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Simulations of the Flow in the Liquid Floating Micro-gyroscope

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— The interactions between the centrifugal force, the cavity and the scale effect make the flow become complicated when the rotor of liquid floating micro-gyroscope rotates in a confined space at a high speed. In this paper, The Reynolds averaged equations were solved with simulation and the distribution laws of the mean flow, turbulent statics and drag were obtained in different Reynolds numbers and aspect ratios of the cavity. The circumferential velocities along z direction changed from linearity to nonlinearity with the increasing of Reynolds number, corresponding to torsional Couette flow To Batchelor flow. The radial velocities kept S shape with different maximum value and the axial velocities were nearly zeros except very close to the inner and the outer cylinders. For Reynolds stresses, they were concentrated in the vicinity of the boundary layer and the normal stresses were slightly higher than shear stresses. The drag coefficients increased with the increasing of the Reynolds number. But the growth rates were not the same in different parameters. This paper provides a guidance for the manufacture of the liquid floating micro-gyroscope.

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