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A High-Order Accurate Numerical Solution of Incompressible Microchannel Flows in Slip and Transition Flow Regimes[1] KAZEM HEJRANFAR, MIR HAMED MOHAFEZ, ALI KHAJEH-SAEED, Aerospace Engineering Department, Sharif University of Technology, Tehran, Iran — In this study, a high-order accurate numerical solution of steady incompressible flows in 2D microchannels is presented. The numerical method used is a fourth-order compact implicit operator scheme which is efficiently implemented to solve the incompressible Navier-Stokes equations in the primitive variables formulation using the artificial compressibility method. The present methodology considers the solution of the Navier-Stokes equations with employing different slip boundary conditions on the wall to model the slip flow in microchannels. Since the slip boundary conditions contain the derivatives of the u velocity, using the compact method the slip boundary conditions can be easily and accurately implemented. Herein, different slip boundary conditions are used and the results for fully developed velocity profiles in the slip flow regime ($Kn < 0.1$) and in the transition flow regime ($Kn > 0.1$) are compared with the available numerical and analytical results which show good agreement.

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