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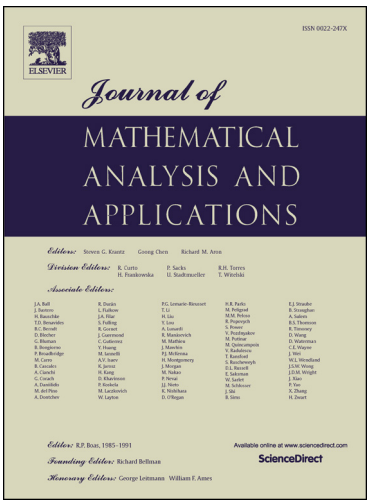

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Fenglong Sun, Lishan Liu, Yonghong Wu

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Finite time blow-up for a thin-film equation with initial data at arbitrary energy level

Fenglong Sun[a], Lishan Liu[a,b*], Yonghong Wu[b]

[a] *School of Mathematical Sciences, Qufu Normal University, Qufu 273165, Shandong, People's Republic of China*

[b] *Department of Mathematics and Statistics, Curtin University, Perth, WA6845, Australia*

Abstract

In this paper, we consider the initial boundary value problem for a class of thin-film equations in $\mathbb{R}^n$ with a p-Laplace term and a nonlocal source term $|u|^{q-2}u - \frac{1}{|\Omega|}\int_\Omega |u|^{q-2}u\mathrm{dx}$. We prove that there exist weak solutions for the problem with arbitrarily initial energy that blow up in finite time. We also obtain the upper bounds for the blow-up time.

Keywords: Thin-film equation, blow-up, upper bound for blow-up time, arbitrary initial energy, nonlocal source

MR Subject Classification 2010: 35K35, 35K92.

1 Introduction

The thin-film equation

$$u_t - \Delta^2 u + \nabla \cdot (f(\nabla u)) = g$$

*Corresponding author: Lishan Liu, Tel.:86-537-4458275; Fax:86-537-4458275.

[1]E-mail addresses: sfenglong@sina.com (F.Sun), mathlls@163.com (L.Liu), Y.Wu@curtin.edu.au(Y.Wu).

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