

GRK 2948

Workshop 20.03.2026

Institute of Computational Physics – Prof. C. Holm
Allmandring 3, 70569 Stuttgart

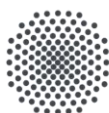


**MIXED
IONIC-ELECTRONIC
TRANSPORT**

Time	Speaker	Title
09:30 – 09:55 h	Arrival & coffee (hanging up posters)	
09:55 – 10:00 h	Prof. Jana Zaumseil & Prof. Sabine Ludwigs	Welcome
10:00 – 10:45 h	Prof. Christian Holm, Uni Stuttgart	<i>Ionic Liquids Under the Microscope: Transport Phenomena for Energy Storage Applications</i>
10:45 – 11:05 h	Yanzhe Huang	<i>Self-stratified PEDOT:PSS Actuators with Programmable Hygro-electro Response</i>
11:05 – 11:25 h	Yachen Li	<i>Electrochemical Transistors with Single- Walled Carbon Nanotube Networks, Semiconducting Polymers, or their Hybrids</i>
11:30 – 12:15 h	Delavier, Eiden, Günes, Hämmerle, Kollenz, Krebs, Quarti, Rinke, Schömig, Stammer, Sun, Xu	<i>Poster Flash Talk Session 12 Posters à 3 Minutes</i>
12:15 – 13:45 h	Lunch & Poster session I	
13:45 – 14:30 h	Prof. Stefan Weber Uni Stuttgart	<i>Multimodal Microscopy of Ion Dynamics in Hybrid Perovskites</i>
14:30 – 14:50 h	Jiyuan Zheng	<i>Magnetism, Electronic Properties and Ionic Transport in $(\text{Li}_2\text{M})\text{ChO}$ ($\text{M} = \text{Mn, Fe, Co}$ $\text{Ch} = \text{S, Se}$) and MA_2CoBr_4</i>
14:50 – 15:10 h	Pooja Jangra	<i>Functionalization of Ion-selective Organic Cage for Sensing Applications</i>
15:10 – 15:30 h	Garrett May	<i>Quantifying Anisotropic Electron Diffusion via Transient Absorption Spectroscopy</i>
15:30 – 17:00 h	Coffee break & Poster Session II	
17:00 – 18:00 h	Dr. Lucas Kreuzer TU München, Workshop	<i>Visible Science – Visible Scientists: Self- Branding and Communication in Research</i>
18:00 h	Barbecue, Mixer	



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List of Flash Talk Presentations and Posters

Presenter	Title
Christian Delavier	<i>Development of Photopolymers for Energy Storage Applications</i>
Silas Eiden	<i>3D Digital Light Processing of Polypyrrole-Containing Materials</i>
Gönç Berk Güneş	<i>Rheological Characterization of 3D-printed PEDOT:PSS Hydrogels</i>
Mona Hämmerle	<i>Conductive Polymeric 3D Scaffolds via 2-Photon Lithography</i>
Philipp Kollenz	<i>Excited-state Reservoir Computing via Defect-mediated Opto-ionic Dynamics in Hybrid Perovskites</i>
Tobias Krebs	<i>The Role of Disorder on OECT Switching</i>
Fabio Quarti	<i>Implementing Anion Selective Cages in New Mixed Ionic Electronic Conductors</i>
Felix Rinke	<i>Swelling-induced Deformations in Hydrogels: Modelling and Parameter Identification</i>
Richard Schömig	<i>An Atomistic Study of Water Dynamics in PEDOT:PSS Networks</i>
Florian Stammer	<i>In-situ Raman Microscopy of Water-gated Single-Walled Carbon Nanotube Transistors</i>
Xiuming Sun	<i>Electrochemical Doping of Naphthalenediimide-Bithiazole-Copolymer Films: from Fundamentals to Devices</i>
Xuqiang Xu	<i>3D Printed Solid-State Electrolyte for Nanotube-Based Electrochemical Transistors</i>

Ionic Liquids Under the Microscope: Transport Phenomena for Energy Storage Applications

Prof. Christian Holm

Institute for Computational Physics, University of Stuttgart

In this talk, I will present our insights into the static structure and charging dynamics of model ionic liquids confined within narrow pores. Motivated by the wide range of anticipated applications of supercapacitors, we examine how ions arrange themselves under nanoscale confinement and identify the key factors governing their transport properties.

Transport properties are crucial for understanding charging and discharging cycles in supercapacitors, while static properties provide essential guidance for designing electrolytes optimized for energy storage. In addition, we analyze the impact of specific modeling choices for the electrodes. In particular, we revisit the ongoing debate between constant-charge and constant-potential boundary conditions and assess their consequences for confined systems.

Our results highlight important implications of modeling electrodes as perfect metals, especially for ionic liquids confined within narrow slit geometries.

Refs:

K. Breitsprecher, K. Szuttor, CH, J. Phys. Chem. C, 119, 22445–22451 (2015)

K. Breitsprecher et al., J. Chem. Phys. 147 104708 (2017)

K. Breitsprecher et al., ACS Nano 12 9733-9741 (2018)

K. Breitsprecher et al., Nat. Comm. 11 6085 (2020)

A. Reinauer, S. Kondrat, CH, J. Chem. Phys. 161, 104101 (2024)

A. Reinauer, S. Kondrat, CH, J. Phys. Chem. C, in press, (2026)

Multimodal Microscopy of Ion Dynamics in Hybrid Perovskites

Prof. Stefan Weber

Nanoscale Microscopy & Characterization, Institute for Photovoltaics, University of Stuttgart

Hybrid metal-halide perovskites (MHPs) are characterized by a soft ionic crystal lattice that promotes structural fluctuations and ion migration. Additionally, typical MHP thin films are characterized by a plethora of nanoscale structures that range from sub-granular twin domains and segregated phases, over grain boundaries and interfaces to lateral variations in crystal grains orientations and facets. Yet, in spite of this high degree of static and dynamic disorder, MHP devices such as solar cells, transistors and LEDs show a remarkable performance, often comparable to high-quality crystalline materials such as silicon or III-V semiconductors. To fully understand MHP materials requires the characterization of the many nano- and microscale structures and their influence on the complex mixed electronic-ionic charge carrier dynamics. Electrical SPM operation modes like Kelvin probe force microscopy (KPFM) or conductive atomic force microscopy (C-AFM) are ideally suited to decipher these structure-function relationships.

Based on static and time-resolved KPFM, we have developed unique techniques for mapping the surface potential, photovoltage, as well as local impedance spectra. Using cross sectional measurements, we map the potential distribution dynamics across different layers of solar cell devices under operating conditions. Thus, ion ionic transport and interfacial charge accumulation can be mapped and traced under realistic working conditions. As one single measurement technique cannot capture the full picture, we have developed a combined optical-scanning-probe platform that integrates spatially resolved photoluminescence (PL), time-resolved PL (TRPL) and electrical scanning probe microscopy (KPFM, C-AFM and local impedance nanoscopy). This multimodal microscope allows simultaneous measurements with diffraction-limited confocal PL spectroscopy (≈ 300 nm lateral resolution), time-resolved photoluminescence (TRPL, time-resolution $\sim$ ps) and quantitative electrical AFM (10-20 nm lateral resolution) on one and the same structure. This “nanoscale photovoltaics lab on a tip” (NanoPLoT) therefore bridges the long-standing divide between optical spectroscopy and nanoscale electrical probing. By delivering a correlative view of band-gap emission, ionic and electronic carrier dynamics and electrostatic landscape, it enables a detailed understanding of nanoscale disorder and how it impacts macroscopic function and limits MHP device performance. This approach can be easily applied to other emerging mixed electronic-ionic systems and offers a powerful tool for rational engineering of grain boundaries, functional interfaces and compositional stability.

Visible Science – Visible Scientists: Self-Branding and Communication in Research

Dr. Lucas Kreuzer

Heinz Maier-Leibnitz Zentrum, Technical University of Munich

Scientific excellence alone does not ensure visibility or impact. In today's competitive and digital research landscape, scientists increasingly need to communicate their work clearly and develop a recognizable professional identity.

This interactive talk introduces practical approaches to science communication and self-branding for researchers. It explores how scientific expertise and personal profiles can be positioned strategically within academia and beyond, and how digital and social media platforms can be used to enhance visibility and credibility without compromising scientific rigor.

Participants will leave with concrete takeaways and a simple action framework to strengthen their professional visibility and career opportunities in academia and beyond.