





SCIENTIFIC AND METHOD MODULES

Module name	Complex Nanostructures: Halide-based Functional Materials			
Number	2021-T3			
Aims	The module intends to give an overview of the international and current developments in the research area of halogen-based functional materials. Manifold application potentials arise from such materials, e.g. in the fields of thin film electronics or solar power conversion.			
Basics	Semiconductors are at the core of many industries and deliver the key contributions to the IT infrastructure (internet, computers, mobile devices), renewable energy (solar cells), displays or electromobility. The listeners should be familiar with the basic solid-state physics and concepts of band structure, band gap, light-matter interaction (optical absorption, emission) and the principle of semiconductor devices (diodes, transistors).			
Contents	The presentations in the module cover topical developments in the field of functional compound materials, in particular semiconductors, containing halogen elements. Two foci are copper iodide (CuI) and related materials as well as perovskites. Besides physical principles and material science and fabrication aspects, device applications are discussed.			
Methods	Seminars			
Туре	Online course or lecture			
Date (month/year)	30 September 2021 (1 October 2021 optional)			
Time	See page 2			
Work load	1 CP: 7 hours presence (online course), 23 hours self-study and passed			
	examination (essay)			
	2 CP. 15 hours presence, 45 hours sell-study (2 CP) and passed			
Examination	Written summary (see page 2 for more information)			
Credit points	1/2 CP			
Responsible scientists	M. Grundmann			
Industrial partners	-			
Recommendations for literature, e-learning	Marius Grundmann et al., Cuprous lodide - a p-type transparent semiconductor: history and novel applications Phys. Status Solidi A 210(9), 1671-1703 (2013)			
	Sylwia Klejna et al., Halogen-containing semiconductors: From artificial photosynthesis to unconventional computing Coordination Chemistry Reviews 415, 213316 (2020)			
	selected chapters of M. Grundmann, Physics of Semiconductors, 4th edition (Springer, 2021) doi:10.1007/978-3-030-51569-0			

SCHEDULE for Module 2021-T3

Time	Lecturer	Program	Location			
Thursday, 30 September 2021						
09:15-10:00	Prof. Dr. Hideo	Recent progress in Cul-based	online			
	Hosono	phosphors and semiconductors				
10:00-10:45	Prof. Dr. Silvana	Understanding and optimizing the	Steigenberger			
	Botti	electronic properties of Cul p-type	Hotel/online			
		transparent semiconductors				
	Coffee Break					
11:15-12:45	Dr. Masao	Molecular beam epitaxy of single-	online			
	Nakamura	crystalline iodide films toward the				
		development of halide electronics				
12:00-12:45	Dr. Andrea Crovetto	Moisture sensitivity of Cul and new	Steigenberger			
		phosphide-based p-type	Hotel/online			
		semiconductors				
		Lunch Break				
14:00-14:45	Prof. Dr. Chang	Progress in anion-doping of copper	online			
	Yang	iodide thin films				
14:45-15:30	Dr. Thomas Unold	Halide perovskites: from structure to	Steigenberger			
		electronic properties, to devices	Hotel/online			
		Coffee Break				
16:00-16:45	Dr. Tomasz Mazur	Halogen semiconductors in	Steigenberger			
		neuromorphic information processing	Hotel/online			

Friday, 1 October 2021					
09:00-10:30	Prof. Dr. Michael Lorenz; Dr. Susanne Selle; Prof. Dr. Harald Krautscheid	Presentation of sub-projects Cul Research Group FOR2857	Steigenberger Hotel		
	Coffee Break				
11:30-12:30	Prof. Dr. Marius Grundmann; Prof. Dr. Silvana Botti; Dr. habil. Holger von Wenckstern	Presentation of sub-projects Cul Research Group FOR2857	Steigenberger Hotel		
		Lunch Break			
14:00-15:00	Dr. Chris Sturm; Prof. Dr. Claudia Schnohr	Presentation of sub-projects Cul Research Group FOR2857	Steigenberger Hotel		

Didactic elements:

All lectures will be presented online. The link to the video conference will be shared with the registered participants via email.

Exam:

For the exam a written summary accompanied by a critical analysis (total of 2-3 pages) of a recent paper in the literature on halogen-containing functional materials/devices will be graded. The students can select this on their own free will, possibly motivated by one of the seminar talks.