*Dynamics of Continuous, Discrete and Impulsive Systems*
*Series* **A:** *Mathematical Analysis* **13 (2006)** 77-84


# GLOBAL EXISTENCE FOR COUPLED REACTION-DIFFUSION SYSTEMS WITH DIRICHLET BOUNDARY CONDITIONS

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**Abstract.** This paper studies the coupled reaction-diffusion systems with Dirichlet bounded conditions and establishes global existence of the solutions by using the duality technique and the Gronwall inequality. This extends some previous results of the global existence of the solution for coupled reaction-diffusion systems with Dirichlet boundary conditions.
**Keywords.** Global existence of solutions, Reaction-diffusion systems, Dirichlet boundary conditions.

# 1 Introduction

The goal of this paper is to study the global existence of solutions for the following coupled reaction-diffusion systems

$$\begin{cases} u_t - a\triangle u = f(x,t,u,v) & in \quad \Omega \times (0,\infty) \\ v_t - c\triangle u - d\triangle v = g(x,t,u,v) & in \quad \Omega \times (0,\infty) \end{cases} \tag{1.1}$$

with the Dirichlet boundary conditions

$$u = 0, v = 0, \qquad on \quad \partial\Omega \times (0,\infty) \tag{1.2}$$

and the initial data conditions

$$u(x,0) = u_0(x), v(x,0) = v_0(x),\ in\,\Omega, \text{ and}\, u_0, v_0 \in L^\infty(\Omega). \tag{1.3}$$

where $\Omega$ is a bounded open set in $R^n (2 \leq n \leq 4)$ with a smooth boundary $\partial\Omega, a > 0, d > 0, c \in R$, and $f, g$ are regular polynomially bounded $(i.e. |f(t,u,v)| \leq k(1+u+v)^m$, for some $m > 0$; same for $g$.) functions satisfying structure assumptions: $f(x,t,r,s), g(x,t,r,s) : \Omega \times [0,\infty) \times R_+^2 \to R$ are measurable and locally Lipschitz continuous in $r, s$, namely , $a.e. x, t, \forall\, 0 \leq |r_1|, |r_2|, |s_1|, |s_2| \leq r$,

$$\begin{aligned} |f(x,t,r_1,s_1) - f(x,t,r_2,s_2)| \quad &+ \quad |g(x,t,r_1,s_1) - g(x,t,r_2,s_2)| \\ &\leq \quad k(r)(|r_1 + r_2| + |s_1 - s_2|). \end{aligned} \tag{1.4}$$

Under this assumptions, it is known that the system (1.1)(1.2)(1.3) has a unique local bounded classical solution (see[3][4]).