

Lecture Series on Fundamentals of molecular beam epitaxial growth of nanostructures

By **Professor George Cirlin**
Otto Mønsted Visiting Professor from St. Petersburg Academic University

Time: **Thursdays 13:00-14:00** (exceptions are marked in **red** below)

Place: DTU Fotonik, building **340**, room **0.7.E**

This lecture series is aimed at students, post-docs, and faculty with an interest in the growth of nanostructures. It will consist of five colloquium lectures about 45-50 minutes each.

09.05.2019 (Thu) 13:00-14:00: Lecture 1 — Basics of MBE growth

Molecular beam epitaxy, definitions, advantages, main processes during interaction of molecular beams with crystal surfaces, equipment. *In situ* monitoring the growth processes using Reflection High Energy Electron Diffraction and Quadrupole Mass Spectrometry. Kinetics of MBE growth (surface diffusion, chemical interaction, evaporation, peculiarities of the beams for groups III and V species). Intentional doping.

16.05.2019 (Thu) 13:00-14:00: Lecture 2 — Heterostructures formation

Band alignment. Band gaps versus lattice parameters. Quantum wells. Superlattices. Devices based on two-dimensional structures (lasers, quantum cascade lasers, high electron mobility transistors).

23.05.2019 (Thu) 13:00-14:00: Lecture 3 — Quantum dots

Historical issues and definitions. Growth mechanisms during epitaxial growth (Stranski-Krastanow, Volmer-Weber, van der Merwe). Stress relaxation during heteroepitaxy of lattice mismatched materials. Particular systems (Ge/Si, InAs/GaAs, InAs/Si). Quantum dot molecules and superlattices. Applications.

29.05.2019 (Wed) 13:00-14:00: Lecture 4 — Nanowires (I)

Nanowires: definitions, catalyzed growth. Growth mechanisms. Diffusion-induced growth of nanowires. Dependencies of the growth conditions on the morphology of nanowires. Temperature domains for the growth of nanowires. Growth of nanowires on host substrates.

06.06.2019 (Thu) 11:00-12:00: Lecture 5 — Nanowires (II)

Heterostructured nanowires. Lateral and axial growth. Hybrid nanowire systems (quantum dot in a nanowire, quantum well in a nanowire). Devices based on nanowires.

Short Bio of Professor George Cirlin

Prof. George Cirlin is head of the laboratory in St. Petersburg Academic University and senior researcher in Ioffe Institute of Russian Academy of Sciences. Prof. Cirlin's research is focused on physics of semiconductor heterostructures and the application of heterostructures based devices for opto- and microelectronics. Last activities are concentrated on self-organized growth of nanostructures, including vertical nanowires fabrication technology. Prof. Cirlin has co-authored more than 300 papers and has several international patents. He has also been a Visiting Professor in the Laboratory of Photonics and Nanostructures CNRS, Marcoussis, France in 2006–2007, and Visiting Scientist / Alexander von Humboldt Fellow at Max-Planck Institute for Microstructure Physics, Halle/Saale, Germany in 2001–2004.

Host: Nika Akopian (DTU Fotonik)