REGULARITY PROBLEM FOR $2m$-ORDER QUASILINEAR PARABOLIC SYSTEMS WITH NON SMOOTH IN TIME PRINCIPAL MATRIX. $(A(t), m)$-CALORIC APPROXIMATION METHOD

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Dedicated to the memory of Professor Marek Burnat

ABSTRACT. Partial regularity of solutions to a class of $2m$-order quasilinear parabolic systems and full interior regularity for $2m$-order linear parabolic systems with non smooth in time principal matrices is proved in the paper. The coefficients are assumed to be bounded and measurable in the time variable and VMO-smooth in the space variables uniformly with respect to time. To prove the result, we apply the $(A(t), m)$-caloric approximation method, $m \geq 1$. It is both an extension of the $A(t)$-caloric approximation applied by the authors earlier to study regularity problem for systems of the second order with non-smooth coefficients and an extension of the A-polycaloric lemma proved by V. Bögelein in [6] to systems of $2m$-order.

1. Introduction

In this paper we continue to study partial regularity of weak solutions to quasilinear parabolic systems. We consider a class of $2m$-order systems in the form

$$(1.1) \quad u_t(z) + (-1)^m \sum_{|\alpha|=|\beta|=m} D^\alpha(A^{\alpha\beta}(z, D^{m-1} u(z))D^\beta u(z))$$
$$= \sum_{|\alpha| \leq m} (-1)^{|\alpha|} D^\alpha F_\alpha(z),$$