



Graduate Physics Seminar
27 March 2014 from 15:00
University of Nova Gorica - Ajdovščina Campus
Vipavska 11, Ajdovščina
Amphitheatre

Markus Rettenmayr

*Friedrich Schiller University Jena
Otto Schott Institute of Materials Research, Chair of Metallic Materials*

Modeling Dendrite Growth – Alternatives to Phase Field Models

Abstract

Realistic simulation of pattern formation is to date a fascinating challenge and will certainly continue to attract the attention of physicists, material and computer scientists. Complex morphologies arise from unstable growth fronts that in turn are a consequence of a combination of large energetic turnovers (due to macroscopic heat and mass transfer) with small energetic contributions (due to capillarity effects). The most prominent and most frequently modeled morphology – the dendrite – is at the same time the technically most important one. Numerous numerical models employing a large variety of simulation methods treat dendritic solidification, with phase field models being at present the most prominent ones. However, other methods can have advantages as compared to the phase field method with respect to computation time and artificial grid anisotropy.

In the presentation, Cellular Automaton (CA) models and a Point Automaton (PA) model will be discussed with respect to their performance in the modeling of dendritic growth. While the CA models predict some of the microstructural features only approximatively, they can still be useful in the frame of simulation of technical processes. PA models bear the potential for accurate prediction of capillary effects including the anisotropy of interfacial energy.