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MIXING PERFORMANCE ANALYSIS OF SERPENTINE MICROCHANNELS WITH STRAIGHT AND CURVED BENDS

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ABSTRACT

The microchannels play a crucial role in various Lab on a chipdevice. The performance of any microchannel is governed by the mixingcharacteristics and the pressure drop. This paper focusses on the comparativemixing performance analysis of serpentine microchannels with straight andcurved bends. COMSOL Multiphysics 5 was used for performing theComputational fluid dynamics (CFD) simulations. The aspect ratio (ratio ofchannel width to height) was varied as 0.75,1 and 1.25. The inlet velocities at the two inlets were varied as 0.5 mm/s, 0.75 mm/s, and 1mm/s. Themicrochannel width and height were 400 µm (for aspect ratio 1). The pressurevariation(drop) and mixing within straight and curved serpentine microchannelis analyzed. The effect of inlet velocity on mixing length and pressure drop isstudied. The influence of the aspect ratio on pressure drop is also investigated. It was noted that the pressure drop is enhanced with an increase in aspect ratiofrom 0.75 to 1.25.

Keywords: serpentine microchannel, straight bend, curved bend, mixing length, pressure drop.