DYNAMICAL SYSTEM FOR EPITAXIAL GROWTH MODEL UNDER DIRICHLET CONDITIONS

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Abstract. This paper treats the initial-boundary value problem for a semilinear parabolic equation of forth order which has been presented by Johnson-Orme-Hunt-Graff-Sudijono-Sauder-Orr [8] to describe the large-scale features of a growing crystal surface under molecular beam epitaxy. In the preceding papers [4, 5, 6, 7], we have already treated the problem under the Neumann like boundary conditions $\frac{\partial u}{\partial n} = \frac{\partial}{\partial n}\Delta u = 0$. In this paper, we want to handle the same equation but under the Dirichlet boundary conditions $u = \frac{\partial u}{\partial n} = 0$, more natural boundary conditions than before. In the previous case, the leading linear operator Δ^2 was decomposed into the product $(-\Delta)^2$, where $-\Delta$ is a negative Laplace operator equipped with the usual Neumann boundary conditions and is a positive definite self-adjoint operator of L_2 space. Such a favorable decomposition is now no longer available. We have to handle a very fourth order operator Δ^2 equipped with the homogeneous Dirichlet boundary conditions.

Our goal of this paper is to construct a dynamical system generated by the initial-boundary value problem as done in [4] for the Neumann like boundary conditions.

Key words and phrases. Epitaxial Growth, Dynamical system, Attractors.