suggested micromixer is perfectly suited for biological applications due to its low pressure drop (below 10 Pa) and low shear rate. The proposed micromixer with optimized working parameters is able to attain a mixing efficiency of 95% in a span of 0.5 seconds using a frequency of 10 Hz, a voltage of 0.7 V, and an inlet velocity of 0.366 mm/s.

Keywords : microfluidics, active mixer, pulsed AC electroosmosis flow, micromixer

Conference Title : ICLCT 2021 : International Conference on Lab-on-a-Chip Technologies

Conference Location : Istanbul, Türkiye

Conference Dates : April 26-27, 2021