Applications of Orlicz spaces in the theory of nonlinear PDE: non-Newtonian fluids and abstract problems

Aneta Wróblewska-Kamińska

Institute of Mathematics, Polish Academy of Sciences, Poland
`a.wroblewska@impan.pl`

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We are interested in the existence of solutions to strongly nonlinear partial differential equations. We concentrate mainly on problems which come from dynamics of non-Newtonian fluids of a nonstandard rheology and abstract theory of elliptic and parabolic equations. In considered problems the nonlinear highest order term is monotone and its behaviour – coercivity/growth condition – is given with help of some general convex function. In our research we would like to cover both cases: sub- and super-linear growth of nonlinearity. Such a formulation requires a general framework for the function space setting, therefore we work with non-reflexive and non-separable Orlicz and Musielak-Orlicz spaces. Within the presentation we would like to emphasise problems we have met during our studies, their reasons and methods which allow us to achieve existence results.

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