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Single Phase Fluid Flow in Series of Microchannel Connected via Converging-Diverging Section with or without Throat

Authors : Abhishek Kumar Chandra, Kaushal Kishor, Wasim Khan, Dhananjay Singh, M. S. Alam

Abstract : Single phase fluid flow through series of uniform microchannels connected via transition section (converging-diverging section with or without throat) was analytically and numerically studied to characterize the flow within the channel and in the transition sections. Three sets of microchannels of diameters 100, 184, and 249 μm were considered for investigation. Each set contains 10 numbers of microchannels of length 20 mm, connected to each other in series via transition sections. Transition section consists of either converging-diverging section with throat or without throat. The effect of non-uniformity in microchannels on pressure drop was determined by passing water/air through the set of channels for Reynolds number 50 to 1000. Compressibility and rarefaction effects in transition sections were also tested analytically and numerically for air flow. The analytical and numerical results show that these configurations can be used in enhancement of transport processes. However, converging-diverging section without throat shows superior performance over with throat configuration.

Keywords : contraction-expansion flow, integrated microchannel, microchannel network, single phase flow
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