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EXISTENCE AND ASYMPTOTIC BEHAVIOR OF SOLUTIONS TO A CLASS OF SEMILINEAR DEGENERATE PARABOLIC EQUATIONS WITH NONLINEARITIES OF ARBITRARY ORDER

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Abstract. We study the existence and asymptotic behavior of weak solutions to a class of semilinear degenerate parabolic equations with nonlinearities of arbitrary order. The main novelty of our result is that no restriction on the upper growth of the nonlinearities is imposed.

Keywords. degenerate parabolic equation; exponential nonlinearity; weak solution; global attractor.

AMS (MOS) subject classification: 35B41; 35D30; 35K65.

1 Introduction

In recent years, a number of papers has been devoted to the study of existence and asymptotic behavior of solutions to degenerate parabolic equations. In this paper we consider the following semilinear degenerate parabolic equation

$$\begin{cases} \dfrac{\partial u}{\partial t} - \operatorname{div}(\sigma(x)\nabla u) + f(u) = g(x), & x \in \Omega, t > 0, \\ u(x,t) = 0, & x \in \partial\Omega, t > 0, \\ u(x,0) = u_0(x), & x \in \Omega, \end{cases} \tag{1}$$

where Ω is a bounded domain in $\mathbb{R}^N$ $(N \geq 2)$ with smooth boundary $\partial\Omega$, the nonlinearity f and the external force g satisfy some conditions specified later.

Problem (1) can be derived as a simple model for neutron diffusion (feedback control of nuclear reactor) (see [9]). In this case u and σ stand for the neutron flux and neutron diffusion respectively.

The degeneracy of problem (1) is considered in the sense that the measurable, nonnegative diffusion coefficient $\sigma(x)$, is allowed to have at most a