



21st International Conference on Microscopy of Semiconducting Materials (MSM-XXI)

9–12 April 2019

Fitzwilliam College, Cambridge, UK

<http://msmxxi.iopconfs.org/>

Programme

Tuesday, 9 April

09:00	Opening Remarks <i>Auditorium</i>
	Analytical Transmission Electron Microscopy and Electron Holography <i>Auditorium</i> Chair: Martin Hytch, CEMES Toulouse, France
09:20	(Invited) Phase-shifting holography of semiconductor materials Chris Boothroyd, Nanyang Technological University, Singapore
10:00	3D characterization of nanowire devices with STEM based modes Hugo Bender, IMEC, Belgium
10:20	Measuring polarization induced electric fields in AlGaIn/GaN nanowires using nano-beam electron diffraction and momentum-resolved 4D-STEM Tim Grieb, Institut für Festkörperphysik, Universität Bremen, Germany
10:40	Electron tomography measurement of III-V semiconductor interface roughness Lars Nicolai, Paul-Drude-Institut für Festkörperelektronik, Germany
11:00	Coffee Break <i>Auditorium Foyer</i>
	Analytical Transmission Electron Microscopy and Electron Holography <i>Auditorium</i> Chair: Dr Chris Boothroyd, Nanyang Technological University, Singapore
11:20	(Invited) Materials for quantum computing : topological insulators Martina Luysberg, Research Center Jülich GmbH, Germany
12:00	Design a coherent sampler in scanning transmission electron microscopy to characterize the 2D strain field in crystalline material on a large field of view Alexandre Pofelski, McMaster University, Canada
12:20	Advanced moiré strain measurement technique using smart scanning strategies Viveksharma Prabhakara, University of Antwerp and IMEC, Belgium
12:40	EDS for composition and thickness analysis as well as measurements at elevated temperatures Meiken Faulke, Bruker, Germany
13:00	Lunch <i>Upper Hall 1&2</i>

In-Situ and In-Operando Microscopy*Auditorium***Chair:** Martina Luysberg, Research Center Jülich GmbH, Germany

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- 14:00 **(Invited) In situ MOCVD growth of III-V Nanowires in the lund ETEM**
Crispin Hetherington, Lund University, Sweden
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- 14:40 **FIB sample preparation for *in situ* electrical characterization of semiconductor devices in the TEM**
Rémy Berthier, Protochips, USA
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- 15:00 **Electromechanical current mechanisms in GaAs nanowires probed by conductive AFM**
Yonatan Calahorra, University of Cambridge, UK
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- 15:20 Coffee Break
Auditorium Foyer
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- In-Situ and In-Operando Microscopy**
Auditorium
Chair: Dr Crispin Hetherington, Lund University, Sweden
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- 15:40 **(Invited) Measuring electric fields in operando devices by in-situ electron holography**
Martin Hytch, CEMES Toulouse, France
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- 16:20 **In-situ observation of Σ 3{112} twin boundary motion at atomic resolution in III-V nanowires**
James Gott, University of Warwick, UK
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- 16:40 **In situ transmission electron microscopy observation of solid phase epitaxy of Ge on Fe₃Si**
Markus Terker, Paul Drude Institute for Solid State Electronics, Germany
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- 17:00 **In-Situ transmission electron microscopy annealing for crystallization and phase stability studies in the Ga₂O₃-In₂O₃-Al₂O₃**
Charlotte Wouters, Leibniz Institute for Crystal Growth, Germany
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- 17:20 **Welcome Reception**
Upper Hall 1&2
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- 18:00 **Poster Session 1**
Upper Hall 1&2
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- 20:00 **Dinner (pre-bookable)**
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Wednesday, 10 April**Lattice Defects in Bulk Materials***Auditorium***Chair:** Fabien Massabuau, University of Cambridge, UK

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- 09:20 **(Invited) Dislocations in semiconductors: atomic structures and dynamic properties**
Ichiro Yonenaga, Tohoku University, Japan
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- 10:00 **Two-dimensional polymorphic structure on {111}/{115} grain boundaries in Si**
Yutaka Ohno, Tohoku University, Japan
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- 10:20 **Characterization of Pb_{0.93}Sb_{0.05}S by double aberration corrected STEM**
Yang Qiu, Southern University of Science and Technology, China

10:40	Aberration corrected HRTEM analysis of Shockley partial dislocations in GaN George Dimitrakopoulos, Aristotle University of Thessaloniki, Greece
11:00	Coffee break <i>Auditorium Foyer</i>
	Strained Layer Epitaxy and Quantum Wells <i>Auditorium</i> Chair: Professor Dr Ichiro Yonenaga, Tohoku University, Japan
11:20	(Invited) Preparation and nanocharacterisation of Si-Ge and III-Sb semiconductor heterostructures Ian MacLaren, University of Glasgow, UK
12:00	Origin of the two-dimensional electron gas at the interface between BaSnO₃/LaInO₃ wide bandgap oxides Martina Zupancic, Leibniz-Institut für Kristallzüchtung, Germany
12:20	Effects of well width fluctuations on green InGaN/GaN quantum wells grown at different temperatures Boning Ding, University of Cambridge, UK
12:40	Ordered structure of FeGe₂ formed during solid-phase epitaxy Bernd Jenichen, Paul Drude Institute for Solid State Electronics, Germany
13:00	Lunch <i>Upper Hall 1&2</i>
	Strained Layer Epitaxy and Quantum Wells <i>Auditorium</i> Chair: Dr Ian MacLaren, University of Glasgow, UK
14:00	(Invited) Strain accommodation in InGaN heterostructures: from epilayers to monolayers George Dimitrakopoulos, Aristotle University of Thessaloniki, Greece
14:40	Simultaneous determination of local thickness and composition for ternary III-V Semiconductors by aberration-corrected STEM Pirmin Kükelhan, Philipps University Marburg, Germany
15:00	Cathodoluminescence study of non-radiative recombination on dislocations in In-rich and In-poor InGaN QWs emitters Piotr Perlin, Institute of High Pressure Physics, Poland
15:20	Al₅Si₅₊ δN_{1,2}, a new nitride semiconductor Philippe Vennéguès, Université Côte d'Azur, CNRS, CRHEA, France
15:40	Coffee Break <i>Auditorium Foyer</i>
16:20	Exhibitors Session <i>Upper Hall 1&2</i>
17:00	Poster Session 2 <i>Upper Hall 1&2</i>

Thursday, 11 April**Scanning Electron and Ion Beam Microscopy***Auditorium***Chair:** Giorgio Divitini, University of Cambridge, UK

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- 09:00 **(Invited) Structural and luminescence imaging and characterisation of semiconductors in the scanning electron microscope**
Carol Trager-Cowan, Strathclyde University, UK
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- 09:40 **Towards large area semi-automatic phase mapping in semiconducting nanostructures**
Antonius van Helvoort, Norwegian University of Science and Technology, Norway
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- 10:00 **Neuromorphic MoS₂ memtransistors fabricated by localised helium ion beam irradiation**
Jacob Jadwyszczak, Trinity College Dublin, Ireland
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- 10:20 **Helium ion microscopy as a novel probe for complex quantum heterostructures in core-shell nanowires**
Gregor Koblmueeller, Technical University of Munich, Germany
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- 10:40 **Contacting nanostructures: detailed characterisation of the Au/Ge/GaAs nanowire interface**
Julie Nilsen, Norwegian University of Science and Technology, Norway
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- 11:00 Coffee break and exhibition
Upper Hall 1&2

Atom Probe Tomography*Auditorium***Chair:** Dr Catherine Bougerol, CNRS Institut Neel, France

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- 11:30 **(Invited) Optical spectroscopy and atom probe tomography on single semiconductor nanoscale specimens: from the sequential to the in-situ approach**
Lorenzo Rigutti, University of Rouen, France
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- 12:10 **Correlative atom probe tomography of low angle grain boundaries in high performance multicrystalline silicon and their response to industrial processing**
David Tweddle, University of Oxford, UK
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- 12:30 **Atom probe tomography: toward improved productivity and correlative analysis in the semiconductor industry**
Peter Clifton, Cameca Instruments Inc, France
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- 12:50 Lunch and exhibition
Upper Hall 1&2

Nanowires and Quantum Dots*Auditorium***Chair:** Yonatan Calahorra, University of Cambridge, UK

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- 13:50 **(Invited) The microstructure of III-V nanowires and its importance for nanowire-based optoelectronics**
Hannah Joyce, University of Cambridge, UK
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- 14:30 **Cathodoluminescence visualisation of local thickness variations of GaAs/AlGaAs quantum-well tubes on nanowires**
Anders Gustafsson, Solid State Physics NanoLund, Sweden
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- 14:50 **TEM compositional and structural analysis of MBE grown wurtzite (Ga,In)As nanowires with (Ga,Al)As and Ga(Bi,As) shells**
Slawomir Kret, Instytut of Physics PAS, Poland

15:10	The structure of MoTe₂ and Mo₆Te₆ layers and nanowires grown by MBE on GaAs substrates Janusz Sadowski, University of Warsaw, Poland
15:30	III-V semiconductor nanowire heterostructures grown by metal organic chemical vapour deposition Jennifer Wong-Leung, The Australian National University, Australia
15:50	Coffee Break and exhibition <i>Upper Hall 1&2</i>
	Doping Studies by Microscopy <i>Auditorium</i> Chair: Lorenzo Rigutti, University of Rouen, France
16:20	(Invited) Investigation of doping and alloy composition in III-nitrides thin films from atom probe tomography and EDX spectroscopy Catherine Bougerol, CNRS, France
17:00	Detection limit of dopants in silicon crystalline by TEM Kei-ichi Fukunaga, JEOL Ltd, Japan
17:20	Dopant mapping using advanced STEM/EDX techniques Raghda Makarem, LPCNO/INSA, France
	Doping Studies by Microscopy 2 <i>Auditorium</i> Chair: Lorenzo Rigutti, University of Rouen, France
17:40	(Invited) Exploration of doping atoms in semiconductors at the atomic scale Paul Koenraad, Eindhoven University of Technology, The Netherlands
18:20	Reception and Exhibition <i>Upper Hall 1&2</i>
19:00	Conference Dinner Sponsored by JEOL <i>Dining Hall</i>



Friday, 12 April

	Advanced Devices <i>Auditorium</i> Chair: David Cooper, CEA, France and Dr Carol Trager-Cowan, University of Strathclyde, UK
09:00	(Invited) TEM investigations of gate-all-around nanowire devices Paola Favia, IMEC, Belgium
09:40	Dynamics of tuneable defect-rich grains in organic-inorganic halide perovskite films Stuart Macpherson, University of Cambridge, UK
10:00	Fabrication of vertically arrayed Si/InP core-shell nanowire heterojunction based solar cell using MOCVD Biswajit Pal, Indian Institute of Technology Kharagpur, India
10:20	Imaging the local optoelectronic response in high-performance, textured perovskite/Si tandem solar cells Elizabeth Tennyson, University of Cambridge, UK
10:40	Coffee break and exhibition <i>Upper Hall 1&2</i>

Advanced Devices 2

Auditorium

Chair: Paola Favia, IMEC, Belgium

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- 11:20 **(Invited) Field mapping in semiconductor materials by off-axis electron holography and other techniques**
David Cooper, CEA LETI, France
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- 12:00 **Closing of meeting**
Auditorium
SST arrangement
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- 12:40 Lunch and exhibition
Upper Hall 1&2

Poster Session 1*Upper Hall 1&2*

- P1.1 **Analytical scanning transmission electron microscopy of monolayer thin embedded semiconducting layers**
Thomas Walther, University of Sheffield, UK
- P1.2 **Influence of 2s Bloch wave state excitation on STEM-HAADF intensity and how it affects analysis in ordered alloy structures**
Charlotte Wouters, Leibniz Institute for Crystal Growth, Germany
- P1.3 **Comparison of difference ways to evaluate amount of interfacial excess atomic density from atom probe tomography data**
Thomas Walther, University of Sheffield, UK
- P1.4 **Hydrogen passivation of N:GaAs studied by cross-sectional scanning tunnelling microscopy**
Douwe Tjeertes, Eindhoven University of Technology, The Netherlands
- P1.5 **In situ TEM thermal annealing and growth investigations of III/V semiconductor materials**
Maximilian Widemann, Philipps-Universität Marburg, Germany
- P1.6 **3D reconstruction of chiral photonic metasurface patterned in monocrystalline silicon**
Oleg Rogov, Russian Academy of Sciences, Russia
- P1.7 **Ion Auger electrons contrast on cross-beam systems**
Alexander Pereyaslavtsev, Federal State Unitary Enterprise, Russia
- P1.8 **Multimode scanning near-field optical microscopy applied on nonpolar InGaN/GaN quantum wells**
Saulius Marcinkevicius, KTH Royal Institute of Technology, Sweden
- P1.9 **Cathodoluminescence spectroscopy of core-shell nanowire heterostructures**
Jonas Lähnemann, Paul Drude Institute for Solid State Electronics, Germany
- P1.10 **Characterization of solution-grown and sputtered $\text{In}_x(\text{O}, \text{S})_y$ buffer layers in $\text{Cu}(\text{In}, \text{Ga})\text{Se}_2$ -based solar cells by analytical TEM**
Reinhard Schneider, Karlsruhe Institute of Technology, Germany

P1.11 **Systematic study of the influence of surface oxide, amorphous carbon and built-in potential on BSE and SE images of doped GaAs**

Ran Guo, The University of Sheffield, UK

P1.12 **Electron microscopy investigations of Si vertical heterostructures**

Saleh Firoozabadi, Philipps- Universität Marburg, Germany

Poster Session 2

Upper Hall 1&2

P2.1 **Synthesis and microstructural characterisation of size-tunable Gd₂O₃ crystals for lanthanide-doping and upconversion luminescence**

Zhili Dong, Nanyang Technological University, Singapore

P2.2 **Methodology for depth-dependent plan-view TEM – a study of dislocations in mesoporous GaN distributed Bragg reflectors**

Fabien Massabuau, University of Cambridge, UK

P2.3 **Morphological and structural analysis of cadmium incorporated zinc oxide films grown on (111) silicon using pulsed laser deposition for solar cell applications**

Sugandha Sharma, University of Delhi South Campus, India

P2.4 **Stacking faults in plastically relaxed InGaN epilayers**

Joanna Moneta, Institute of High Pressure Physics, Poland

P2.5 **Epitaxial growth and characterisation of Co₂FeSi/MgO/GaAs heterostructures**

Bernd Jenichen, Paul-Drude-Institut, Germany

P2.6 **Effects of stacking faults on heterostructure compositions in Zincblende GaN LEDs**

Boning Ding, University of Cambridge, UK

P2.7 **Structural features and interfaces of Al thin films grown on GaAs(001) by MBE**

George Dimitrakopoulos, University of Thessaloniki, Greece

P2.8 **Growth of indium gallium arsenide layer on silicon substrate by metal organic chemical vapor deposition (MOCVD) technique**

Sisir Chowdhury, ITT Kharagpur, India

P2.9 **Channel characteristics of InAs/AlSb heterojunction epitaxy: comparative study on 4 kinds of epitaxies with different thickness of InAs channel and AlSb barrier**

He Guan, Northwestern Polytechnical University, China

P2.10 **Analysis of the N distribution in GaAs(Sb)(N) superlattices from ADF imaging**

Nazaret Ruiz Marín, Cádiz University, Spain

P2.11 **Challenges of HRTEM image contrast simulation of MoS₂/TaS₂ heterostructure**

Holm Kirmse, Humboldt University of Berlin, Germany

P2.12 **Investigation of photocatalytic mechanism in (Fe, Ag) co-doped ZnO nanoparticles**

Jiayi Zhang, Southwest Minzu University, China

P2.13 **Analysis of FBE (floating body effect) induced threshold voltage shift in vertical-cell transistor DRAM**

Young Seung Cho, Sungkyunkwan University, South Korea

- P2.14 **Effect of different stabilizer on the microstructures and photocalytic activities of ZnO:Ag photocatalyst synthesized by sol-gel method**
Fei Yu, Southwest Minzu University, China
- P2.15 **Growth and characterisation of InGaAs Nanowire on Si substrate without foreign catalysts**
Sisir Chowdhury, IIT Kharagpur, India
- P2.16 **Combined STEM-EDS tomography of nanowire structures**
Hugo Bender, IMEC, Belgium
- P2.17 **TEM study of ZnO nanorods to unveil their growth mechanisms**
Sarka Kucerova, Czech Academy of Sciences, Czech Republic
- P2.18 **Synthesis and size dependent charge trap behaviour of graphene quantum dots**
Kalyan Sarkar, Indian Institute of Technology Kharagpur, India
- P2.19 **In-situ observation of $\Sigma 3$ {112} twin boundary motion at atomic resolution in III-V Nanowire**
James Gott, University of Warwick, UK
- P2.20 **Nanoscale characterisation of Perovskite chemical composition with multivariate statistical analysis**
Feliz Kosasih, University of Cambridge, UK