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Nonlinear Parabolic Equations with Singular Coefficient and Diffuse Data

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Abstract: In this paper we introduce a notion of renormalized solution for nonlinear parabolic problems whose model is $\frac{\partial b(u)}{\partial t} - \Delta A(u) - div\,(\Phi(x,t,u)Du) = \mu$ in Q, where b is a strictly increasing C^1-function defined on $\mathbb{R}$, and $A(z) = \int_0^z a(s)ds$. The function $a(s)$ is continuous on an interval $]-\infty, m[$ of $\mathbb{R}$ such that $a(u)$ blows up for a finite value m of the unknown u, Φ is a Carathéodory function and μ is a diffuse measure.

Keywords: *nonlinear parabolic equations; renormalized solutions; soft measure.*

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1 Introduction

Let Ω be a bounded open set of $\mathbb{R}^N$ $(N \geq 1)$, T be a positive real number, and $Q = \Omega \times (0,T)$.

In this paper we deal with the existence of a renormalized solution for a class of nonlinear parabolic equations of the type

$$\frac{\partial b(u)}{\partial t} - \Delta A(u) - div\,(\Phi(x,t,u)Du) = \mu \ \text{ in } Q, \tag{1}$$

$$b(u(t=0)) = b(u_0) \ \text{ in } \Omega, \tag{2}$$

$$u = 0 \ \text{ on } \partial\Omega \times (0,T). \tag{3}$$

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