Some polymeric fluid flow models: steady states & large-time convergence

Anton Arnold, Institute for Analysis und Scientific Computing, E101
Vienna University of Technology

We consider a dumbbell model for a dilute solution of polymers in a homogeneous fluid. In a micro-macro model, the incompressible Navier-Stokes equation for the fluid flow is coupled to a Fokker-Planck equation for the (microscipic) distribution of the polymeric chains.

First we analyze the linear Fokker-Planck equation for Hookean dumbbells and in the case of finite extension nonlinear elasticity (FENE): steady states and large-time convergence using entropy methods. In the FENE case the stationary problem is degenerate elliptic, requiring to use weighted Sobolev spaces. In the coupled Hookean case we also show exponential convergence to a homogeneous stationary flow.

References:

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