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Numerical study of elastic turbulence in a 3D curvilinear micro-channel[1] HONGNA ZHANG, TOMOAKI KUNUGI, Department of Nuclear Engineering, Kyoto University, FENGCHEN LI, School of Energy Science and Engineering, Harbin Institute of Technology — Elastic turbulence is an intriguing phenomenon of viscoelastic fluid flow, and dominated by the strong nonlinear elasticity due to the existence of flexible microstructures. It implies the possibility to generate a turbulent state (so-called an elastic turbulence) in the micro-scale devices by introducing the viscoelastic fluids, which could significantly enhance the mixing efficiency therein. Several experiments have been carried out to study its characteristics and underlying physics. However, the difficulty in measuring the flow information and behaviors of the microstructures, especially in the cross section normal to the mean flow direction, limits our current understanding and controlling. In the present study, the nondimensionalization method in which the characteristic velocity is defined as the ratio of the solution viscosity to the width of the channel was adopted to simulate the elastic turbulence in the micro-scale devices. And the elastic turbulent flow was obtained numerically in the 3D curvilinear micro-channel. Therein, the characteristics of the velocity field and polymer's behavior are discussed. Moreover, the energy transfer between the kinetic energy and the polymer's elastic energy is also investigated to understand its physical mechanism.

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