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Compressibility Effects in 2D Wall Heating Microchannel Flow

MD. TAJUL ISLAM

Abstract:-In this article we present a numerical solution of the Navier-Stokes equations and energy equation in parallel plate microchannels with the first order slip boundary conditions on the walls, adopting control volume scheme of CFD technique. Wall heating condition was considered on the walls. Noslip boundary conditions for compressible and incompressible flows were also solved to compare the effect of slip conditions. Compressibility effects were also investigated for compressible slip and compressible noslip flow conditions. A series of simulations were performed for different heights and lengths of channels and pressure ratios. Results are presented in graphs and tables and are compared with the available analytical and experimental results. It was found that the friction constants are the highest for noslip compressible flow and lowest for the slip flow against pressure ratio and mach numbers. Friction constant decreases continuously for compressible slip flow but it approaches to an asymptotic value of 96 for compressible noslip flow for the decrease of aspect ratio.