

The theory of homogenization allows to find for a given system of partial differential equations governing a model with a very complicated internal structure a system governing a model without this structure, whose solution is in a certain sense an approximation of the solution of the original problem. In this thesis, methods of the theory of homogenization are applied to three systems of partial differential equations. The first one governs a flow of a class of non-Newtonian fluid through a porous medium. The second system is utilized for modeling of a flow of a fluid through an electric field wherein the viscosity depends significantly on the intensity of the electric field. For the third system is considered an elliptic operator having growth and coercivity indicated by a general anisotropic inhomogeneous N -function.