IMPLICIT RELATIONS IN FLUID MECHANICS AND IN ABSTRACT PARABOLIC PROBLEMS

Agnieszka Swierczewska-Gwiazda

Institute of Applied Mathematics and Mechanics, University of Warsaw, Banacha 2, 02-097 Warszawa

e-mail: `aswiercz@mimuw.edu.pl`

Joint work with Piotr Gwiazda

Abstract

We are going to present both abstract parabolic equation and the parabolic system capturing the flow of incompressible non-Newtonian fluid. In the first part of the talk we describe parabolic problems containing a multi-valued term. The problem is formulated in the language of maximal monotone graphs. We assume that the growth and coercivity conditions of a nonlinear term are prescribed by means of time and space dependent N–function. This results in formulation of the problem in generalized Musielak-Orlicz spaces. We are using density arguments, hence an important step of the proof is a uniform boundedness of appropriate convolution operators in Musielak-Orlicz spaces.

In the second part of the talk we concentrate on problems arising in fluid mechanics where the relation between Cauchy stress tensor and shear rate is given by an implicit constitutive relation. An example of fluids which exhibit the behaviour which can be well described with help of the framework of maximal monotone graphs are Bingham and Herschel-Bulkley fluids.