

The 31st International Conference on
Defects in Semiconductors



UiO • University of Oslo

Oslo, Norway | July 26 – 30, 2021

Welcome!

Welcome to the 31st International Conference on Defects in Semiconductors (ICDS-31), for the first time held as an online event. The conference was originally planned to be held at the University of Oslo, Norway, but, unfortunately, only an online conference was within reach this summer.

The global coronavirus pandemic has been a challenging period for all of us. Despite this, there are many interesting contributions and a good turnout of participants! I am happy to see that the ICDS community is still thriving under these circumstances. On behalf of the organizing committee, let me thank the support from the international advisory and program committees, the invited and tutorial speakers for their positive response, and our generous government and corporate sponsors for supporting this important conference! Special thanks go to Kristin Nygård and the rest of the LENS group at UiO for making this happen. Thank you all!

ICDS promotes a fundamental understanding of point and extended defects in semiconductors, including electrical, vibrational, optical, and magnetic phenomena. Substantial advances have been reported since our last meeting in Seattle, and I am looking forward to all the exciting contributions. I hope ICDS-31 will facilitate stimulating discussions on defects in materials for micro- and optoelectronics, quantum computing, photovoltaics, and other applications.

The conference starts Monday July 26th at 09:00 with the live presentations organized in conventional sessions categorized according to topics. The Live sessions will be held in Zoom, while the tutorials, pre-recorded and poster presentations will be viewed directly in the conference portal (<https://event.fourwaves.com/icds31/pages>). See the “Practical Information” or the next page for further information.

Thank you for your participation, and I hope you will enjoy the program.

Lasse Vines
Chair, ICDS-31

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Practical Information

The program, program outline, and full abstracts are all available online in the conference portal home page (see Conference Access below). A completely online conference with participants from many different time zones was challenging to fit into the traditional ICDS program. Therefore, we decided to deviate from the traditional program to accommodate as many participants as possible. The daily parallel sessions are replaced by a daily “Live” session and on-demand “Pre-recorded” talks. The “Live” session consists of morning and evening talks, leaving free time in the middle of the day. Hence, the morning sessions should be suitable for European, Asian, and Australian participants, whereas the evening session should be suitable for Europeans and Americans. The pre-recorded talks and the poster presentations will be available throughout the week and can be accessed at any time. It will be possible to discuss with the presenters during the poster session. Several tutorial lectures geared toward students, early-career scientists, and newcomers to the field are available in digital format. The tutorials are available to all participants and are on-demand, so they can be watched prior, during, or after the conference.

Conference Access

The conference activities will be held in the conference portal supported by Fourwaves:

<https://event.fourwaves.com/icds31/pages>

Access will be given after registering at the ICDS-31 website:

<https://www.icds31.org>

Tutorial Lectures

A selection of relevant tutorial lectures are available throughout the conference from leading experts in the field.

Live session

The Live part of the program will be held in the video conferencing platform Zoom, and a link to the correct session can be found under the “**Schedule**” tab in the conference portal. The speakers should join their session 10-15 minutes before the session starts. Make sure you have your correct name (first name and surname) in Zoom so the technician can find you. The presentations (not the Q&A) will be recorded and made available (under the all presentations tab in the conference portal) after the session.

Q&A for Pre-recorded talks

There will be a Q&A session for the pre-recorded talks, similar to that of the poster session, where you will be able to interact with the presenters. Before the start of the evening sessions on Monday, Tuesday, and Wednesday (4-5 pm CET), the presenters are encouraged to be available for questions, and can be approached from the presentation webpage (click on the presentation from the “**pre-recorded**” tab or the “**All presentations**” tab), and press “**Call presenter**”.

Poster Session

The posters will be available for viewing throughout the conference. There are two sessions (Tuesday 7:10 PM to 8:40 PM and Thursday 10:30 AM to 12:10 AM). The presenters are encouraged to be available during these times for discussions through the conference portal. The presenters can be approached from the presentation webpage (click on the presentation from the “**pre-recorded**” tab or the “**All presentations**” tab), and press “**Call presenter**”. Unlike the poster session at a traditional ICDS conference, we have not assigned presenters to a specific session. The presenters and attendees are free to participate in the session that is most convenient for them.



IUPAP policies

This conference is supported by the International Union of Pure and Applied Physics (IUPAP). Free Circulation of Scientists: The principle of the Universality of Science is fundamental to scientific progress. This principle embodies freedom of movement, association, expression and communication for scientists, as well as equitable access to data, information and research materials. In pursuing its objectives with respect to the rights and responsibilities of scientists, the International Union of Pure and Applied Physics (IUPAP) actively upholds this principle, and, in so doing, opposes any discrimination on the basis of such factors as ethnic origin, religion, citizenship, language, political stance, gender, or age. IUPAP should only sponsor conferences and events at institutions and in countries that uphold this principle. If scientists are excluded from attending IUPAP-sponsored international conferences by a host institution or country on the basis of any of these factors, IUPAP should register its concern at the highest level of that institution or country, and should not sponsor any future events in that country until such exclusions have been eliminated. [Section 1]* Harassment at Conferences: It is the policy of the International Union of Pure and Applied Physics (IUPAP) that all participants at an IUPAP-supported Conference will enjoy a comfortable experience, and that they will treat each other with respect at all times. The conference organizers will name an advisor who will consult with those who have suffered from harassment and who will suggest ways of redressing their problems, and an advisor who will counsel those accused of harassment. [Section 4]*

*<http://iupap.org/sponsored-conferences/conference-policies/>

Program Overview

Time (CEST)	Monday 26/07	Tuesday 27/7	Wednesday 28/7	Thursday 29/7	Friday 30/7
8:30					
8:40					
8:50					
9:00	Welcome	Johnson	Sudo	Zhang	Oshiyama
9:10			Fukata	Pecunia	Raebiger
9:20			Vecchi	Falsini	Tuomisto
9:30	Dreau	Gao	Kissinger	Vinattieri	Beyer
9:40					Smalc-Koziorowsk
9:50					
10:00	Break	Gilardoni	Break	Break	Break
10:10		Break			
10:20					
10:30	Tetienne	Wörle	Lavrov	Poster Session II	Polyakov
10:40			Müller		Stehr
10:50	Thiering	Bathen	Kuznetsov		Makkonen
11:00	Abrikosov	Lindvall	Scanlon		Seyidov
11:10			Karsthof		Zimmermann
11:20	Todenhausen	Herklotz			
11:30		Kavanagh			
11:40	Razinkovas	Savory	Break	Break	
11:50					
12:00	Break				Closing Remarks
12:10					
12:20					
12:30					
14:00	Free time for leisure, meetings, and on-demand presentations			Niewelt	Silicon II
14:10				Markevich	
14:20				Emtsev	
14:30				Vandermolen	
14:40					
14:50					
15:00					
15:10					
15:20					
16:30	Q&A for pre-recorded talks	Q&A for pre-recorded talks	Q&A for pre-recorded talks	Free time, ...	
16:40					
16:50					
17:00	Scarpulla	Finot	Turiansky	Dreyer	Plenary V
17:10		Demchenko	Ivády		
17:20		Reshchikov	Dyakonov	Falletta	
17:30		Vorobiov	Maciaszek	Radulaski	Fund. II
17:40			Stern		
17:50			Van de Walle		
18:00	Hwang	Simmons			
18:10					
18:20					
18:30	Break				
18:40					
18:50					
19:00	Lyons	Poster Session I			
19:10					
19:20	Fowler				
19:30					
19:40	Stavola				
19:50					
20:00	Varley				
20:10					
20:20	McCluskey				
20:30					
20:40					

Time Zone	Abbreviation	GMT	Comparison
Central European Summer Time	CEST	+2	9:00
China Standard Time	CST	+8	15:00
Japan Standard Time	JST	+9	16:00
Eastern Daylight Time	EDT	-4	3:00
Pacific Daylight Time	PDT	-7	0:00



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Scientific Program

Tutorial lectures

Advances in theoretical description of point defects in solids - electronic structure methods & selected examples

Audrius Alkauskas | *Center for Physical Sciences and Technology, Lithuania*

Optically detected magnetic resonance of defects: from fundamental to qubits

Nguyen Tien Son | *Linköping University, Sweden*

Solid state defect qubits - towards full ab initio description

Adam Gali | *Wigner Research Centre for Physics, Hungary*

Detection and quantitative analyses of defects in semiconductors and their alloys using atom probe tomography

Alain Portavove | *CNRS-IM2NP, France*

Capacitance spectroscopy of defects

Anders Hallen | *KTH, Sweden*

Infrared spectroscopy of defects

Michael Stavola | *Lehigh University, USA*

Tutorial on quantum computing with defects in semiconductors

Susan Coppersmith | *University of New South Wales, Australia*

Live Presentations

Monday July 26th

Plenary Session I

Session Chair: Martin Brandt | *Technical University Munich, Germany*

9:00 AM **Opening**

9:10 AM **Broad diversity of near-infrared single-photon emitters in silicon**

Anaïs Dreau | *Montpellier University, France*

Quantum Defects I: Diamond and SiC

Session Chair: Jeffrey McCallum | *University of Melbourne, Australia*

10:30 AM **(Invited) NV centres in diamond as local probes of fields, strain and temperature**

Jean-Phillipe Tetienne | *University of Melbourne, Australia*

11:00 AM **Rydberg excitations of the neutral Silicon Vacancy center in diamond and their role in the spin selective decay**

Gergő Thiering | *Wigner Research Centre for Physics, Hungary*

11:20 AM **Stacking fault-spin defect complexes for quantum technology applications**

Igor Abrikosov | *Linköping University, Sweden*

11:40 AM **Wavelength Dependence of the Electrical Readout of NV Centers in Diamond**

Lina Maria Todenhagen | *Technische Universität München, Germany*

12:00 PM **Photoionization of negatively charged NV centers in diamond: theory and ab-initio calculations**

Lukas Razinkovas | *Center for Physical Sciences and Technology, Lithuania*

Monday July 26th

Plenary Session II

Session Chair: Matt McCluskey | *Washington State University, USA*

5:00 PM **Shining the spotlight on defects in Ga₂O₃**

Michael Scarpulla | *University of Utah, USA*

5:50 PM **Atomic scale investigation of point and extended defects in gallium oxide**

Jinwoo Hwang | *Ohio State University, USA*

Gallium Oxide I

Session Chair: Holger von Wenckstern | *Universität Leipzig, Germany*

7:00 PM **(Invited) First-principles studies of band alignments and doping of AlGaO alloys**

John Lyons | *Naval Research Laboratory, USA*

7:30 PM **The Ga(1) vacancy in β -Ga₂O₃ and its family of trapped impurities**

W. Beall Fowler | *Lehigh University, USA*

7:50 PM **O-H centers that contain Si and Fe impurities in Ga₂O₃**

Michael Stavola | *Lehigh University, USA*

8:10 PM **Exploring donor dopant candidates in (Al,Ga)₂O₃ alloys through hybrid functional calculations**

Joel Varley | *Lawrence Livermore National Laboratory, USA*

8:30 PM **Defects in gallium oxide, in the bulk and on the surface**

Matthew McCluskey | *Washington State University, USA*

Tuesday July 27th

Plenary Session III

Session Chair: Jean-Phillipe Tetienne | *University of Melbourne, Australia*

8:30 AM **Imaging defects in silicon carbide**

Brett Johnson | *University of Melbourne, Australia*

Silicon Carbide

Session Chair: Ulrike Grossner | *ETHZ, Switzerland*

9:20 AM **(Invited) SiC NV centers for quantum applications**

Weibo Gao | *Nanyang Technological University Singapore, Singapore*

9:50 AM **Optical and microwave control of spin-1/2 transition metal defects in SiC**

Carmem M. Gilardoni | *University of Groningen, Netherland*

10:30 AM **(Invited) Defect analysis in 4H-SiC using low-energy muons**

Judith Wörle | *ETH Zürich, Switzerland*

11:00 AM **Resolving the vibronic fine structure of silicon vacancy emission in silicon carbide**

Marianne E. Bathen | *ETH Zürich, Switzerland*

11:20 AM **Dipolar Spin Relaxation of Divacancy Qubits in Silicon Carbide**

Oscar Bulancea Lindvall | *Linköping University, Sweden*

Selenides and Tellurides

Session Chair: Weibo Gao | *Nanyang Technological University Singapore, Singapore*

11:40 AM **SO₄ complexes in CdTe and CdSe**

Frank Herklotz | *Technische Universität Dresden, Germany*

12:00 PM **Rapid Recombination by Cadmium Vacancies in CdTe**

Sean R. Kavanagh | *University College London & Imperial College London, UK*

12:20 PM **Dopability and Defect Tolerance in Antimony Selenide**

Christopher Savory | *University College London, UK*

Tuesday July 27th

Nitrides I

Session Chair: Ben Hourahine | *University of Strathclyde, UK*

- 5:00 PM** **Carrier Dynamics Near a Crack in GaN Microwires with AlGaN Multiple Quantum Wells**
Sylvain Finot | *University Grenoble Alpes, CNRS, France*
- 5:20 PM** **Shallow and deep states of beryllium acceptor in GaN: why photoluminescence experiments do not reveal small polarons for defects in semiconductors**
Denis Demchenko | *Virginia Commonwealth University, USA*
- 5:40 PM** **Photoluminescence study of point defects in ammonothermal GaN**
Michael Reshchikov | *Virginia Commonwealth University, USA*
- 6:00 PM** **Nitrogen vacancy-acceptor complexes in GaN**
Mykhailo Vorobiov | *Virginia Commonwealth University, USA*

Plenary Session IV

Session Chair: Andrej Kuznetsov | *University of Oslo, Norway*

- 6:20 PM** **Silicon telecom colour centres**
Stephanie Simmons | *Simon Fraser University, Canada*

Poster Session I

7:10 PM - 8:30 PM

All posters can be viewed throughout the conference, but authors are encouraged to be present during at least one of the poster sessions.

Wednesday July 28th

Silicon I

Session Chair: Marisa Di Sabatino Lundberg | *Norwegian University of Science and Technology, Norway*

8:30 AM **(Invited) Formation Behavior of Oxygen Precipitates in Silicon Wafers Subjected to Ultra-High-Temperature Rapid Thermal Process**

Haruo Sudo | *GlobalWafers Japan, Japan*

9:00 AM **Defect control and Si/Ge core-shell heterojunction formation on silicon nanowire surface formed by top-down method**

Naoki Fukata | *National Institute for Materials Science (NIMS), Japan*

9:20 AM **Characterization of grain boundaries' electrical activity by conductive atomic force microscopy in mc-Si wafers**

Pierpaolo Vecchi | *University of Bologna, Italy*

9:40 AM **Experimental and theoretical investigation of the stoichiometry and morphology of oxide precipitates in silicon**

Gudrun Kissinger | *Leibniz Institute for high performance microelectronics, Germany*

Oxides

Session Chair: Jan Eric Stehr | *Linköping University, Sweden*

10:30 AM **(Invited) Hydrogen in anatase TiO₂**

Eduard Lavrov | *Technische Universität Dresden, Germany*

11:00 AM **Fe-Li complex emission in ZnO**

Raphael Müller | *Ulm University, Germany*

11:20 AM **Frenkel pairs versus secondary defects balance in ion irradiated semiconducting oxides**

Andrej Kuznetsov | *University of Oslo, Norway*

11:40 AM **(Invited) Designer Dopants for Improved Transparent Conducting Oxides**

David Scanlon | *University College London, UK*

12:10 PM **Identification of Li_{Ni} and V_{Ni} acceptor levels in doped nickel oxide**

Robert Karsthof | *University of Oslo, Norway*

Wednesday July 28th

Quantum Defects II

Session Chair: Audrius Alkauskas | *Center for Physical Sciences and Technology (FTMC), Lithuania*

5:00 PM **(Invited) Single-photon emitters in hexagonal boron nitride**

Mark Turiansky | *University of California, Santa Barbara, USA*

5:30 PM **Boron vacancy pair as a new quantum bit in hexagonal boron nitride with feasible decoherence protection and fabrication possibilities**

Viktor Ivády | *Wigner Research Centre for Physics & Linköping University, Hungary and Sweden*

5:50 PM **Coherent Control of Spin Defects in hexagonal Boron Nitride**

Vladimir Dyakonov | *University of Würzburg, Germany*

6:10 PM **Thermodynamics of carbon defects in hexagonal boron nitride**

Marek Maciaszek | *Warsaw Univeristy of Technology & Center for Physical Sciences and Technology (FTMC), Poland & Lithuania*

6:30 PM **Room-temperature optically detected magnetic resonance of single defects in hexagonal boron nitride**

Hannah Stern | *University of Cambridge, UK*

Fundamental I

Session Chair: Audrius Alkauskas | *Center for Physical Sciences and Technology (FTMC), Lithuania*

6:50 PM **First-principles calculations of shallow impurities**

Chris Van de Walle | *University of California, Santa Barbara, USA*

Thursday July 29th

Perovskites

Session Chair: Justin Wells | *University of Oslo, Norway*

8:30 AM **(Invited) First-principles assessment of defect tolerance in halide perovskites**

Xie Zhang | *Beijing Computational Science Research Center, China*

9:00 AM **Assessing the Impact of Defects on Lead-Free Perovskite-Inspired Solar Cells via Photo-Induced Current Transient Spectroscopy**

Vincenzo Pecunia | *Soochow University, China*

9:20 AM **Role of Hydrogen in Defect Passivation of Cesium Lead Halide Perovskites Thin Films**

Naomi Falsini | *University of Florence, Italy*

9:40 AM **(Invited) The Urbach tail in inorganic halide perovskites**

Anna Vinattieri | *University of Florence, Italy*

Poster Session II

10:30 AM - 12:20 PM

All posters can be viewed throughout the conference, but authors are encouraged to be present during at least one of the poster sessions.

Silicon II

Session Chair: Gudrun Kissinger | *IHP-Innovations for High Performance Microelectronics, Germany*

2:00 PM **(Invited) Mitigation of LID and LeTID in photovoltaics - facets of hydrogen introduction**

Tim Niewelt | *Fraunhofer Institute for Solar Energy Systems ISE*

2:30 PM **A family of defects with negative-U properties in Czochralski-grown silicon doped with Al, B, Ga, or In: complexes of a group-III substitutional atom with the oxygen dimer**

Vladimir Markevich | *The University of Manchester, UK*

2:50 PM **Electron- and proton irradiation of strongly doped silicon of p-type: formation and annealing of boron-related defects**

Vadim Emtsev | *Ioffe Institute, Russian Academy of Sciences, Russia*

Thursday July 29th

3:10 PM Characterization of LPCVD Polycrystalline Silicon Trap-Rich Based Substrates for RF Applications

Eric Vandermolen | *CEA, LETI, Univ. Grenoble Alpes, France*

Plenary Session V

Session Chair: Joel Varley | *Lawrence Livermore National Laboratory, USA*

5:00 PM Computational spectroscopy for point defects

Cyrus Dreyer | *Stony Brook University, USA*

Fundamental II

Session Chair: Joel Varley | *Lawrence Livermore National Laboratory, USA*

5:50 PM Finite-Size Corrections of Defect Energy Levels Involving Ionic Polarization

Stefano Falletta | *Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland*

6:10 PM (Invited) Integrated quantum photonics in Silicon Carbide

Marina Radulaski | *University of California, Davis, USA*

Friday July 30th

Nitrides II

Session Chair: Giovanni Alfieri | *Hitachi ABB Power Grids, Switzerland*

8:30 AM **(Invited) Computics Approach to Dislocation-Impurity Complexes and Interface Characteristics of GaN Devices**

Atsushi Oshiyama | *Nagoya University, Japan*

9:00 AM **Strain control for p-type doping of haeckelite GaN**

Hannes Raebiger | *Yokohama National University, Japan*

9:20 AM **Do N vacancies exist in III-nitrides?**

Filip Tuomisto | *University of Helsinki, Finland*

9:40 AM **A luminescence band related to carbon complexes in GaN:C observed by below bandgap excitation**

Jan Beyer | *TU Bergakademie Freiberg, Germany*

10:00 AM **The mechanism for the emanation of a-type threading dislocations by stacking fault overlapping in III-nitride heterostructures**

Julita Smalc-Koziorowska | *Institute of High Pressure Physics PAS, Poland*

Gallium Oxide II

Session Chair: Filip Tuomisto | *Helsinki University, Finland*

10:40 AM **Differences in deep levels spectra of proton irradiated bulk Ga₂O₃ crystals as affected by orientation changing from (010) to (-201)**

Alexander Y. Polyakov | *National University of Science and Technology MISiS, Russia*

11:00 AM **Magnetic Resonance and Magneto-optical Properties of Cr³⁺ in β -Ga₂O₃**

Jan Eric Stehr | *Linköping University, Sweden*

11:20 AM **Identifying vacancy defects in β -Ga₂O₃**

Ilja Makkonen | *University of Helsinki, Finland*

11:40 AM **Charge state transition levels of cobalt in β -Ga₂O₃ from experiment and theory**

Palvan Seyidov | *Leibniz-Institut für Kristallzüchtung, Germany*

Friday July 30th

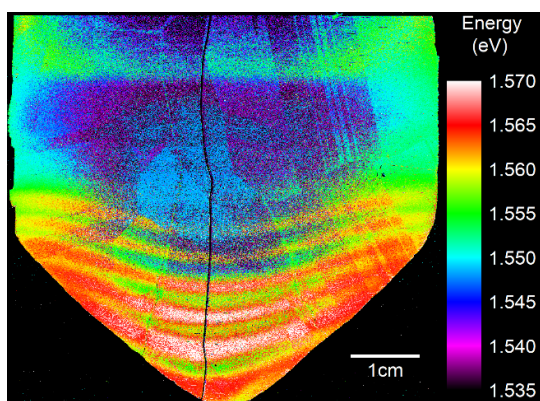
12:00 PM **Identification of Fe-, Ti- and H-related Charge-state Transition Levels in β -Ga₂O₃**

Christian Zimmermann | *University of Washington, USA*

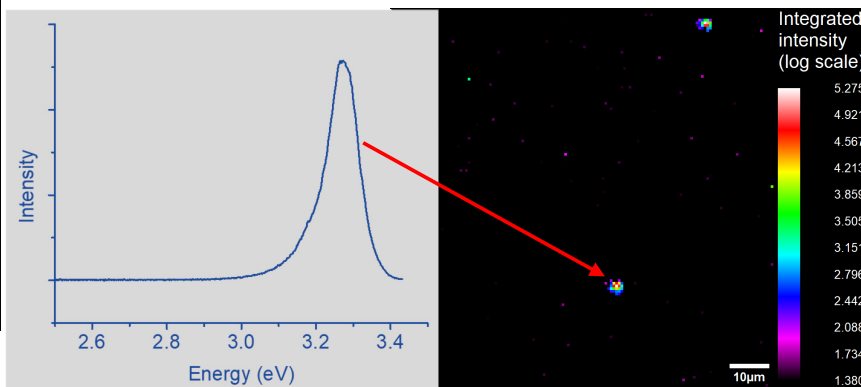
12:20 PM **Closing Remarks**

Klar Mini Pro Microscope

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PL peak energy for CdZnTe ingot. The energy is proportional to Zn content.



Localized emitters on the surface of Ga₂O₃. The spectrum shows a PL peak at 3.27 eV.

The Klar Mini Pro microscope is a compact, affordable instrument designed for scientists who need spectral information with high spatial resolution.

Mini Pro focuses a laser on the sample and collects the emitted light. The sample is scanned and PL spectra are obtained at each (x,y) point. The objective is adjusted in the z direction to maintain focus.

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Highlights

- Laser excitation 355–980 nm
- PL spectral range 355–1700 nm
- Submicron in-plane resolution
- Millions of spectra can be collected
- Fast peak-fitting software
- Compact (1 sq. ft.)
- Enclosure insulates microscope from temperature variations, dust, light
- Affordable

Applications

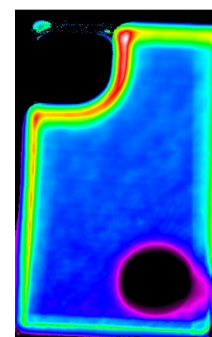
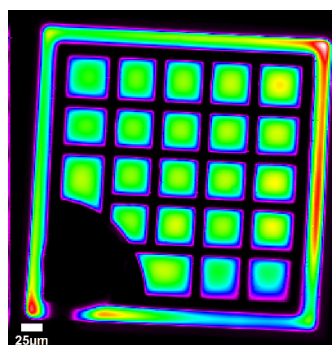
- Defect identification in light-emitting diodes
- PL mapping of wide-bandgap semiconductors
- Luminescence of 2D materials
- Compositional analysis of semiconductor alloys
- Failure analysis and quality control

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On-demand presentations (by topic)

Nitrides

The impact of surface defects created by the high-temperature GaN growth on the InGaN/GaN quantum well efficiency

Yao Chen | *École polytechnique fédérale de Lausanne (EPFL), Switzerland*

Nitrogen-displacement-related hole traps introduced by electron beam irradiations in MOVPE-grown homoepitaxial p-type GaN

Meguru Endo | *Nagoya University, Japan*

Defect structures in (001) zincblende GaN/3C-SiC nucleation layers

Martin Frentrup | *University of Cambridge, UK*

Vibrational modes of mono-, di- and tri-carbon defects in GaN:C

Ivan Gamov | *Leibniz-Institut für Kristallzüchtung (IKZ), Germany*

Carrier dynamics in and around trench defects in InGaN QWs probed by time resolved cathodoluminescence

Gunnar Kusch | *University of Cambridge, UK*

Gyrotron Microwave Beam Parameter Influence on P-Conductivity in Co-Implanted and Annealed GaN: Optical and Electrical Studies

Vincent Meyers | *SUNY Polytechnic Institute Albany, USA*

Defect Mediated Color-tunability in Eu-doped GaN-based LEDs

Hayley Austin | *Lehigh University, USA*

The Role of Threading Edge Dislocations in the Electronic Properties of AlGaIn/GaN Heterostructures: Experimental and First-principles Insights

Rong Wang | *Zhejiang University, China*

Cathodoluminescence imaging of non-radiative point defects buried in InGaIn/GaN quantum wells

Thomas Weatherley | *Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland*

Gallium Oxide

Dominating migration barrier for intrinsic defects in gallium oxide at and above room temperature

Alexander Azarov | *University of Oslo, Norway*

Interstitial defects stability at a β -(Al_xGa_{1-x})₂O₃/ β -Ga₂O₃ interface

Adrian Chmielewski | *The Pennsylvania State University, USA*

Multistability of Ga-O divacancies in β -Ga₂O₃

Ymir Kalmann Frodason | *University of Oslo, Norway*

Radiation resistance and Cascade Density Effect in β -Ga₂O₃

Platon Karaseov | *Peter the Great St.-Petersburg Polytechnic University, Russia*

Defect properties of SiO₂ and Al₂O₃ in the metal oxide semiconductor capacitors of β -Ga₂O₃

Rujun Sun | *The University of Utah, USA*

Silicon and Silicon Carbide

Identification of the M-center in 4H-SiC as a carbon self-interstitial

José Coutinho | *University of Aveiro, Portugal*

Kramers doublet transition metal point defects in hexagonal silicon carbide

Andras Csore | *Budapest University of Technology and Economics, Hungary*

Laser Interferometry Lithography and Quantum Efficiency Measurements of Nanograting Silicon PN Junctions

Nima E. Gorji | *Dublin City University, Ireland*

Improving the doping efficiency of Al in 4H-SiC by co-doping group-IVB elements

Yuanchao Huang | *Zhejiang University, China*

Formation of interstitial boron-substitutional carbon complex and capture radii for interstitial boron in silicon

Leonid Makarenko | *Belarusian State University, Belarus*

Stacking fault expansion in 4H-SiC due to low energy electron beam irradiation

Eugene Yakimov | *Institute of Microelectronics Technology RAS, Russia*

Quantum defects

Coherent phonon generation of ultrafast exciton trapping at VSe+O2 defect complex in monolayer MoSe₂

Soungmin Bae | *Yokohama National University, Japan*

Optical and spin properties of shallow implanted nitrogen vacancy centers in diamond

Srivatsa Chakravarthi | *University of Washington, USA*

Position-controlled quantum emitters with reproducible emission wavelength in hBN

Aymeric Delteil | *Université Paris-Saclay, France*

Shallow donor ensembles in ZnO for optical quantum memory applications

Christian Zimmermann | *University of Washington, USA*

Fundamental

Ion Implantation Damage of Hyperdoped Semiconductors Investigated Using Time-resolved Terahertz Spectroscopy

Sashini Senali Dissanayake | *Wesleyan University, USA*

Electron-Hole Recombination and Spin Dynamics for Quantum Defects in Two Dimensions

Yuan Ping | *University of California, Santa Cruz, USA*

Other Materials

Thermal evolution of point and extended defects in N-implanted ZnO and (ZnO)_{1-x}(GaN)_x thin films: STEM-EELS investigations

Calliope Bazioti | *University of Oslo, Norway*

Passivation mechanism of harmful defects in Se alloyed CdTe

Sameer Gupta | *Univ. Grenoble Alpes and CEA, France*

Enhancement of Er luminescence from bridge-type photonic crystal nanocavities with Er,O-codoped GaAs

Zhidong Fang | *Osaka University, Japan*

Enhancing dielectric constant of pulsed laser deposition grown ZnO via co-doping of acceptor and donor

Francis Ling | *The University of Hong Kong, Hong Kong / China*

Multiple defect-assisted mechanisms determine blinking of I-III-VI quantum dots

Adam Olejniczak | *Polish Academy of Sciences, Poland*

An atomic scale study of isoelectronic dopant pairs in GaAs using X-STM and DFT

Tom Verstijnen | *Eindhoven University of Technology, Netherlands*

CaCuP: A Degenerate Wide Band Gap Phosphide for Transparent Conducting Applications

Joe Willis | *University College London, UK*

Tailoring oxygen-related point defects with a technology to create and irradiate negatively charged oxygen (O^-) ions to control electrical, optical properties and band gaps of Sn-doped In_2O_3 films

Tetsuya Yamamoto | *Kochi University of Technology, Japan*

Special Topic on Defects in Semiconductors to be published in *Journal of Applied Physics*



The ICDS Committee and the Editor-in-Chief of *Journal of Applied Physics* are pleased to announce that *Journal of Applied Physics* will feature a Special Topic on Defects in Semiconductors. This collection of articles aims to deliver state-of-the-art findings and understanding of fundamentals of defects in semiconductors. The Guest Editors for this Special Topic are Lasse Vines, Andrej Yu. Kuznetsov and Eduard Monakhov (University of Oslo).

The *Journal of Applied Physics* Special Topic collection on Defects in Semiconductors welcomes submissions from both the ICDS and the broader community of researchers working in the field. Please note that manuscripts considered for publication as Articles in *Journal of Applied Physics* are expected to meet *Journal of Applied Physics*' standards of acceptance, i.e. to report on original and timely results that significantly advance understanding in the current status of contemporary applied physics. Material that is exclusively review in nature will not be considered for publication, however, Perspective and Tutorial papers will be included on an invitation-only basis. Manuscripts submitted for consideration in this Special Topic will undergo the *Journal of Applied Physics*' standard peer-review process. *Journal of Applied Physics* Editors' Team will issue final decisions on the submitted manuscripts.

To learn more and submit to the Special Topic, click here

(<https://publishing.aip.org/publications/journals/special-topics/jap/defects-in-semiconductors-2022/>)

Poster presentations (alphabetical order by last name)

Detection of Interstitial-Defect Levels in Mg-Ion-Implanted GaN Using MOS Diodes.

Masamichi Akazawa | *Hokkaido University, Japan*

Energy structure and luminescence line shapes of point defects in AlN

Ivan Aleksandrov | *Rzhanov Institute of Semiconductor Physics, Russia*

Deep Levels in 4H-SiC Implanted with Amphoteric Species

Giovanni Alfieri | *Hitachi ABB Power Grids, Switzerland*

Investigation of the effect of gamma radiation on the electrical properties of n-type GaAs_{1-x}Bi_x layers grown by Molecular Beam Epitaxy

Sultan Alhassan | *University of Nottingham, UK*

Synthesis and electrical characterization of GaN grown by electrochemical deposition

Abdulraoof Ali | *University of Pretoria, South Africa*

Investigation of Electrically Active Defects in GeSiSn/Si Multi Quantum Wells Using Deep Level Transient Spectroscopy Technique

Abdulaziz Almaki | *University of Nottingham, UK*

Electrical Properties of In_{0.5}Ga_{0.5}P n-i-p solar cells grown by metal organic chemical vapor deposition using I-V, C-V and Deep level Transient Spectroscopy

Saud Alotaibi | *University of Nottingham, UK*

Quantum-well features of Shockley stacking faults in 4H-SiC

Rohit Babar | *Linköping University, Sweden*

Positively Charged Muonium in Cadmium Oxide

Brittany Baker | *Francis Marion University, USA*

Computational Design of Quantum Defects in Low-Dimensional Semiconductors

Fabian Bertoldo | *Technical University of Denmark, Denmark*

Mg related charge transitions in Ga₂O₃:Mg

Suman Bhandari | *University of Alabama at Birmingham, USA*

High-Throughput Search of Point Defects in SiC

Joel Davidsson | *Linköping University, Sweden*

Poster presentations (continued)

Illumination-Induced Defectivity in β -Ga₂O₃ Epilayers

Brian Eisner | *University of Utah, USA*

Using Illumination to Modify Defects in β -Ga₂O₃ at 1000 °C

Brian Eisner | *University of Utah, USA*

Dopability of Telluride Diamond-Like Semiconductors and Ordered Vacancy Compounds for Thermoelectric Applications

Elif Ertekin | *University of Illinois at Urbana-Champaign, USA*

Role of Hydrogen in Defect Passivation of Cesium Lead Halide Perovskites Thin Films

Naomi Falsini | *University of Florence, Italy*

Origin of the external quantum efficiency reduction in InGaP/InAlGaP micro light emitting diodes

Philippe Ferrandis | *University of Toulon, France*

Quantum emitters in silicon: identification attempt in the context of recent literature data

David Rivas Gongora | *University of Oslo, Norway*

Bundle-type columnar Cu₂O photoabsorbers with vertical grain-boundaries using instant strike processed metallic seeds and their enhanced photoelectrochemical efficiency

Ji Hoon Choi | *Sungkyunkwan University, South Korea*

Modeling of the point defect migration across the AlN/GaN interfaces – ab initio study

Roman Hrytsak | *Polish Academy of Science, Poland*

Interstitial and substitutional nitrogen in silicon crystal studied by infrared absorption spectroscopy of multiple peaks

Naohisa Inoue | *Osaka Prefecture University Japan*

Al-Catalyzed Si Nanowire Formations on Thin Si Substrates and Photovoltaic Applications

Wipakorn Jevasuwan | *National Institute for Materials Science (NIMS), Japan*

Electronic properties and the dominant levels in ZnON

Kjetil Karlsen | *University of Oslo, Norway*

Conversion pathways of primary defects by annealing in proton-irradiated n-type 4H-SiC

Robert Karsthof | *University of Oslo, Norway*

Poster presentations (continued)

Identification of LiNi and VNi acceptor levels in doped nickel oxide

Robert Karsthof | *University of Oslo, Norway*

Rapid Recombination by Cadmium Vacancies in CdTe

Sean R. Kavanagh | *University College London & Imperial College London, UK*

Telecom-frequency, silicon-based impurities embedded in dielectric Mie resonators towards directional emission

Mario Khoury | *IM2NP, France*

Robust spin coherence with optical access for the Zink-Vacancy in ZnSe

Erik Kirstein | *TU Dortmund, Germany*

A Study on the Spin Coating Process Optimization

Sungjun Kim | *Sungkyunkwan University, South Korea*

A Study on the vdW Semiconductor with Ferroelectric Polymer

Sungjun Kim | *Sungkyunkwan University, South Korea*

Defect-annealing in Si⁺-implanted β -Ga₂O₃

Snorre B. Kjeldby | *University of Oslo, Norway*

Electronic states and radiative transitions in germanium doped with shallow donors: effect of short-range potential

Anton Konakov | *Lobachevsky University, Russia*

Identification of mechanism of defect formation in plastically relaxed individual semiconductor heteronanowires by transmission electron microscopy

Slawomir Kret | *Polish Academy of Sciences, Poland*

Electron Irradiation-Induced Defects In Carbon doped n-GaN

Piotr Kruszewski | *Polish Academy Of Sciences, Poland*

The influence of Cd and Hg doping on defect states formation in AgInS₂ quantum dots

Rafal Krzysztof Kosman | *Polish Academy of Sciences, Poland*

Diffusion of donor dopants in β -Ga₂O₃ and interplay with gallium vacancies

Patryk Krzyzaniak | *University of Oslo, Norway*

Highlights of 15R crystal phase in au-catalyzed ZnS nanowires

Sumit Kumar | *Université Paris-Saclay, France*

Poster presentations (continued)

Defects in 10-13 GaN: An electron microscopy study

Gunnar Kusch | *University of Cambridge, UK*

Steady-state Photo-capacitance Spectroscopy of Intrinsic Defects in Electron-Irradiated β -Ga₂O₃

Amanda Langørgen | *University of Oslo, Norway*

Spin-dependent transport in silicon carbide devices

Christopher Lew | *University of Melbourne, Australia*

Transport phenomena in copper doped cadmium telluride: calculation from the first principles

Orest Malyk | *Lviv Polytechnic National University, Ukraine*

Probing the SiO₂/SiC interface with nanometer depth resolution using low-energy muons

Maria Martins | *Paul Scherrer Institute, Switzerland*

Study of Ti contacts to corundum α -Ga₂O₃ – ohmic behavior and interfacial reactions

Fabien Massabuau | *University of Strathclyde, UK*

Muonium in β -Ga₂O₃

Rick (P.W.) Mengyan | *Northern Michigan University, USA*

Generation rates of electron-hole pairs due to a passage of protons and Si ions: investigation by the methods of time-dependent density functional theory and electron force field

Kirill Migdal | *Dukhov Automatics Research Institute (VNIIA), Russia*

Substitutional boron-doping of silicene nanoribbons when the presence of external field

Hoang Van Ngoc | *Thu Dau Mot University, Vietnam*

Diverse Electronic and Magnetic Properties of Semiconducting Silicene Nanoribbons Under Halogen Adsorption Effect

Duy Khanh Nguyen | *Thu Dau Mot University, Vietnam*

Diverse structural and electronic properties of carbon-substituted silicene nanoribbons

Thanh Tung Nguyen | *Thu Dau Mot University, Vietnam*

Poster presentations (continued)

Impact of growth conditions on the optoelectronics applications of $\text{CH}_3\text{NH}_3\text{PbI}_3$, studied by low-energy mSR

Xiaojie Ni | *Paul Scherrer Institute, Switzerland*

Tailoring quantum defect properties for quantum transduction with trapped ions

Vasileios Niaouris | *University of Washington, USA*

The effect of deep levels on the efficiency of InGaAs quantum wire intermediate-band solar cells based nanostructures grown by molecular beam epitaxy

Noor alhuda Al Saqri | *Sultan Qaboos University, Oman*

Segregation mechanism of arsenic dopants at Si grain boundaries

Yutaka Ohno | *Tohoku University, Japan*

Interplay between intrinsic and extrinsic defects in ZnSnN_2

Vegard Skiftestad Olsen | *University of Oslo, Norway*

Near-Surface SiV Charge Behavior After Cold Hydrogen Treatment

Christian Pederson | *University of Washington, USA*

Ga_2O_3 Schottky Photodiodes: Effects of Holes Trapping on Photosensitivity

Alexander Y. Polyakov | *National University of Science and Technology (MISiS), Russia*

Theory and experiment of Si – cation vacancy interactions in nitride semiconductors

Igor Prozheev | *University of Helsinki, Finland*

Evidence of O-polar (000-1) ZnO surfaces induced by in situ Ga doping

Vincent Sallet | *GEMAC, CNRS-UVSQ, France*

A Framework for Calculating Defect Concentrations Including Under Generalized Quenching Implemented in MATLAB

Mike Scarpulla | *University of Utah, USA*

Fine core structure and spectral luminescence features of freshly introduced dislocations in Fe-doped GaN

Sevastian Shapenkov | *Saint-Petersburg State University, Russia*

Dislocation relaxation in wide band gap heterostructures with trigonal and hexagonal crystal lattices

Andrei Smirnov | *ITMO University, Russia*

Poster presentations (continued)

Electrically Active Extended Defects in Ferromagnetic Structures based on Ga(Mn)InAs compounds

Oleg Soltanovich | *Institute of Microelectronics Technology RAS, Russia*

Machine Learning Assisted Identification of Threading Dislocations

Bohdan Starosta | *University of Strathclyde, UK*

Analyzing the polarization properties of O-H centers in β -Ga₂O₃

Andrew Venzie | *Lehigh University, Bethlehem, USA*

Deep levels at native defects and impurities in cesium lead bromide

Michael W Swift | *US Naval Research Laboratory, USA*

Investigation of MOCVD parameters correlation vs AIIIIV quality

Oleg Rabinovich | *NUST MISIS, Russia*

Thermal annealing of GaN implanted with Be

Michael Reshchikov | *Virginia Commonwealth University, USA*

Edge and screw threading dislocations in heteroepitaxial GaN layers

Cosmin Romanitan | *National Institute for Research and Development in Microtechnology, Romania*

Elastic constants of pseudo-graphenes

Mikhail Rozhkov | *ITMO University, Russia*

Terahertz time-domain spectroscopy of GaAs epitaxial layers treated with the use of fast atom bombardment

Hideo Takeuchi | *Osaka City University, Japan*

Electronic structure of neutral group-IV Vacancy colour centres in diamond

Gergő Thiering | *Wigner Research Centre for Physics, Hungary*

Size-dependent quantum efficiency of red emission from GaN:Eu micro-structures

Dolf Timmerman | *Osaka University, Japan*

Achieving bulk-insulating states in Pb(Bi,Sb)₂(Te,Se)₄ topological insulator

Yuki Tokumoto | *The University of Tokyo, Japan*

Poster presentations (continued)

Feature-Rich Electronic Properties of Germanene Nanoribbons Under Fluorine Doping Effect: A DFT Study

Vo Van On | *Thu Dau Mot University, Vietnam*

Polytypism in Zinc Sulphide thin films during RF Magnetron Sputtering

Vishnukanthan Venkatachalapathy | *University of Oslo, Norway*

Comparison of β -Ga₂O₃ photoluminescence upon anneals in vacuum, oxygen- and gallium-rich atmospheres

Vishnukanthan Venkatachalapathy | *University of Oslo, Norway*

Influence of annealing on the electrical properties of ITO deposited under different ambient atmospheres

Vishnukanthan Venkatachalapathy | *University of Oslo, Norway*

Dislocations in GaN: the activation energy for the glide and dislocation-related luminescence

Pavel Vergeles | *Institute of Microelectronics Technology RAS, Russia*

Effect of pulling speed on oxygen related defects in Czochralski silicon ingots

Gabriela K. Warden | *Norwegian University of Science and Technology, Norway*

Evolution of hydrogen-related defects in float zone-grown silicon wafers under dark annealing: resistivity change vs. FT-IR

Philip Weiser | *University of Oslo, Norway*

Can muons probe charge carrier kinetics in direct gap semiconductors?

Koji Yokoyama | *STFC Rutherford Appleton Laboratory, UK*

Approaches to Kinetics of Point Defect Formation and Evolution in Gallium Oxide

Nathan Yonkee | *University of Utah, USA*

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