Numerical modeling of Generalized Newtonian Flows in Channels

V. Prokop, R. Keslerová, K. Kozel

Faculty of Mechanical Engineering, CTU in Prague, Karlovo nám. 13, 113 00 Praha 2, Czech Republic

In this work are considered generalized Newtonian fluids described by the system of conservation laws and viscosity function. The system consists of equation of continuity and three momentum equations in 3D case. Energy conservation is not taken into account because temperature variations are in our case negligible. Numerical solution of steady system is in our case based on artificial compressibility method. There are different approaches to solve unsteady system of Navier-Stokes equations. One of them is the artificial compressibility that allows to use time marching method after the continuity equation is changed by addition of pressure time derivative divided by $\beta^2 \to \infty$. The other possible approach is the dual-time stepping method based on the addition of the derivative of W in fictitious dual time. The time derivative in the real time can be discretized by three–point backward formula. The scheme is implicit in the real time. Space derivatives are discretized using finite volume method in the cell centered formulation. Numerical solution of incompressible generalized Newtonian flow is sought in the geometry of channel and bypass or in geometry of branched channels.