



Dr. Qiao Zhong-hua

Research interests include:

- Numerical analysis
- Scientific Computing

On-going GRF project

Error Estimates for Numerical Solutions of Epitaxy Growth Equations

Abstract

Numerical methods have been extensively studied for investigating thin film epitaxial growths. A class of typical governing equations are of Ehrlich-Schwoebel type, which involves a small positive diffusion parameter, a fourth-order diffusion term and a strong nonlinear second-order term. These difficulties require a careful study of numerical methods for complex solution dynamics. Meanwhile, a large time simulation is required to reach the steady state of numerical solutions. It has been a great challenge in error analysis for numerical solutions of thin film epitaxy equations at a large time because the error constant increases to infinity exponentially as the small diffusion parameter goes to zero.

This project focuses on both a priori and a posteriori error estimates for semi-discrete and fully discrete numerical schemes of aforementioned thin film epitaxy equations at different developmental stages. Under proper assumptions on initial data and suitable constraints on the space mesh size and the time step size at different states, rigorous error estimates will be given to limit the growth of the error constant for very small diffusion parameters. The goal of this project is to establish optimal order and quasi-optimal order error bounds for some highly efficient numerical methods for the thin film epitaxial growth simulations.