GOX 2025: The 8th United States Gallium Oxide Workshop (August 4- 6, 2025, University of Utah, Salt Lake City)

TECHNICAL PROGRAM

Venue: James L. Sorenson Molecular Biotechnology Building (SMBB), University of Utah

August 4th 2025 (Monday)

8:20 AM	**Opening Remarks (Sriram Krishnamoorthy, Michael Scarpulla)**		
8:30 AM	**Advances in Ga_2O_3 Crystal Growth and Device Applications (PLENARY TALK)**	**Kohei Sasaki**	**Novel Crystal Technology**
	Technical Session 1: Bulk Crystal Growth Session Chair: Michael Scarpulla		
9:15 AM	**Bulk Growth of Offcut (100) Ga_2O_3 by EFG: Establishing a Domestic Source of Gallium Oxide Substrates (INVITED TALK)**	**Drew Haven**	**Luxium Solutions**
9:45 AM	Bulk Crystal Growth of β-Ga_2O_3 Crystals from the Melt Without Precious-Metal Crucible Using Oxide Crystal Growth from a Cold Crucible Method	Akira Yoshikawa	Tohoku University
10:00 AM	Optimization of Axial Vertical Temperature Distribution and Experimental Verification in 4-Inch β-Ga_2O_3 Crystal Growth Using the Vertical Bridgman Method	Dae-Uk Kim	Dong Eui University
10:15 AM	Thermal Field Engineering Using Ceramic Materials to Optimize β-Ga_2O_3 Crystal Quality by EFG Method	Tae-Hun Gu	Pukyong National Uni.
10:30 AM	**COFFEE BREAK**		
	Technical Session 2: Substrates & Epitaxial Growth Session Chair: Matthew McCluskey		
11:00 AM	Development of a Manufacturing Process for Epi-Ready Miscut (100) β-Ga_2O_3 Substrates	Daniel Erdely	Penn State, Applied Research Laboratory
11:15 AM	Characterization of Miscut (100) β-Ga_2O_3 Substrates to Enable Bulk Growth and Processing Improvements	Robert M Lavelle	Penn State, Applied Research Laboratory
11:30 AM	Fabrication of (010) and (001) β- β-Ga_2O_3 Thin Film Composite Wafers	Michael E Liao	Apex Microdevices
11:45 AM	Evaluation of the Impact of Substrate Processing on (010) β- β-Ga_2O_3 Epitaxial Growth	Robert M Lavelle	Penn State, Applied Research Laboratory
12:00 PM	**Nitrogen-Doped Ga_2O_3 Thin Films Grown by Molecular Beam Epitaxy (INVITED TALK)**	**Masataka Higashiwaki**	**Osaka Metropolitan University**
12:30 PM to 2:00 PM	**LUNCH BREAK**		

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Technical Session 3: Epitaxy, Material Characterization & Defects
Session Chair: Masataka Higashiwaki

2:00 PM	**Illuminating Features in β-Ga_2O_3 with Photoluminescence and Raman Spectroscopy (INVITED TALK)**	**Matthew McCluskey**	**Washington State University**
2:30 PM	Mitigating Unintentional Carbon Incorporation and Characterizing Associated Deep Compensating Centers	Hemant Ghadi	The Ohio State University
2:45 PM	Non-Equilibrium Defect Formation Energies-What Happens to Defect Concentrations in the Presence of Excess Carriers?	Isaac Thomas	University of Utah
3:00 PM	Infrared-Active Phonon Modes, Band-to-Band Transitions, and Ultraviolet Dielectric Functions of Unintentionally-Doped (X < 0.3) and Silicon Doped (X < 0.25) Single Crystal (100) β-$(Al_xGa_{1-x})_2O_3$	Preston R Sorensen	University of Nebraska-Lincoln
3:15 PM	Si-Doped β-Ga_2O_3 Films Grown by LPCVD with Controlled Doping, Promising Mobility and High Growth Rates	Saleh Ahmed Khan	University of Massachusetts Lowell
3:30 PM	**COFFEE BREAK**		

Technical Session 4: Epitaxial Growth
Session Chair: Anhar Bhuiyan

4:00 PM	**Synthesis of UWBG GeO_2 and $GeSnO_2$ semiconductors (INVITED TALK)**	**Rebecca L (Becky) Peterson**	**University of Michigan**
4:30 PM	Seed-Driven Stepwise Crystallization for Phase Control in Growing Rutile GeO_2 Films by MOCVD	Imteaz Rahaman	University of Utah
4:45 PM	β-Ga_2O_3 Epitaxial Layer Grown by Liquid Phase Epitaxy	Zhijin Chen	Mitsubishi Gas Chemical Company
5:00 PM	MOVPE Growth and Characterization of β -$(Al_xGa_{1-x})_2O_3$ Thin Films on β -$(Al_yGa_{1-y})_2O_3$ Substrates	Saud Bin Anooz	Leibniz-Institut für Kristallzüchtung (IKZ)
5:15 PM	Epitaxial Stabilization of Monoclinic (Al, in, Ga)$_2O_3$/Ga_2O_3 Heterostructures	Stephen Schaefer	National Renewable Energy Laboratory
5:30 – 7:30 PM	**GOX Welcome Reception** **Cleone Peterson Eccles Alumni House** **155 SOUTH CENTRAL CAMPUS DRIVE** **SALT LAKE CITY, UT 84112**		

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August 5th 2025 (Tuesday)

8:30 AM	**Advancements in the Epitaxial Growth of Ga_2O_3 Thin Films, Alloys, and Heterostructures (PLENARY TALK)**	**Hongping Zhao**	**The Ohio State University**
	Technical Session 5: MOCVD Growth Session Chair: Hari Nair		
9:30 AM	Growth of >50micron Thick, <1e16 Doped Ga_2O_3 Layers on Sn-Doped (001) Substrates by Halide Vapor Phase Epitaxy	Jacob Leach	Kyma Technologies
9:45 AM	Sub-Nanometer Surface Roughness of 20 μm Thick Homoepitaxial β-Ga_2O_3 on ~3.8° (100) Substrates by MOCVD	Joshua T Buontempo	Cornell University
10:00 AM	MOCVD Growth of (010) β- Ga_2O_3 with Fast Growth Rates (> 4.3 μm/H) and Superior Transport Properties	Dong Su Yu	The Ohio State University
10:15 AM	MOCVD Epitaxy of (001) β- Ga_2O_3 Films with Fast Growth Rates	Lingyu Meng	The Ohio State University
10:30 AM	**COFFEE BREAK**		
	Technical Session 6: MOCVD Growth Session Chair: Xiuling Li		
11:00 AM	**MOCVD Synthesis and in Situ Etching of Ga_2O_3 (INVITED TALK)**	**Hari Nair**	**Cornell University**
11:30 AM	Low-Background Carrier Density Intentionally and Unintentionally Doped (010) β- Ga_2O_3 Drift Layers and Schottky Diodes	Carl Peterson	University of California, Santa Barbara
11:45 AM	Novel Showerhead for Scalable β-Ga_2O_3 MOCVD	William Timothy Brand	Agnitron Technology
12:00 PM	Electrical Transport in δ-Doped β- Ga_2O_3 Grown by MOCVD	Cameron A Gorsak	Cornell University
12:00 PM	MOCVD-Grown Insulating Nitrogen-Doped (010) β- Ga_2O_3 Buffer Layers for Silicon Peak Suppression	Rachel Kahler	University of California, Santa Barbara
12:30 PM to 2:00 PM	**LUNCH BREAK**		

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Technical Session 7: Dielectrics, Ion Implantation & Material Processing
Session Chair: Kai Fu

2:00 PM	**Dielectric Integration for Ga_2O_3 MOS Devices (INVITED TALK)**	**Ahmad Ehteshamul Islam**	**Air Force Research Lab**
2:30 PM	Investigation of SiO_2: HfO_2 Composition Effects on ALD $HfSiO_x$ as Gate Dielectric on β Ga_2O_3 (001)	Xin Zhai	University of Michigan
2:45 PM	Characterization of Ion-Implanted Nitrogen as a Compensating Acceptor in β- Ga_2O_3	Jacob S Breakfield	Air Force Research Lab
3:00 PM	High-Density Si Doping into Ga_2O_3 by Hot Implantation	Kotaro Yagi	Osaka Metropolitan University
3:15 PM	Effect of NiOx Sputtering and ICP Dry Etching on (010) β- Ga_2O_3 Films Grown by MOCVD	Chinmoy Nath Saha	University of California, Santa Barbara
3:30 PM	COFFEE BREAK		

Technical Session 8: Heterojunctions, Epitaxy & Wet Etching
Session Chair: Ahmad Islam

4:00 PM	**Atomic Structure of the Ga_2O_3-Based PN Junction Interface (INVITED TALK)**	**Jinwoo Hwang**	**The Ohio State University**
4:30 PM	MOCVD-Grown n-Ga_2O_3/p-GaN Heterojunction Diodes with Atomically Sharp Interfaces	Zhongjie Ren	The University of Texas at Austin
4:45 PM	Thermal Degradation and Performance Enhancement of β-Ga2O3 Diodes Using CNT/ Ga_2O_3 Heterojunctions	Hunter Ellis	University of Utah
5:00 PM	Near-Vertical Non-Plasma HCl Gas Etching on (011) β- Ga_2O_3	Takayoshi Oshima	National Institute for Materials Science, Japan
5:15 PM	Dry Etch Damage Mitigation in (001) β- Ga_2O_3 Schottky Diodes Using Hot-H_3PO_4	Steve Rebollo	University of California, Santa Barbara
5:30 – 7:30 PM	**Poster Session** **Cleone Peterson Eccles Alumni House** **155 SOUTH CENTRAL CAMPUS DRIVE** **SALT LAKE CITY, UT 84112**		

	Posters		
1	Crack Formation in Strained β-$(Al_xGa_{1-x})_2O_3$ Films Grown on (010) β- Ga_2O_3 Substrates	Dorian P Luccioni	University of California Los Angeles
2	Advanced MOCVD Growth and TEM Analysis of Rutile GeO_2	Imteaz Rahaman	University of Utah
3	Distinction Between (001) and (-101) Plane Orientations of β-Ga_2O_3 Crystals Grown by EFG Method	So-min Shin	Dong Eui University
4	Improving Thermal Management in β- Ga_2O_3 Power Devices Through Interface Engineering: a First-Principles Study	Sanjay Gopalan	North Carolina State University
5	Understanding Anisotropic Breakdown Behavior in β- Ga_2O_3 Through TCAD and Experimental Analysis of JTE Structures	Mohamed Torky	University of Albany
6	Measurement Geometries and Depth Sensitivity for High Resolution X-Ray Diffraction Measurements: Homoepitaxial β- Ga_2O_3	Mark Goorsky	University of California Los Angeles
7	Remote Hydrogen Plasma Interplay with Ga_2O_3 Carbon, Oxygen, and Gallium Defects	Carlos R DeLeon	The Ohio State University
8	High-Frequency Electron Paramagnetic Resonance Generalized Spectroscopic Ellipsometry Characterization of Cr -Doped Gallium Oxide	Viktor Rindert	Lund University
9	Mitigating Interfacial Si Conductivity in β- Ga_2O_3 Thin Films with Fe Compensation	Brenton A. Noesges	Air Force Research Lab
10	Nucleation and Evolution of GeO_2 Grown on Sapphire Substrates by MOCVD	Botong Li	University of Utah
11	Low-Pressure CVD of Sn- and Ge-Doped β-Ga_2O_3: Tunable Doping, Promising Mobility, Schottky Diodes, and Insights from DFT	Ahmed Ibreljic	University of Massachusetts Lowell
12	Investigating the Epitaxial Growth of Hexagonal ε-$(In_xGa_{1-x})_2O_3$ on AlN for High Power and Extreme Environment Applications	Maria Sultana	Texas State University
13	Effect of N_2 Atmosphere Annealing on Impurity Distribution and Crystallinity of 4N β-Ga_2O_3 Single Crystals Grown by EFG Method	A-Ran Shin	Pukyong National University
14	TEM Investigation of Point-Defect Formation in Beta-$(Al_xGa_{1-x})_2O_3$ Single Crystals	Arub Akhtar	Leibniz-Institut für Kristallzüchtung (IKZ)
15	Machine Learning Guided Microscopy for Vacancy Detection in β-Ga_2O_3	Shaon Das	University of Buffalo
16	Vertically Conducting β- Ga_2O_3 Diodes on 4H-SiC Substrate as Short Wavelength (<245 Nm) Switches/Detectors	Tahir Hassan	University of South Carolina
17	Nanoscale Thermal Transport in Ion-Beam-Exfoliated β-Ga_2O_3 Nanomembranes	Azat Abdullaev	Nazarbayev University
18	Defects in Atomic Layer Deposited Polycrystalline HfO2 on ($\bar{2}$01) β- Ga_2O_3	Khushabu Agrawal	Tyndall National Institute Cork
19	Modulating Interface and Bulk Properties in ALD Al2O3 on β- Ga_2O_3 with Spatially Selective Oxidants	Adam A Gruszecki	University of Texas at Dallas

20	In Situ Study of Crystal Quality and Phase Transition of Ga_2O_3 and GeO_2 at High Temperatures Up to 1000 ℃ by XRD	Botong Li	University of Utah
21	Defect Kinetics in β- Ga_2O_3: Sequential Quenching Simulations for Thin Films and Bulk Crystals	Khandakar Aaditta Arnab	University of Utah
22	Orientation Dependence of near Surface Open Volume Defects in Beta- Ga_2O_3 Investigated with Positrons	Marc H Weber	Washington State University
23	High Quality Ga_2O_3 on Sapphire to Achieve Fast Solar-Blind Photodetectors with High Detectivity	Chen He	University of Chinese Academy and Science
24	Numerical Simulation and Optimisation of Hot-Zone Configurations for β- Ga_2O_3 Crystal Growth via the Vertical Bridgman Method	Seora Son	AXEL Co, Ltd., Korea (South)
25	Generative Co-Design of Ga_2O_3 Devices for Coupled Electrical, Thermal, and Mechanical Performance	Miguel Aguilo	Morphorm LLC
26	The Study on Surface Properties of Various Crystal Planes Obtained from Bulk β- Ga_2O_3 Single Crystals Grown by the EFG Method	Yunjin Kim	DongEui University
27	A Surface Potential Based Analytical C-V Model of a Double-Gate Vertical Fin-Shaped Ga_2O_3 Power Transistor	Twisha Titirsha	University of Missouri-Columbia
28	Simulation and Performance Evaluation of AlN/β-Ga_2O_3 HEMTs for Next-Generation Ultrawide Bandgap Power Devices	Md Maruf Hossain	University of Missouri-Columbia
29	Crystallographic HCl Gas Etching for Fabrication of β- Ga_2O_3/Air-Gap Structures on (100) Substrates	Takayoshi Oshima	National Institute for Materials Science, Japan

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8:30 AM	**The Roadmap Towards Ga_2O_3 Technology Insertion (PLENARY TALK)**	**Andrew Green**	**Air Force Research Lab**
	Technical Session 9: Transistors Session Chair: Nolan Hendricks		
9:30 AM	1.8 kV Multi-Fin β- Ga_2O_3 Vertical FinFET with Field Oxide Exhibiting a PFOM of 1 GW/cm^2	Saurav Roy	University of California, Santa Barbara
9:45 AM	Enhancement-Mode Vertical β- Ga_2O_3 U-Trench MOSFETs Featuring in-Situ Mg-Doped Current Blocking Layers	Walid Amir	University at Buffalo
10:00 AM	β-Ga2O3 Sub-Micron FinFETs Modulating > 3 x 1E13 cm^{-2} Charge Density and 10^9 on/off Ratio	Nabasindhu Das	Arizona State University
10:15 AM	High-Voltage β- Ga_2O_3 MOSFET with Staircase Field Plate Design and 400 V Dynamic Switching	Shivam Sharma	University of Buffalo
10:30 AM	COFFEE BREAK		
	Technical Session 10: Diodes & Thermal Management Session Chair: Nidhin Kurian Kalarickal		
11:00 AM	Near-Ideal 1D Thermionic Field Emission Current in Vertical β- Ga_2O_3 Schottky Diodes via Ultra-High-κ Sputtered $BaTiO_3$ Field Management	Kyle Liddy	Air Force Research Lab
11:15 AM	Orientation-Dependent β- Ga_2O_3 Heterojunction Diode with Atomic Layer Deposition (ALD) Grown NiO	Yizheng Liu	University of California, Santa Barbara
11:30 AM	An Aerosol Jet Printed Heat Spreader Material for Thermal Management of Gallium Oxide Devices	Laura C Davidson	KBR
11:45 AM	Improved Thermal Performance of Gallium Oxide Devices Through the Metal-Embedded Chip Assembly Process	Judit K Beagle	Air Force Research Lab
12:00 PM	A Field Plate Study on Large-Area β- Ga_2O_3 Transistors for Field Management in Power Switching Devices	Nicholas P Sepelak	KBR & Air Force Research Laboratory
12:30 PM to 2:00 PM (Working Lunch)	**Expert panel: Lessons learned from incumbent technologies and applications for Ga_2O_3** Moderator: Nolan Hendricks, Air Force Research Lab Panelists: • Victor Veliadis, Executive Director & CTO, Power America, Professor, North Carolina State University • Sudip Mazumder, University of Illinois, Chicago • Alan Mantooth, University of Arkansas		

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Technical Session 11: Sapphire & Devices for extreme environment applications
Session Chair: Uttam Singisetti

2:00 PM	**Reaching beyond Diamond to Sapphire a 7 eV Semiconductor (INVITED TALK)**	**Darrell Schlom**	**Cornell University**
2:30 PM	Electrothermal Co-design of Vertical β- Ga_2O_3 Schottky Diodes with High Permittivity Dielectric Field Plate for High-field and Thermal Management	Emerson J. Hollar	Iowa State University
2:45 PM	Heavy Ion Single Event Effects (SEE) Testing of kV-Class Lateral Gallium Oxide MOSFETs	Shivam Sharma	University of Buffalo
3:00 PM	Influence of Doping Concentration and E-Field on Radiation Response in MOCVD β- Ga_2O_3 Schottky Diodes	Joe McGlone	The Ohio State University
3:15 PM	COFFEE BREAK		

Technical Session 12: Novel devices & dynamic performance
Session Chair: Esmat Farzana

3:45 PM	**TBD (INVITED TALK)**	**Faisal Khan**	**National Renewable Energy Laboratory**
4:15 PM	Effects of Spatially Resolved Heavy Ion Irradiation on Ga_2O_3 MOSFETs	Daram N Ramdin	Air Force Research Lab
4:30 PM	Evaluation of a β- Ga_2O_3 MSM Detectors for Proton Therapy	Hunter Ellis	University of Utah
4:45 PM	Binary Phase-Only Gallium Oxide Diffractive Optical Element for Beam Shaping	Wei Jia	University of Utah
5:00 PM	Application of α- Ga_2O_3-Based Schottky Barrier Diode to Microwave Rectenna	Takeru Wakamatsu	Kyoto University
5:15 PM	Dynamic Breakdown Voltage and Overvoltage Margin Under Pulsed Conditions in β- Ga_2O_3 Based Devices	Harsh Raj	Indian Institute of Science
5:30 PM	**Closing remarks (Michael Scarpulla, Sriram Krishnamoorthy)**		