



Meiji University Global COE Program

17th Mathematical Sciences based on Modeling, Analysis and Simulation seminar



Date: November 11, 2009, 16:30~17:30

Location: Meiji Univ. Ikuta Campus, Build 2 Annex A, Room A205

Vladimir Chalupecky (Kyushu Univ.)

Title : Phase-field models of liquid-phase epitaxy

Abstract : Liquid phase epitaxy is an epitaxial technique for producing thin semiconductor films from liquid supersaturated solutions. In my talk, I will present some mathematical models and their numerical solution that describe the film growth process in the phase-field framework. First, the physical process of crystal growth by liquid phase epitaxy is presented together with various growth morphologies. Single spiral growth is modelled by a phase-field formulation of the Burton-Cabrera-Frank model. Then, we consider a two-scale model that couples the diffusion-convection transport of concentration of atoms in a three-dimensional volume above the epitaxial surface and the microscopic spiral growth at the crystal surface. This model is obtained via a homogenization procedure from the microscopic model. The numerical scheme is based on finite-difference discretization on rectangular cell-centered and staggered grids. The two-scale nature of the model allows us to use a coarse grid in the three-dimensional volume and a fine grid on the two-dimensional epitaxial surface, thus making the algorithm more efficient. Finally, we also present results of some numerical experiments.

Everyone is welcome to attend the MAS seminar.

Meiji institute for Advanced Study of Mathematical Science (<http://www.mims.meiji.ac.jp>)

(Organizers: M. Mimura, D. Ueyama, Y. Wakano and K. Ikeda)

MAS seminar is partly supported by Meiji University Global COE program “Formation and Development of Mathematical Sciences Based on Modeling and Analysis”

(<http://gcoe.mims.meiji.ac.jp/>), the Grant-in-Aid for Scientific Research (S), “Mathematical Theory of Nonlinear-Non-equilibrium Reaction-Diffusion Systems” by M. Mimura (<http://nnrds.math.meiji.ac.jp/>).

Access: 10 minutes on foot from Ikuta St. Odakyu line,
Or 10 minutes by bus No. 13「明治大学正門前」, get off at the last stop.
See http://www.meiji.ac.jp/koho/campus_guide/ for details.