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Numerical simulation of unsteady two-dimensional Giesekus flow over a circular cylinder[1] SAI PENG, PENG YU, Department of Mechanics and Aerospace Engineering, Southern University of Science and Technology, Shenzhen, 518055, China — This study numerically examines vortex shedding of two-dimensional viscoelastic flow over a circular cylinder at a Reynolds number of 100. The Giesekus model is selected to describe the viscoelastic constitutive relationship. The effects of shear-thinning and elastic properties of fluid are discussed. The shear-thinning may trigger the inertial instability by decreasing the apparent viscosity near the cylindrical wall. The elasticity may introduce extensional viscosity in the wake field to suppress flow instability. Macroscopically, the recirculation of the wake field is elongated, and both C_{lrms} and St decrease; and these trends are opposite to those induced by the shear-thinning property. However, our simulations also indicate that strong elasticity may trigger the elastic instability, which is unlike the inertial instability caused by the shear-thinning. Due to the elastic instability, very high flow field fluctuation appears at the leading edge of the cylinder. Additionally, weak elasticity can increase the drag-reduction effect of the shear-thinning solutions. However, strong elasticity or strong shear-thinning may increase the drag.

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