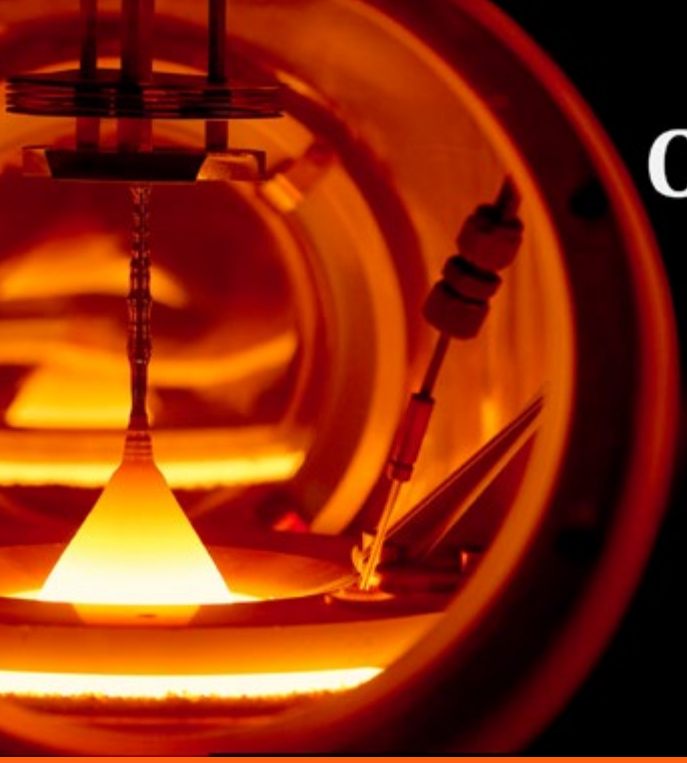

International Lectures on CRYSTAL GROWTH

Methods, Thermodynamics, Kinetics, Transport, Defects

Winter School

for students, PhDs, researchers, and industry employees

December 09–13, 2019

Berlin / Leibniz-Institut für Kristallzüchtung (IKZ)

Lecturer: Peter Rudolph (CTC)

WELCOME

The director of the Leibniz-Institut für Kristallzüchtung, Prof. Dr. T. Schröder, is pleased to announce an international Winter School on fundamentals of crystal growth that will be held December 2019 in the Max-Born-Saal, nearby the IKZ in Berlin-Adlershof.

THE LEIBNIZ-INSTITUT FÜR KRISTALLZÜCHTUNG (IKZ)

in Berlin is the international state-of-the-art competence center for science & technology as well as service & transfer for innovations in and by crystalline materials. The R&D spectrum ranges from basic over applied research up to pre-industrial development. The IKZ provides innovations in crystalline materials by its combined in-house expertise on plant engineering, numerical simulations and crystal growth to achieve highest quality crystalline materials with tailored properties. Nanostructures, thin films and volume crystals are investigated with the latter being the unique selling point of the institute. A strong theoretical and experimental materials science is a strong asset for IKZ´s R&D activities. Together with partners (e.g. institutes & industries), the institute also drives innovations by crystalline materials, namely the reliable evaluation of innovative materials for disruptive technologies.

GENERAL INFORMATION

Contact:

Lecturer:
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www.crystal-technology-consulting.de

Organisational details:
Anne Riemann
Tel: +49 30 6392 3233
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Venue:
Max-Born Saal
Max-Born-Str. 2a
12489 Berlin, Germany

Registration

Students and PHDs	50,- Euro
Academic researchers	250,- Euro
Industrial employees	500,- Euro

If you are interested in attending this year's Winter School please send an email to winter.school@ikz-berlin.de with details of your institution and position.
As space is limited the number of attendees is limited to 60.

Accomodation

All guests are asked to take care of their overnight stays themselves.
There are several hotels available nearby. A timely reservation is strongly recommended.

Organization

Leibniz-Institut für Kristallzüchtung (IKZ)
Max-Born-Str. 2
12489 Berlin, Germany
www.IKZ-Berlin.de

More details can be found on www.ikz-berlin.de/en/winter-school-19

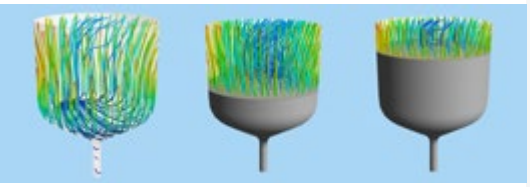
LEIBNIZ-INSTITUT FÜR KRISTALLZÜCHTUNG

International Lectures on Crystal Growth

Methods, Thermodynamics, Kinetics, Transport, Defects

THE COURSE

includes the whole range of fundamentals of crystal growth and related defect generation. In order to study and repeat the key relationships within a relative short time effectively the presentations are composed straightforwardly.



THE LECTURES

will be given by the well-known specialist on crystallization processes and crystal growth technology Prof. Dr. Peter Rudolph (Crystal Technology Consulting) who was employed at IKZ from 1994 until 2011. His lectures were already held in more than 20 countries around the world.

PROGRAM

Monday, December 09, 2019

12:00 p.m. – 1:30 p.m. I. Introduction and growth methods overview
2:00 p.m. – 4:00 p.m. II. Thermodynamics for crystal growers

The **Introductory Lecture** shows the interdisciplinary character of crystal growth, the importance of combination of the 3 main-stays thermodynamics, kinetics and transport, gives selected crystallographic requisites and summarizes methods of bulk and epitaxial crystal growth from a historical and modern challenging point of view.

The **Thermodynamics** starts with differentiation between equilibrium and non-equilibrium thermodynamics. Crux of the matter is the dialectics of potential of Gibbs. After the equilibrium between one- and multi-component phases by considering non-stoichiometry the role of surface energy is treated. The driving force of crystallization and nucleation fundamentals are discussed.

Tuesday, December 10, 2019

10:00 a.m. – 12:00 p.m. III. Kinetics of growth processes (Part 1)
2:00 p.m. – 4:00 p.m. III. Kinetics of growth processes (Part 2)

The lecture on **Kinetics** starts with introduction to atomistic interface descriptions, faceting and roughening phenomena. After that the crystal growth modes and related velocities are compared. The effects of step bunching and role of dislocations and impurities are added. Selected examples of numeric modelling are shown and illustrated.

Wednesday, December 11, 2019

10:00 a.m. – 12:00 p.m. IV. Transport of heat and mass
2:00 p.m. – 5:00 p.m. Participant self-introductions – free discussion
In short presentations the participants have the opportunity to brief each other on their current research projects, challenges and results of their work.
6:00 p.m Joint dinner of the participants

Heat and Mass Transfer are treated by considering the importance of thermal flux, radiation, diffusion and convection on crystal growth quality. Their sensitive influence on the boundary layers at the propagating interface and material homogeneity are demonstrated. Instructive results of global 3D numeric modelling are shown. Finally, advanced external control methods, such as accelerated container rotation, ultrasonic vibration and magnetic fields are discussed.

Thursday, December 12, 2019

10:00 a.m. – 12:00 p.m. V. Fundamentals and Engineering of Defects (Part 1)
2:00 p.m. – 4:00 p.m. V. Fundamentals and Engineering of Defects (Part 2)

The fundamentals on **Defect** generation are shown in the classical context – 1. point defects, 2. dislocations, 3. grain boundaries, facets, twins, 4. second phase particles. Special attention is given to the non-stoichiometry related point defects and precipitations, dislocation cell patterning, dislocations dynamics at epitaxial processes, faceting and twinning at bulk growth. Today there exists an enormous knowledge about the defect genesis. However, there are still unsolved problems of controlling, particularly, in case of high-temperature, high-dissociative substances. The lecture aims at suggestions for improved defect engineering

Friday, December 13, 2019

10:00 a.m. – 12:00 p.m. V. Fundamentals and Engineering of Defects (Part 3)
12:15 p.m. – 13:00 p.m. Certificate Ceremony for the Participants