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The effect of channel aspect ratio on the particle focusing in microchannels

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In this study, particle focusing mechanisms and the effect of channel aspect ratio on the focused particle streamline positions have been studied in microchannels with 30, 45 and 60 degree angles at the entrance of contraction parts. Due to these angular parts, particle focusing mechanism has been altered so that lift forces have greater effect on the particles than that of drag forces. Theory for the angle effect on the single particle focusing mechanism is explained. With using an angular path at the entrance of contraction part, wall effect induced lift force is introduced to the system in advance. Because of the angle, wall effect induced lift force is not only applying in the y direction but it is also applying in the x direction, opposing the direction of fluid flow. This x component's value is dependent on the angle and it has the highest value in 60 degree design studied. Since the x component of lift force is working against the fluid flow, 60 degree design had the single focused particle streamline at much higher flow rates than the other two designs. The effect of channel aspect ratio has also been studied. Depth of the microchannel has been lowered, which in turn the particle focusing mechanisms was altered so that the particles tend to obtain single focused particle streamlines at different positions of the microchannel by varying the flow rates. Particles were focused at the bottom of the channel at low flow rates while at higher flow rates they were focused at the top.

Biography

Huseyin Kizil received his Ph.D. degree in Materials Science and Engineering at Rensselaer Polytechnic Institute, Troy, New York in 2002. He has worked as Research Associate at General Electric Global Research Center, Niskayuna for three years. He is currently working as an Assistant Professor at Istanbul Technical University, Turkey. His research expertise spans the fields of lab-on-a-chip devices and micro-electro-mechanical based systems.

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