

Qualitative properties of solutions to equations of fluid mechanics

Mgr. Jakub Tichý

Supervisor: doc. Mgr. Petr Kaplický, Ph.D.

Department: Department of Mathematical Analysis

Abstract

This thesis is devoted to the boundary regularity of weak solutions to the system of nonlinear partial differential equations describing incompressible flows of a certain class of generalized Newtonian fluids in bounded domains. Equations of motion and continuity equation are complemented with perfect slip boundary conditions. For stationary generalized Stokes system in \mathbb{R}^n with growth condition described by N -function Φ the existence of the second derivatives of velocity and their regularity up to the boundary are shown. For the same system of equations integrability of velocity gradients is proven. L^q estimates are obtained also for classical evolutionary Stokes system via interpolation-extrapolation scales. Hölder continuity of velocity gradients and pressure is shown for evolutionary generalized Navier-Stokes equations in \mathbb{R}^2 .

Keywords

Generalized Stokes and Navier - Stokes equations, incompressible fluids, perfect slip boundary conditions, regularity up to the boundary