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Micro-Scale Couette-Poiseuille Flow in Curved Microchannels ALA'ALDEEN AL-HALHOULI, Technische Universität Braunschweig, MOHAMMAD KILANI, AHMAD AL-SALAYMEH, University of Jordan, STEPHANUS BUETTGENBACH, Technische Universität Braunschweig — This work presents an extended flow model estimates for the combined effect of geometrical design parameters: channel aspect ratio, mean radius to width ratio, and polar slope ratio on the Couette-Poiseuille flow in curved microchannels. For this purpose analytical and numerical investigations were performed at different boundary conditions. The flow in spiral channel, single and double disks micropumps are Couette-Poiseuille like flow and depend on dragging the fluid between the ends of the curved protrusion by spinning a flat disk in close proximity over the curved microchannel. The flow is generated due to a net tangential viscous stress on the boundaries which produces a positive pressure gradient in the direction of flow. The combined effect of the geometrical design parameters was expressed through defining drag and pressure shape factors. The analytical estimations were verified numerically and compared with the experimental. Results show that the flow rate varies linearly with both the pressure difference and boundary velocity. The obtained extended approximate model depicts complete representation for the effect of channel width, height, polar slope, spiral length, and mean radius on the flow through curved microchannels.

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