BuildMoNa

SCIENTIFIC AND METHOD MODULES

Module name	Synthesis
Number	2008-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), preparation and characterization of thin films.
Type	Two-day block course/ yearly recurrence with modification
Date (month/year)	9.Oct.- 10.Oct. 2008
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	Grundmann, Rauschenbach
International guest lecturers	Prof. T. Karabaczak (Arkansas University) Prof. Z. Shen (Stockholm University) Dr. Christoph Giesen (Aixtron AG)
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

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SCHEDULE 2008

Time	Lecturer	Program	Location
Day 1		Physical Synthesis Technologies I	
08:30 - 09:30	PD Dr. Lorenz	Lecture I: Pulsed Laser Deposition - Basic phenomena and methodical aspects	P221 Linné-str. 5
09:30 - 10:30	Dr. Christoph Giesen	Guest Lecture II: Metal-organic Chemical Vapor Deposition (MOCVD) chemistry and basics of MOCVD technology	P221
		Coffee Break and Discussion	
11:00- 11:45	PD Dr. Lorenz	Lecture III: Pulsed Laser Deposition - Application to oxide thin films and nanostructures	P221
11:45- 12:30	Dr. Christoph Giesen	Guest Lecture IV: MOCVD as production technology for electronic and optoelectronic devices	P221
		Lunch break	
14:00 - 15:00	Prof. Grundmann	Practical Training in the Laboratory (in two groups) PLD I: (PD Dr. Lorenz) PLD II: (Dr. Holger von Wenckstern)	P221
		Coffee Break and Discussion	
15:00 - 16:30	Prof. Grundmann	Practical Training in the Laboratory (in groups) X-Ray Diffraction (Dr. Lorenz) Scanning Electron Microscopy (J. Lenzner)	P221
16:30 – 17:30		Test or Contributions of the Doctoral Candidates	P221
Day 2		Physical Synthesis Technologies II	
08:30 - 09:30	Prof. Rauschenbach	Lecture V: Fundamentals of Physical Thin Film Deposition	IOM
09:30 - 10:30	Prof. Z. Shen (Stockholm University)	Guest Lecture VI: Spark Plasma Sintering	IOM
		Coffee Break and Discussion	
11:00 – 12:00	Prof. T. Karabaczak (Arkansas University)	Guest Lecture VII: Simulation of the Physical Deposition Process	IOM
		Lunch break	
13:00 - 14:00	Prof. Rauschenbach	Practical Training in the Laboratory (in two Groups) Molecular Beam Epitaxy (Dr. Gerlach) Plasma-assisted Deposition (Dr. Mändl)	IOM
		Coffee Break and Discussion	
14:30 - 16:30	Prof. Rauschenbach	Practical Training in the Laboratory (in three Groups)	IOM

		Atomic Force Microscopy (Dr. Frost/Dr. Ziberi) Secundary Ion Mass Spectrometry (PD Dr. Mändl) Transmission Electron Microscopy (PD Dr. Höche)	
16:30 – 17:30		Test or Contributions of the Doctoral Candidates	IOM