



TC2024

Transparent Conductive Oxides – Fundamentals and Applications

Monday, 23 September to Friday, 27 September 2024
Universität Leipzig, 04103 Leipzig, Linnéstr. 5,
Lecture Hall for Theoretical Physics

Agenda

Monday, 23 September 2024

13:00 Prof. Dr. Marius Grundmann
Universität Leipzig, Germany
Opening

Tutorials: Anisotropic Properties of Oxide Semiconductors

13:15 **Tutorial I**
Prof. Dr. Marius Grundmann
Universität Leipzig, Germany
Anisotropic elastic properties

14:00 **Tutorial II**
Prof. Dr. Saskia Fischer
Humboldt-Universität zu Berlin, Germany
*Anisotropy and size effects in thermal and
thermo-electrical properties of β -Ga₂O₃*

14:45 **Tutorial III**
Dr. Chris Sturm
Universität Leipzig, Germany
Optical properties of optically anisotropic materials

15:30 *Coffee break (Aula)*

*Invited talk

°Keynote talk



Session Topic: Wide Bandgap Materials for Solar Energy Harvesting

- 16:00 Prof. Luis Pereira (*)
Universidade Nova de Lisboa, Portugal
Oxide nanostructures on mechanical energy harvesting applications
- 16:45 Dr. Frank Herklotz
Technische Universität Dresden, Germany
The interstitial hydrogen donor in SnO₂: A comprehensive spectroscopic study
- 17:00 Dr. Dwight R. Acosta Najarro
Universidad Nacional Autónoma de México, Mexico City, Mexico
Rejuvenation of electrochromic properties in rhenium doped WO₃ thin films deposited by pneumatic spray pyrolysis
- 17:15 Dr. Lars Korte (*)
Helmholtz-Zentrum Berlin für Materialien und Energie, Germany
High efficiency perovskite/Si tandem solar cells: Challenges in materials and interface design
- 19:00 Dinner for invited speakers (“Auerbachs Keller”)

Tuesday, 24 September 2024

- 10:00 *Excursion Museum of Fine Arts Leipzig - MdbK (www.mdbk.de)
Venue: Katharinenstraße 10*
- 12:30 *Lunch (Aula)*

Session Topic: Amorphous and off-stoichiometric TCOs

- 14:00 Prof. Julia Medvedeva (*)
University of Missouri, USA
Materials genome approach to defects in amorphous oxide semiconductors
- 14:45 Dr. Takashi Koida
National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan
Amorphous SnO₂ thin films with superior conductivity: Production methods, characterizations, and comparative analysis with amorphous In₂O₃ thin films

*Invited talk
°Keynote talk



- 15:00 Chun Yuen Ho
University of Southern Denmark, Sønderborg, Denmark
Defects evolution and upscaling of aluminum doped zinc oxide
- 15:15 Dr. Andrey Zameshin
Malvern Panalytical B.V., Almelo, The Netherlands
Thin films and wafer analysis with laboratory X-ray diffraction techniques
- 15:30 *Coffee break (Aula)*
- 16:00 Prof. Dr. Bernd Szyszka (*)
Technische Universität Berlin, Germany
Current status of hollow cathode gas flow sputtering for advanced TCO films
- 16:45 Alexander Creutz
Technische Universität Darmstadt, Germany
Electrical properties of partially reactive co-sputtered In_2O_3 thin films
- 17:00 ***Karl Bädeker Lecture***
Prof. Dr. Darrell Schlom
Cornell University, Ithaca, USA
Navigating reaction pathways to grow TCOs by suboxide MBE
- 18:00 Poster session and finger food (TA307)

Wednesday, 25 September 2024

Session Topic: Ultra-wide Bandgap Materials

- 09:00 Dr. Alexander Karg (*)
Universität Bremen, Germany
MBE growth of $\kappa\text{-Ga}_2\text{O}_3$: From phase stabilization towards the realization of heterostructures
- 09:45 Clemens Petersen
Universität Leipzig, Germany
Structural properties of PLD-grown ternary alloys of rhombohedral transition metal sesquioxides and $\alpha\text{-Ga}_2\text{O}_3$

*Invited talk

°Keynote talk



- 10:00 Martin Williams
Universität Bremen, Germany
Growth, catalysis and faceting in α -Ga₂O₃ and α -(In_xGa_{1-x})₂O₃ on m-plane α -Al₂O₃ by molecular beam epitaxy
- 10:15 Dr. Javier García Fernández
University of Oslo, Norway
Probing, microstructure, crystallization and phase segregation in (In_{1-x}Ga_x)₂O₃ thin films by TEM
- 10:30 *Coffee break (Aula)*
- 11:00 Prof. Piero Mazzolini (*)
University of Parma, Italy
Engineering shallow and deep level defects in κ -Ga₂O₃ thin films: Comparing metal-organic vapour phase epitaxy to molecular beam epitaxy and the effect of annealing treatments
- 11:45 Wenshan Chen
Paul-Drude-Institut Berlin, Germany
Phase transitions of GeO₂ by in-situ solid phase epitaxy and ex-situ post-annealing
- 12:00 *Lunch (Aula)*

Session Topic: TCMs: Halide Semiconductors

- 14:00 Prof. Monica Morales-Masis (*)
University of Twente, The Netherlands
Development and study of novel transparent conducting materials for solar cells
- 14:45 Dr. Michael Seifert
FSU Jena / Ruhr-Universität Bochum, Germany
Computational prediction and characterization of CuI-based ternary p-type transparent conductors
- 15:00 Yang Chen
Universität Leipzig, Germany
Heteroepitaxial growth of γ -CuI thin films deposited by PLD with modification of the conductivity

*Invited talk

°Keynote talk



- 15:15 Dr. Romain Claes (°)
University of Birmingham, UK
Limits to hole mobility and doping in copper iodide
- 15:45 Sandra Montag
Universität Leipzig, Germany
Nonlinear bond length change in zincblende Cu(Br,I) alloys
- 16:00 *Group photo shooting (in front of the main entrance)*
Coffee break (Aula)

Session Topic: Post-growth Annealing of Wide Bandgap Alloys

- 16:30 Dr. Takuya Hosokai (*)
AIST, Japan
Real-time monitoring of the laser-induced functionalization of transparent conductive oxide films
- 17:15 Dr. Jiri Rezek
University of West Bohemia, Pilsen, Czech Republic
Enhancement of hole mobility in high-rate reactively sputtered CuO₂ thin films induced by high-power infrared laser
- 17:30 Mustafa Göktürk Yazlak
Universität Leipzig, Germany
Revealing the incorporation site and local structure of nickel and selenium in doped CuI thin films using X-ray absorption spectroscopy
- 17:45 Christiane Dethloff
Universität Leipzig, Germany
Eliminating oxygen in-diffusion into CuI thin films and cappings through area-selective magnetron co-sputtering
- 18:00 Dr. Ryotaro Nakazawa
Institute for Molecular Science, Okazaki, Japan
In-gap states of an amorphous In-Ga-Zn-O₄ thin film studied via photoemission spectroscopies: Direct observation of light-induced in-gap states
- 18:15 Dr. Thomas Dittrich
Helmholtz Zentrum Berlin für Materialien und Energie GmbH, Berlin, Germany
Surface photovoltage spectroscopy of ultra-wide bandgap materials
- 20:00 Prize ceremony and conference banquet at "Mückenschlösschen"

*Invited talk

°Keynote talk



Thursday, 26 September 2024

Session Topic: Local Structures and Interfaces

- 09:00 Prof. Dr. Claudia S. Schnohr (°)
Universität Leipzig, Germany
Short-range structure and amorphous nature of Zn-Sn-O and Cu-Sn-O semiconductor thin films
- 09:30 Peter Callaghan
Trinity College Dublin, Ireland
Investigating the local bonding structure of amorphous zinc tin oxide to elucidate the effect of altering the intercation ratio
- 09:45 Dr. Ramon Schifano
Polish Academy of Sciences, Warsaw, Poland
Branch point energies in ZnO and MgO measured using ZnMgO:Al/Si heterostructures
- 10:00 Dr. Elzbieta Guziewicz
Polish Academy of Sciences, Warsaw, Poland
Acceptor and donor states in N-doped ZnO films: Effect of strain and surface proximity
- 10:15 *Coffee break (Aula)*

Session Topic: UWBG-based Devices

- 10:45 Dr. Andrew Green (*)
Air Force Research Laboratory, USA
Gallium oxide microelectronics
- 11:30 Dr. Sofie Vogt (°)
Universität Leipzig, Germany
High performance metal-semiconductor field-effect transistors on zirconium doped α -Ga₂O₃
- 12:00 *Lunch (Aula)*

*Invited talk

°Keynote talk



Session Topic: Polymorphism in UWBG Semiconductors

- 14:00 Prof. Dr. Markus Wagner (°)
Paul-Drude-Institut Berlin, Germany
Anisotropy of optical transitions and thermal transport in Ga₂O₃ polymorphs
- 14:30 Prof. Dr. Vassilios Binas (°)
Aristotle University of Thessaloniki, Greece
Transparent conductive oxides for energy and electronic applications
- 15:00 Prof. Yasushi Hirose (*)
Tokyo Metropolitan University, Japan
Rutile SnO₂-GeO₂ alloy-based deep ultraviolet-transparent conducting films
- 15:45 *Coffee break (Aula)*

Session Topic: Advanced Aspects of Solar Cell and Wide Bandgap Materials

- 16:15 Prof. Dr. Wolfgang Tress (*)
Zürcher Hochschule für Angewandte Wissenschaften, Switzerland
Characterizing perovskite optoelectronic devices
- 17:00 Dr. Thorsten Schultz (°)
Technische Universität Berlin, Germany
X-ray photoelectron spectroscopy – a versatile characterization tool for transparent conducting oxides

Friday, 27 September 2024

Session Topic: Multinary Wide Bandgap Materials

- 09:00 Prof. Dr. Janine George (*)
Bundesanstalt für Materialforschung und -prüfung, Berlin, Germany
High-throughput approaches for materials understanding and design
- 09:45 Jorrit Bredow
Universität Leipzig, Germany
Towards synthesis of compositionally graded multi-component oxide thin films by CCS-PLD using multi-segmented targets

*Invited talk

°Keynote talk



- 10:00 Minseok Kim
Aoyama Gakuin University, Sagamihara, Japan
Independent control of the valence band maximum and conduction band minimum of amorphous Cd–In–Ga–O thin film by adjustment of Cd and Ga concentration
- 10:15 Dr. Karsten Fleischer
Dublin City University, Ireland
Complex growth kinematics in spray pyrolysis grown ternary transparent conducting oxides
- 10:30 Daichi Miyagi
Aoyama Gakuin University, Sagamihara, Japan
p-type Cu₂O films deposited by RF sputtering using Cu or Cu₂O targets
- 10:45 *Coffee break (Aula)*
- 11:15 Dr. Jonas Deuermeier (*)
Universidade Nova de Lisboa, Portugal
ZTO-based memristors and diodes for neuromorphic computation
- 12:00 Shiun Inoue
Chiba University, Chiba, Japan
Observation of in-gap states in Cu₂O thin films using constant initial and final states yield spectroscopy
- 12:15 Dr. Brian Walls
Trinity College Dublin, Ireland
Crystallographic structure and electrical and optical properties of V₂O₃ - Cu₂O bilayers
- 12:30 Prof. Dr. Marius Grundmann
Universität Leipzig, Germany
Closing
- 12:40 Prospective end

*Invited talk

°Keynote talk