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GLOBAL ATTRACTORS FOR A NON-CLASSICAL REACTION-DIFFUSION EQUATION WITH MEMORY

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Abstract. In this paper, we consider a periodic boundary value problem of a non-classical reaction-diffusion equation with memory. We give a detail analysis to the existence of global attractors. First we get the existence of bounded absorbing sets in the spaces $X_1 = \dot{H}^1_{per}(\Omega) \times L^2_\mu(R^+, \dot{H}^1_{per}(\Omega))$ and $X_2 = \dot{H}^2_{per}(\Omega) \times L^2_\mu(R^+, \dot{H}^2_{per}(\Omega))$, respectively. Then we use the ω-limit compactness of the solution semigroup $\{S(t)\}_{t\geq 0}$ to get the existence of global attractor.

Keywords. Infinite dimensional dynamical systems, bounded absorbing set, global attractor, compactness, memory.

AMS (MOS) subject classification: 35B40, 35B41, 35R15

1 Introduction

The study of dynamics of dissipative systems arising from mechanics and physics is a very important issue, as it is essential for practical applications[10,11]. For the problem in a bounded domain, usually we can use the Sobolev compact embedding theorem to get the compactness of the solution semigroup $\{S(t)\}_{t\geq 0}$. In contrast to systems in bounded domains, the study of dissipative systems in large and unbounded domains necessitates to develop new ideas and methods[9].

A.Q. Celebi et al[2] considered the existence of attractors for generalized Benjamin-Bona-Mathony equation with periodic boundary value problem

$$u_t - a\Delta u_t - b\Delta u - \nabla \cdot F(u) = h(x),\ x \in R^n, t \in R^+, \tag{1.1}$$

$$u(x,0) = u_0(x), \qquad x \in R^n, \tag{1.2}$$

$$u(x + L_i e_i, t) = u(x,t), \qquad x \in R^n, t > 0. \tag{1.3}$$