BuildMoNa

UNIVERSITÄT LEIPZIG

SCIENTIFIC AND METHOD MODULES

Module name	Quantum Coherent Structures: Quantum Structures for Energy Applications
Number	2013-A3
Aims	This module treats materials, structures and quantum effects that have relevance for energy transport and energy efficiency. Thermoelectrics convert temperature difference into electrical current and rely on management of electronic and heat transport. Here, phonon scattering should be maximized in order to reduce thermal conductivity. Macroscopic condensates of polaritons can form at room temperature; here phonon scattering should be reduced in order to enhance the coherence time. The module combines lectures of introductory/overview nature and presentations on current research topics.
Basics	***Recommended knowledge:*** thematic modules T1, T3 ***Required knowledge:*** quantum mechanics, solid-state devices, thermodynamics, electron and phonon transport, dielectric structures, excitons
Contents	Thermoelectrics, Oxide electronics, Superconductivity, Bose-Einstein(-like) condensates
Methods	Electronic transport and thermal measurements, device characteristics, optical properties
Type	Two-day block course/ yearly recurrence with modification
Date (month/year)	30 September to 1 October 2013
Time	9:00 to 18:00
Work load	15 hours presence/ 45 hours self-study
Examination	Poster presentation about a self-chosen topic about "structures, quantum effects or devices in relation to energy research" (own research or from literature) and discussion (oral) in front of the poster with the organizer(s)
Credit points	2
Responsible scientists	Grundmann, Rauschenbach, Rosenow
International guest lecturers	Prof. Dr. Luis Vina (Universidad Autonoma de Madrid, Spain), Prof. Dr. Tero Heikkilä (University of Jyväskylä/Aalto University, Finland)
Industrial partners	
Recommendations for literature, e-learning	J. R. Sootsman, D. Y. Chung, M. G. Kanatzidis: "New and Old Concepts in Thermoelectric Materials", Angewandte Chemie International Edition 2009 (48) 8616 - 8639. L. Pitaevskii, S. Stringari, Bose-Einstein Condensation (Oxford, 2003)

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SCHEDULE for Module 2013-A3

Time	Lecturer	Programme	Location
30 September 2013			
9:00		Welcome address	Linnéstr. 5, ThHS
9:10	Dr. Jan König (Fraunhofer-Institut für Physik. Messtechnik, Freiburg i. Br.)	Basics of thermoelectricity - exemplified by Bi_2Te_3	Linnéstr. 5, ThHS
10:00		*Coffee break*	*Aula*
10:30	Prof. Dr. Oliver Oeckler (IMKM, Univ. Leipzig)	Overview of thermoelectric materials in fundamental science and technology	Linnéstr. 5, ThHS
11:20	Prof. Dr. Sabine Schlecht (Justus-Liebig-Universität Gießen)	Nanostructured thermoelectric materials: synthesis, properties, applications	Linnéstr. 5, ThHS
12:10		*Lunch break*	Mensa
14:10	Dr. Gabi Schierning (Universität Duisburg-Essen)	Silicon nanostructures for thermoelectric energy conversion	Linnéstr. 5, ThHS
15:00		*Coffee break*	Aula
15:30		Poster session	Aula
20:00		Dinner	
1 October 2013			
9:00	Dr. Holger von Wenckstern (Universität Leipzig)	Transparent Semiconductors - From Materials to Devices	Linnéstr. 5, ThHS
9:50	Dr. Heiko Frenzel (Universität Leipzig)	Oxide-based devices for transparent electronics	Linnéstr. 5, ThHS
10:40		*Coffee break*	*Aula*
11:10	Dr. Helena Franke (Universität Leipzig)	Distinct polaritonic effects in ZnO-based microcavities	Linnéstr. 5, ThHS
12:00	Prof. Dr. Luis Vina (Universidad Autonoma de Madrid, Spain)	All-optical logical switches with polariton condensates	Linnéstr. 5, ThHS
12:50		*Lunch break*	*Mensa*
14:50	Prof. Dr. Tero Heikkilä (University of Jyväskylä/Aalto University, Finland)	High-temperature superconductivity at graphite interfaces	Linnéstr. 5, ThHS
15:40		*Coffee break*	Aula
16:10	Prof. Dr. Matthias Vojta (TU Dresden)	From Graphene to Topological Insulators	Linnéstr. 5, ThHS

Didactic elements:
Lecture, discussions, practical training – lab demonstration, etc.

Expected performance:
Active participation in discussions during lab demonstration etc.