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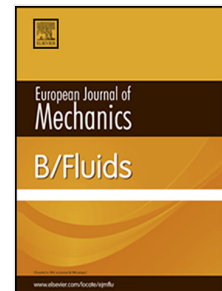
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A two-dimensional computational study of gas flow regimes past of square cylinder confined in a long microchannel

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Abstract

In this paper, the transition between steady and unsteady regimes of the two-dimensional gas flow past a moving square cylinder confined between two parallel plates with equal temperatures was investigated for different subsonic and transonic speeds and blockage ratios $B=3, 5, 10$ and 20 (B is the ratio between microchannel height and square size). The influence of B on the drag coefficient of the square, pressure at stagnation point and transition between steady and unsteady regime were studied. A set of transition curves were obtained for different blockage ratios. The results showed a similar shape of the neutral curves, which shifts to lower Knudsen and Mach numbers when B decrease. A continuum approach based on the Navier-Stokes-Fourier equations was basically applied to all flow regimes. Navier-Stokes-Fourier equations was calculated numerically by using pressure based finite volume algorithm SIMPLE-TS. For the initial transition velocity slip regime, the results were compared to data obtained by using the particle Direct Simulation Monte Carlo (DSMC) method.

Keywords: transition, steady flow regime, unsteady flow regime, microflows, continuum model, SIMPLE-TS, molecular model, DSMC, SBT
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