Models of viscous fluids with variable exponents: Results and Open Problems.

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In this talk, we shall consider the initial-boundary value problem for the generalized Navier-Stokes equations which modell isothermal flows of incompressible fluids with shear stress depending viscosity.
Firstly, we shall give an historical perpespective of the evolution of this model of Fluid Mechanics through the last centuries, starting with a simple, but outstanding, observation by I. Newton and ending up in the consideration of smart fluids. For all the considered problems, we will discuss the existence of weak solutions. In this particular, we will highlight the cases that still remain open. In a different topic, we will also discuss about the important issue of the extinction in a finite time of the corresponding solutions.
(Joint with S. Antontsev and J.F. Rodrigues)