

Experimental data convincingly show that viscosity of a fluid may change significantly with pressure. This observation leads to various generalizations of well-known models, like Darcy's law, Stokes' law or the Navier-Stokes equations, among others. This thesis investigates three such models in a series of three published papers. Their unifying topic is development of existence theory and finding a weak solution to systems of partial differential equations stemming from the considered models.