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Analytical and Numerical Investigations of the Influence of the Geometrical Parameters on the Flow Performance of Spiral Channel Viscous Micropump. A.T. AL-HALHOULI, TU-Braunschweig, M.I. KILANI, A. AL-SALAYMEH, University of Jordan, S. BÜTTGENBACH, TU-Braunschweig — Spiral channel viscous micropump (Spiral CVMP) idea depends on dragging the fluid along a spiral channel either by rotating the spiral channel disk against a stationary flat disk or rotating the flat disk against the spiral channel. A net tangential viscous stress on the boundaries is built and produces a positive pressure gradient in the direction of flow. In this work, Analytical and numerical investigations for the effect of mean radius to channel width ratio (R_m/w) on the flow performance of a newly introduced Spiral CVMP have been carried out. Drag and shape factors for the effect of R_m/w were also generated. For this purpose computational fluid dynamics (CFD) simulations using finite volume method were performed, a number of 3D models for the pump geometry were built and analyzed at different boundary conditions. An analytical model estimating for the effect of mean radius to channel width ratio was also derived, and showed good agreement with the numerical simulations. It has been also found that the flow rate varies linearly with both the pressure difference and boundary velocity for a wide range ofR_m/w, which supports the validity of the linear lubrication model for this problem for the full range of studied parameter. Further, it is found that resulting error from ignoring $R_m/w \geq 1.0$ is less than 10%.

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