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Study on the effect of EDL and van der waals forces in the inlet manifold on flow distribution in parallel micro channels

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Microchannels are the channels which their hydraulic diameter is in the micrometre range. Due to their high surface to volume ratio, these channels are good implements for transfer phenomenon. They are categorized based on their geometry which depends on their functions. Flow distribution and pressure drop are two significant parameters which govern fluid condition in these channels. These parameters are functions of inlet and outlet manifold geometry, flow rate, EDL and van der Waals forces. In the present study effect of inlet manifold geometry, by a focus on triangular shape manifolds, in low Reynolds number (5<Re<10) have been studied. For this purpose, distilled water was pumped into the chip with triangular input manifold and five parallel microchannels and the flow rate for per channel was calculated, and pressure drop was also measured by a pressure transducer. Base on the result of the present study, Non-uniformity of flow distribution in the channels was not changed clearly with varying the Reynolds number. Moreover, the flow distribution with an equilateral triangle is preferable in comparison with a Right triangle. As well as an equilateral triangle with the curved wall has been studied. The results show that flow distribution is more uniform when using an equilateral triangle with a concaved wall in comparison with other structures. Also, changing the method of manufacturing microchips from laser engraving to additive manufacturing causes a more uniform distribution that this phenomenon can be explained by EDL and van der Waals forces.

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