Existence Result for Nonlinear Degenerated Parabolic Systems

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Abstract: An existence result of a solution for a class of nonlinear parabolic systems is established. The source term is less regular (bounded Radon measure) and no coercivity is made in the non-divergentiel lower order term $div(c(x,t)|u(x,t)|^{\gamma-2}u(x,t))$. The main contribution of our work is to prove the existence of a renormalized solution without the coercivity condition on the nonlinearities, so we used the Gagliardo-Nirenberg theorem to prove it.

Keywords: *Dirichlet problem; parabolic systems; Gagliardo-Nirenberg inequality; renormalized solutions.*

Mathematics Subject Classification (2010): Primary 35K41; Secondary 35K55, 35K65.

1 Introduction

Given a bounded-connected open set Ω of $\mathbb{R}^N$ ($N \geq 2$), with Lipschitz boundary $\partial\Omega$, $Q_T = \Omega \times (0,T)$ is the generic cylinder of an arbitrary finite hight, $T < \infty$. We prove the existence of a renormalized solution for the nonlinear parabolic systems

$$\begin{cases} \frac{\partial b_i(x,u_i)}{\partial t} - \text{div}(a(x,t,u_i,\nabla u_i) - \phi_i(x,t,u_i) - F_i) = f_i(x,u_1,u_2) & in \quad Q_T, \\ u_i(x,t) = 0 & on \quad \partial\Omega \times (0,T), \\ b_i(x,u_i(x,0)) = b_i(x,u_{0,i}(x)) & in \quad \Omega, \end{cases} \tag{1}$$

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