

SCIENTIFIC AND METHOD MODULES

Module name	Synthesis of Thin Films and Nanostructures
Number	2010-M08
Aims	Deepen the understanding of epitaxial growth, growth of two-, one- and zero-dimensional films and heterostructures, synthesis of new materials via molecular precursors, ion beam methods, alloy formation, understanding and application of the different methods to prepare complex systems.
Basics	Principles of crystallography, preparation of thin films by physical and chemical techniques, thin film analysis, methods to analyze thin film properties, thermodynamics,
Contents	Understanding the physical and chemical aspects of epitaxial processes for layered and nanostructured materials. Examples from industrial processes, device relevant layered structures.
Methods	Introducing the synthetic tools for materials, thin films and nanostructures, especially to prepare complex materials, e.g., chemical deposition techniques (MOCVD), physical deposition techniques (MBE, PLD, IBAD, etc.), preparation and characterization of thin films.
Type	Two-day block course/ yearly recurrence with modification
Date (month/year)	6.Oct.- 7.Oct. 2010
Time	Day 1: 8.30 – 17.30 h, Day 2: 8.30 – 17.30 h,
Work load	15 hours presence/ 45 hours self-study
Examination	oral/ written
Credit points	2
Responsible scientists	Rauschenbach, Mayr, Grundmann,
International guest lecturers	Prof. Dr. J.E. Greene (USA) Prof. Chang Liu (China)
Industrial partners	Aixtron AG, Aachen
Recommendations for literature, e-learning	D.L.Smith, Thin Film Deposition – Principles & Practice, McGraw Hill, Boston 1995 D.Briggs, M.P.Seah, Practical Surface Analysis, Wiley, New York 1990

SCHEDULE 2010

Time	Lecturer	Program	Location
Day 1 Physical Synthesis Technologies I			
08:30 - 09:15	PD Dr. M. Lorenz, Univ. Leipzig	Lecture I: Pulsed Laser Deposition - Principle	Univ. Leipzig Kl. HS, Linnéstr. 5
		<i>Coffee Break and Discussion</i>	
09:45 - 10:30	PD Dr. M. Lorenz, Univ. Leipzig	Lecture II: Pulsed Laser Deposition - Thin Films and Nanostructures	dito
10:30 - 11:15	Dr. A. Rahm, Solarion AG	Guest lecture I: Cu(In,Ga)Se ₂ thin films for photovoltaic applications,	dito
		<i>Lunch break</i>	
11:45- 12:30	Prof. Dr. K. Nielsch, Univ. Hamburg	Guest Lecture II: Atomic Layer Deposition I - Principle	dito
12:30- 13:00	Prof. Dr. K. Nielsch, Univ. Hamburg	Guest Lecture III: Atomic Layer Deposition I - Magnetic Nanotubes and Core-Shell Nanowires	dito
14:30 - 16:00	Prof. M. Grundmann Dr. Lorenz	Practical Training in the Laboratory (in groups)	tba
		<i>Coffee Break and Discussion</i>	
16:00 - 17:30	Prof. M. Grundmann Dr. Lorenz	Practical Training in the Laboratory (in groups)	tba
Day 2 Physical Synthesis Technologies II			
08:30 - 09:30	Prof. Liu Chang / Center Nanoscience Wuhan	Guest Lecture IV: Molecular Beam Epitaxy (eingeladen)	IOM Seminarraum Geb. 32
09:30 - 10:30	Prof. S.G. Mayr	Lecture II: Structure Formation at Surfaces	dito
		<i>Coffee Break and Discussion</i>	
11:00 - 12:00	J. E. Greene University of Illinois	Guest lecture V: (angefragt)	dito
12:00 - 13:00	PD Dr. V. Mosneaga Univ. Göttingen	Guest Lecture VI: Metal-organic Chemical Vapor Deposition	dito
		<i>Lunch break</i>	
14:00 - 15:30	Prof. Rauschenbach Prof. S.G. Mayr	Practical Training in the Laboratory (in two Groups) Magnetron Sputtering (Prof. Mayr) Molecular Beam Epitaxy (Dr. Gerlach)	IOM, Labor
		<i>Coffee Break and Discussion</i>	
16:00 – 17:30	Prof. Rauschenbach Prof. S.G. Mayr	Practical Training in the Laboratory (in two Groups) Plasma-jet Deposition (Dr. Arnold) Plasma-Immersion-Deposition (PD Dr. Mändl)	IOM, Labor