Homogenization of a non-Newtonian flow through a porous medium

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Abstract

We consider the incompressible viscous non-Newtonian flow through a porous medium. We assume that viscosity is a nonlinear function of the symmetric velocity gradient, i.e. this nonlinear function is a generalization of the power-law case. We provide a mathematical derivation of the law governing a polymer flow through a porous medium for stationary and nonstationary case using homogenization. The crucial mathematical tool that we use is two-scale convergence, here adopted for Orlicz setting.

Keywords: generalized Stokes system, Sobolev-Orlicz space, homogenization, two scale convergence.