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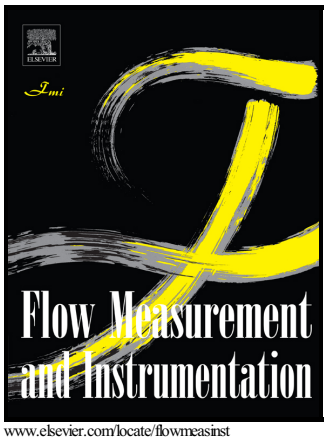


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# Measurement of Particle Migration in Micro Channel by Multi Capacitance Sensing Method

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## Abstract:

Study of particle migration is important to enhancement and increases the efficiency of the positioning and sorting process in order to produce the high yield of desired product especially in microfluidic applications. In this study, in order to study particle migration, normalized particle concentration in a micro channel has been calculated for high initial particle concentrations ($\xi$=3.0, 5.0 and 10.0 %) and the small particle diameters ($d_p$=1.3, 1.5 and 2.1 μm) by using capacitance data measured by multi capacitance sensing method. From the calculations, it has been observed that the particle concentration at the wall vicinity area is increased as $\xi$ and $d_p$ are increased while the particle concentration at the center area is decreased. To analyze the tendency of the particle migration, two quantitative indicators are introduced, viz., streamwise migration ratio (Ψ) which is the ratio of particle concentration at the downstream to the upstream cross-section position, and the cross-sectional migration ratio (Φ) which is the ratio of the particle concentration at the wall to the center area at the same cross-sectional position. The result shows that the Ψ at the center area is decreased as the particles move along the channel irrespective of $\xi$ and $d_p$ while the Ψ at the wall vicinity area is increased. Based on Ψ and Φ, it has been observed that the particle migrate from the center area towards the wall vicinity area in the case of low $\xi$ and small $d_p$ while the particles tend to concentrate on the center area in the case of high $\xi$ and the large $d_p$. As a result, the particle concentration at center is higher in the case of the lower $\xi$ and the smaller $d_p$ than that in the case of higher $\xi$ and the larger $d_p$.

**Keywords:** Particle concentration, Micro channel, Multi layered sensor electrodes, Multi capacitance sensing, Particle migration, Streamwise migration ratio, Cross-sectional migration ratio

## Nomenclature

| | |
|---|---|
| $\xi$ | initial particle concentration [v/v%] |
| $d_p$ | particle diameter [μm] |
| Ψ | streamwise migration ratio |
| Φ | cross-sectional migration ratio |
| (1-$\phi$) | calculated particle concentration [v/v%] |
| $D$ | width micro channel |
| $l$ | length |

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