

ICII-2024

International Conference on Internal Interfaces

02 – 05 September 2024
Marburg, Germany



Program and Abstracts

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Interfaces between solids play a decisive role in modern materials sciences and their technological applications. ICII-2024 provides an expert forum for the discussion of recent progress as well as of experimental and theoretical challenges in fundamental research of solid/solid interfaces. Scientific topics include: interfaces of two-dimensional semiconductors, organic/inorganic interfaces, hybrid organic/layered materials interfaces, interfaces with carbon-based materials, ultrafast charge transfer processes at interfaces, properties of interface excitons, chemical reactivity and interphase formation, synthetic interface chemistry, electronic and structural characterization of solid/solid interfaces, interface-specific optical spectroscopies, electron microscopy at internal interfaces, advances in theoretical methods for solid/solid interfaces, computational materials design.

Organizers:

Prof. Dr. Ermin Malic
Prof. Dr. Kerstin Volz
Prof. Dr. Ulrich Höfer
Prof. Dr. Michael Gottfried
Prof. Dr. Gregor Witte

Philipps-Universität Marburg
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Conference Secretary:

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Conference Location:

University Library, Deutschhausstraße 9, 35037 Marburg

Financial Support:

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Corporate Sponsor:

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Scientific Program

Monday, 02.09.2024

08:30 – 09:00 *Registration* *University Library*

09:00 – 09:10 *Welcome*

**Session I Perovskite Interfaces: Dynamics, Excitons and Applications I
(Chair: Christian Schneider)**

09:10 – 09:40 **Lukas Schmidt-Mende, University of Konstanz**
Perovskite solar cells - reducing the defect density

09:40 – 10:10 **Ilja Akimov, University of Dortmund**
Coherent optical spectroscopy in perovskite semiconductors

Coffee break

**Session II Semiconductor Interfaces: Spectroscopy, Dynamics and Growth I
(Chair: Markus Raschke)**

10:40 – 11:10 **Andrey Turchanin, University of Jena**
Tailored growth of transition metal dichalcogenide monolayers and their heterostructures

11:10 – 11:30 **Oliver Maßmeyer, University of Marburg**
MOCVD growth of 2D GaS: Influence of nucleation and interface formation on 2D film properties

11:30 – 12:00 **Ron Tenne, University of Konstanz**
A new look at spectral fluctuations in the emission of semiconductor nanocrystals

12:00 – 12:30 **Christian Schneider, University of Oldenburg**
Controlling excitons in two dimensional materials via tunable optical cavities

12:30 – 14:30 *Lunch Break*

Session III **TMDC interfaces: Exciton dynamics I (Chair: Marina Gerhard)**

- 14:30 – 15:00 **Ralph Ernstorfer, Fritz Haber Institute Berlin**
Exciton dynamics in momentum space: watching excitations fission or transfer across interfaces
- 15:00 – 15:30 **Markus Raschke, University of Colorado Boulder, Colorado, USA**
Ultrafast nano-imaging: Probing quantum dynamics in space and time
- 15:30 – 15:50 **Jens Gdde, University of Marburg**
Ultrafast dynamics of interface currents
- 15:50 – 16:20 **Alice Kunin, Princeton University, New Jersey, USA**
Interlayer, intralayer, and defect-bound excitons in transition metal dichalcogenide moir heterostructures
- Coffee break*

Session IV **Hybrid Interfaces I (Chair: Jens Gdde)**

- 16:50 – 17:20 **Mischa Bonn, Max Planck Institute for Polymer Research, Mainz**
Tracking and controlling ultrafast charge and energy flow in graphene-semiconductor heterostructures
- 17:20 – 17:40 **Marina Gerhard, University of Marburg**
Efficient exciton funneling and singlet fission in binary molecular systems
- 17:40 – 18:10 **Norbert Koch, Humboldt University of Berlin**
Charge and energy transfer in van der Waals heterostructures of organic molecules and 2D semiconductors

Tuesday, 03.09.2024

- 09:00 – 09:40 **Ulrich Höfer, University of Marburg**
Structure and dynamics of internal interfaces: Some highlights
- Session V Semiconductor Interfaces: Spectroscopy, Dynamics and Growth II**
(Chair: Stefan Tautz)
- 09:40 – 10:10 **Alexey Chernikov, TU Dresden**
Tunable exciton dynamics and transport in 2D materials
- 10:10 – 10:40 **Jonathan Finley, TU München**
Probing interactions in 2D-heterostructures: Excitons, phonons and strongly correlated phases
- Coffee Break*
- Session VI Hybrid Interfaces II (Chair: Ulrich Höfer)**
- 11:10 – 11:40 **Kirill Bolotin, FU Berlin**
2D materials + molecules: from ultrastrong electric fields to exciton manipulation
- 11:40 – 12:00 **Stefan Tautz, Forschungszentrum Jülich**
From photoemission orbital tomography to cinematography
- 12:00 – 12:30 **Catarina Cocchi, University of Oldenburg**
Electronic structure and light-matter dynamics in organic/inorganic interfaces: Insights from first principles
- 12:30 – 14:30 *Lunch Break*
- Poster Session I**
- 14:30 – 17:00 Poster Session
- 17:00 *City tour (prior registration required)*

Wednesday, 04.09.2024

Session VII Microscopy and Spectroscopy of Interfaces I (Chair: Michael Dürr)

09:00 – 09:30 **Nan Jiang, University of Illinois Chicago, Illinois, USA**
Angstrom-scale spectroscopic visualization of interfacial interactions in an organic/two-dimensional materials vertical heterostructure

09:30 – 09:50 **Michael Gottfried, University of Marburg**
Exploring new carbon allotropes and nanographenes at interfaces

09:50 – 10:20 **Markus Lackinger, Deutsches Museum / LMU München**
Topochemical photopolymerization on photoexcitable crystalline surfaces

Coffee Break

Session VIII Microscopy and Spectroscopy of Interfaces II (Chair: Michael Gottfried)

10:50 – 11:20 **Quentin Ramasse, University of Leeds, United Kingdom**
Recent advances in high-resolution electron energy-loss spectroscopy and applications to electronic structure determination at interfaces

11:20 – 11:40 **Kerstin Volz, University of Marburg**
4D Scanning Transmission Electron Microscopy for quantification of real and electronic structures at interfaces

11:40 – 13:10 *Lunch Break*

Session IX Microscopy and Spectroscopy of Interfaces III (Chair: Kerstin Volz)

13:10 – 13:40 **Petra Tegeder, University of Heidelberg**
Adsorption and electronic properties of interfaces with functional molecules

13:40 – 14:00 **Michael Dürr, University of Giessen**
Organic/inorganic interface formation on Si(001) using selective click reactions

Session X 2D Semiconductor Interfaces: Exciton Theory I (Chair: Markus Lackinger)

14:00 – 14:30 **Jaroslav Fabian, University of Regensburg**
Interfacing 2D materials for spin engineering

14:30 – 14:50 **Ermin Malic, University of Marburg**
Moiré exciton dynamics in twisted 2D materials

Coffee Break

Poster Session II

15:20 – 17:20 Poster Session

18:30 – 21:00 *Dinner* *Fürstensaal*

from 21:00 *City tour “Marburg im Laternenschein” (prior registration required)*

Thursday, 05.09.2024

Session XI Hybrid Interfaces III (Chair: Gregor Witte)

09:00 – 09:30 **Paolo Samori, University of Strasbourg**
Dressing 2D materials with molecules: sophisticated structures enabling complex functions

09:30 – 10:00 **Elke Scheer, University of Konstanz**
Interface-created triplet superconductivity in superconductor-helium magnet van der Waals bilayers

Session XII 2D Semiconductor Interfaces: Exciton Theory II (Chair: Stefan Mathias)

10:00 – 10:30 **Thomas Heine, TU Dresden**
Mattermorphosis or the magic of twisted 2D materials

10:30 – 11:00 **Sivan Refaely-Abramson, Weizmann Institute of Science, Israel**
Excited-state dynamics in low-dimensional semiconductors: an ab initio approach

Coffee Break

Session XIII Perovskite Interfaces: Dynamics, Excitons and Applications II (Chair: Ermin Malic)

11:20 – 11:50 **Paulina Plochocka, LNCMI – CNRS, Toulouse, France**
Perovskite–Exciting Playground for exciton and polaron studies

11:50 – 12:10 **Sangam Chatterjee, University of Giessen**
White-light emission from self-trapped excitons in low-dimensional perovskites

12:10 – 13:40 *Lunch Break*

Session XIV TMDC interfaces: Exciton dynamics II (Chair: Sangam Chatterjee)

13:40 – 14:10 **Stefan Mathias, University of Göttingen**
Excitonic charge transfer at 2D material interfaces

14:10 – 14:30 **Nadine Leisgang, Harvard University, Massachusetts, USA**
Interlayer excitons in gated two-dimensional semiconductors

**Session XV Semiconductor Interfaces: Spectroscopy, Dynamics and Growth III
(Chair: Elke Scheer)**

14:30 – 15:00 **Tobias Korn, University of Rostock**
*Tuning excitons in two-dimensional crystals and van der Waals
heterostructures via interlayer alignment*

15:00 – 15:20 **Gregor Witte, University of Marburg**
*Hybrid systems of 2D materials/organic adlayers: Interface properties and
fabrication challenges*

15:20 – 15:30 *Closing remarks*

Timetable

| | Monday, 02.09.2024 | Tuesday, 03.09.2024 | Wednesday, 04.09.2024 | Thursday, 05.09.2024 | |
|---------------|--|---|--|--|---------------|
| 09:00 - 09:10 | Welcome | Höfer | Microscopy and Spectroscopy of Interfaces I Jiang | Hybrid Interfaces III Samori | 09:00 - 09:10 |
| 09:10 - 09:20 | Perovskite Interfaces I Schmidt-Mende | | Gottfried | Scheer | 09:10 - 09:20 |
| 09:20 - 09:30 | | | | | Lackinger |
| 09:30 - 09:40 | | | Akimov | Semiconductor Interfaces II Chernikov | |
| 09:40 - 09:50 | | Coffee Break | | | Finley |
| 09:50 - 10:00 | Coffee Break | | Coffee Break | Refaely-Abramson | |
| 10:00 - 10:10 | | Semiconductor Interfaces I Turchanin | | | Coffee Break |
| 10:10 - 10:20 | Maßmeyer | | Hybrid Interfaces II Bolotin | Volz | |
| 10:20 - 10:30 | | Tenne | | | Tautz |
| 10:30 - 10:40 | Schneider | | Cocchi | Lunch Break | |
| 10:40 - 10:50 | | Lunch Break | | | Lunch Break |
| 10:50 - 11:00 | Lunch Break | | Lunch Break | Dürr | |
| 11:00 - 11:10 | | Lunch Break | | | Lunch Break |
| 11:10 - 11:20 | Lunch Break | | Lunch Break | Malic | |
| 11:20 - 11:30 | | Lunch Break | | | Lunch Break |
| 11:30 - 11:40 | Lunch Break | | Lunch Break | Poster Session I | |
| 11:40 - 11:50 | | Lunch Break | | | Lunch Break |
| 11:50 - 12:00 | Lunch Break | | Lunch Break | Poster Session II | |
| 12:00 - 12:10 | | Lunch Break | | | Lunch Break |
| 12:10 - 12:30 | Lunch Break | | Lunch Break | Poster Session II | |
| 12:30 - 13:10 | | Lunch Break | | | Lunch Break |
| 13:10 - 13:40 | Lunch Break | | Lunch Break | Poster Session II | |
| 13:40 - 14:00 | | Lunch Break | | | Lunch Break |
| 14:00 - 14:10 | Lunch Break | | Lunch Break | Poster Session II | |
| 14:10 - 14:30 | | Lunch Break | | | Lunch Break |
| 14:30 - 14:50 | Lunch Break | | Lunch Break | Poster Session II | |
| 14:50 - 15:00 | | Lunch Break | | | Lunch Break |
| 15:00 - 15:20 | Lunch Break | | Lunch Break | Poster Session II | |
| 15:20 - 15:30 | | Lunch Break | | | Lunch Break |
| 15:30 - 15:50 | Lunch Break | | Lunch Break | Poster Session II | |
| 15:50 - 16:20 | | Lunch Break | | | Lunch Break |
| 16:20 - 16:50 | Lunch Break | | Lunch Break | Poster Session II | |
| 16:50 - 17:00 | | Lunch Break | | | Lunch Break |
| 17:00 - 17:20 | Lunch Break | | Lunch Break | Poster Session II | |
| 17:20 - 17:30 | | Lunch Break | | | Lunch Break |
| 17:30 - 17:40 | Lunch Break | | Lunch Break | Poster Session II | |
| 17:40 - 18:10 | | Lunch Break | | | Lunch Break |
| 18:10 - 18:30 | Lunch Break | | Lunch Break | Poster Session II | |
| 18:30 - 21:00 | | Lunch Break | | | Lunch Break |
| 21:00 - 22:00 | Lunch Break | | Lunch Break | Poster Session II | |
| | | | | | |
| | | | City Tour II | | |

Poster Sessions

Tuesday, 03.09.2024 (uneven numbers) & Wednesday, 04.09.2024 (even numbers).

- 1 Tomer Amit, Weizmann Institute of Science, Israel**
Phonon-induced ultrafast exciton decomposition in transition metal dichalcogenides heterostructures: an ab initio approach
- 2 Patrick Amsalem, Humboldt University of Berlin**
The impact of argon clusters ion beam sputtering on MAPbI₃
- 3 Mohammed Suhail Ansari, University of Marburg**
Structure and Thermal Stability of (C60 + P2O) and (C60 + P4O) heterolayers on Ag(111)
- 4 Max Bergmann, University of Marburg**
Exploring excitonic features beyond the visible spectrum in 2D WS₂ through electron energy loss spectroscopy
- 5 Tim Bergmeier, University of Marburg**
Imaging the ultrafast dynamics of interface currents with subcycle ARPES
- 6 Maximilian Dreher, University of Marburg**
Organic/TMDC interfaces: The role of intra- and interlayer interactions on their structure formation
- 7 Daniel Erkensten, University of Marburg**
Stability of Wigner crystal states in 2D materials
- 8 Jamie Fitzgerald, University of Marburg**
The Impact of dark excitons on polariton optics and relaxation in 2D semiconductors
- 9 Sophie Göbel and Jannick Peters, University of Giessen**
Selectivity on and off: bifunctional ethers on Si(001)
- 10 Lukas Gümbel, University of Giessen**
Self-trapped exciton diffusion in lead-free hybrid perovskites

- 11 Robin Günkel and Nils Langlotz, University of Marburg**
MOCVD growth of van der Waals III-VI compounds
- 12 M. Alex Hollberg, University of Dortmund**
Direct measurement of the exciton bright-dark state splitting in bulk single crystal mixed halide perovskite $FA_{0.9}Cs_{0.1}PbI_{2.8}Br_{0.2}$
- 13 Ruth Kenmogne, University of Marburg**
Bidirectional synthesis of unilaterally substituted fluorotetracenes
- 14 Philip Klement, University of Giessen**
Enhanced circular dichroism and polarized emission in an achiral, low bandgap bismuth iodide perovskite derivative
- 15 Serhii Kovalchuk, Forschungszentrum Jülich**
Disentangling anisotropic resistivities of the topological insulator Bi_4Br_4
- 16 Vitalii Lider, University of Marburg**
Towards measuring electric fields at hetero-interfaces using electron diffraction and 4D-STEM
- 17 Jan-Heinrich Littmann, University of Giessen**
Chiroptical activity in bismuth doped (R/S-PyEA) PbI_4 2D perovskites
- 18 Oliver Maßmeyer and Stefan Kachel, University of Marburg**
2D Layer MOCVD growth of GaS on sapphire: Insights on the mechanism
- 19 Keito Mizukami, University of Giessen**
Optical properties of bismuth doped methylbenzylamine lead iodide 2D perovskites
- 20 Florian Münster and Leonard Neuhaus, University of Marburg**
On-surface synthesis of alkali metal tetrapyrroles
- 21 Dominik Muth, University of Marburg**
Electronic coupling and photoluminescence anisotropy in van-der-Waals-stacks of WS_2 with molecular single crystals
- 22 Ravi Priya, University of Marburg**
P2O and P4O on Ag(111): Homogeneous layers, heterostructures, and mixed layers

- 23 Muhammad Sufyan Ramzan, University of Oldenburg**
Strain-free MoS₂/ZrGe₂N₄ van der Waals heterostructure: Tunable electronic properties with type-II band alignment
- 24 Roberto Rosati, University of Marburg**
Engineering the charge-transfer excitons in 2D lateral heterostructures
- 25 Zilin Ruan and Tim Naumann, University of Marburg**
On-surface synthesis of novel acenes and cycloarenes
- 26 Dominik Scharf, University of Marburg**
Synthesis of cyclooctynes for non-covalent layer-by-layer synthesis on Si(001)
- 27 Laura Scholz, Humboldt University of Berlin**
Temperature-dependent electronic ground-state charge transfer in van der Waals heterostructures
- 28 Julian Schröer, University of Rostock**
Towards a framework for organic-dye/TMD heterostructure spectroscopy
- 29 Markus Stein, University of Giessen**
Quantifying electron mobilities in MOCVD-grown 2D materials via THz-TDS
- 30 Andreas Stier, TU München**
Polarons shape the interlayer exciton emission of MoSe₂/WSe₂ heterobilayers
- 31 Marcel Theilen, University of Marburg**
Time-resolved photoemission orbital tomography of organic interfaces
- 32 Maximilian Ünzelmann, University of Würzburg**
Momentum-space spin and orbital textures in tellurium – metal interface states
- 33 Sabine Wenzel, University of Marburg**
Selective on-surface synthesis of isokekulene through strong molecule-metal interaction
- 34 Edith Wietek, TU Dresden**
THz-induced conversion of dark and bright interlayer excitons in MoSe₂/WSe₂ heterostructures

- 35 Hao Yin, Forschungszentrum Jülich**
H₂ intercalated epitaxial twisted bilayer graphene
- 36 Sarah Zajusch, University of Marburg**
Evaluation of multi-hits in momentum- and time-resolved photoemission
- 37 Klaus Zollner, University of Regensburg**
Proximity-induced spin interactions in twisted van der Waals heterostructures
- 38 Yeondu Kim, University of Marburg**
Phase transformation and Ag-induced structural ordering of CuPc on Ag(111)