



Advanced Epitaxy for
Freestanding Membranes
and 2D Materials

July 7-9 • 2025



Grenoble • France
MAISON Minatec

AEFM

INTERNATIONAL CONFERENCE

In Titane 1 & 2 and Chrome 1

Advanced Epitaxy for Freestanding
Membranes and 2D Materials

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The world's premier center for advanced semiconductor solutions

Located in Europe's deep tech hotspot of Grenoble, France, CEA-Leti has been pioneering innovation in micro and nanotechnologies since 1967. It is part of the CEA, a Clarivate Top 100 Global Innovator.

CEA-Leti's lab-to-fab model is designed to support companies throughout the innovation lifecycle. Companies of all types and sizes, from startups to major global corporations, have entered into long-term partnerships with CEA-Leti at various stages of their R&D journeys, from proof of concept to scaling new solutions up for volume manufacturing.

CEA-Leti leverages internationally-renowned expertise in micro and nanotechnologies to drive the development of new solutions that respond to society's most pressing challenges around low-carbon energy, digital, health, and defense and security. Transferring the technologies developed to businesses is an integral part of CEA-Leti's mission



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PLENARY

SPEAKERS



Jeehwan Kim

Massachusetts Institute of Technology, USA



Sheng Xu

University of California San Diego, USA



Chang-Beom Eom Kim

University of Wisconsin, USA



Jiwoong Park

University of California San Diego, USA



Ionut Radu

SOITEC, France

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VACUUM TECH

Rocky Mountain Vacuum Tech, Inc was established in 2006. Since that the company has been producing and assembling various vacuum equipment and improved new technologies such as DLC coating, ICP source, SiC heating element, Large area ITO coating, Dry cleaning under ATM plasma, Sputtering Ion beam module, Li-Ion battery vacuum drying and 2D materials. Our customers are worldwide. University, government laboratory and manufacture company. OEM's and end user are all extensively represented in our customer base.

Products

Vacuum equipment

- PVD (Physical Vapor Deposition)
 1. Evaporator
 2. Sputter
- CVD (Chemical Vapor Deposition)
- Solar Cell
- RTP (Rapid Thermal Process)
- Etcher
 1. ICP
(Inductively Coupled Plasma)
 2. RIE (Reactive Ion Etching)
 3. CAIBE
(Chemically Assisted Ion Beam Etching)
- Atmospheric Plasma
- Vacuum Dryer



Sputtering System



E-Beam Evaporator



Metal & Organic Evaporator



RTP System



PLD System



ALD System

Session 1 : Remote and van der Waals epitaxy

08:15 – 09:50

08:15 to 08:20	Bérangère Hyot – CEA-Leti, France	Welcome	Chair: Sanghoon Bae
08:20 to 08:30	Thomas Ernst – CEA-Leti, France	Introduction and Welcome	
08:30 to 09:10	Ionut RADU – SOITEC, France	Single-crystalline thin films à la carte: applications and technology opportunities	
Plenary			
09:10 to 09:30	Kyusang LEE – Future Semiconductor Business, USA	From Laboratory to Industry: Remote Epitaxy for Scalable Semiconductor Membranes	
Keynote			
09:30 to 09:50	Hyunseok Kim – University of Illinois Urbana-Champaign, USA	Is remote epitaxy really remote? – Unveiling the mode of epitaxy on 2D materials	

Coffee break and poster session 15 min

10:05 – 12:05 Session 2 : Monolithic 3D integrations

Chair: Munho Kim

10:05 to 10:45	Jeewan Kim – MIT, USA	Seamless wafer-free monolithic 3D integration enabled by confined growth and remote epitaxy
Plenary		
10:45 to 11:15	Saptarshi Das – Penn State University, USA	2D Materials for 3D Integration, Advanced Logic, and More
Keynote		
11:15 to 11:45	Qing Cao – University of illinois Urbana-Champaign, USA	Monolithic three-dimensional integration of complementary single-crystalline silicon transistors
Keynote		
11:45 to 12:05	Jiho Shin– TAMU, USA	Dissolvable, Flexible, and 3D-integrated electronics using freestanding membranes



we make bricks of your dream.



ALD equipment for R&D

iOV DX3 (4" ~ 12" wafer)	iOV EX2 (8" or 12" wafer)	iOV CX2 (8" or 12" wafer)
<ul style="list-style-type: none"> From 4" to 12" and larger Application : Various R&D 	<ul style="list-style-type: none"> From 8" to 12" Application : High-k, Nitride R&D 	<ul style="list-style-type: none"> From 8" to 12" Application : High-k, Nitride R&D

ALD equipment for Mass production

iOV MX4 (4" wafer)	iOV MX8 (8" wafer)	iOV MX12 (12" wafer)
<ul style="list-style-type: none"> 4" 5 Slot Cluster (PE) ALD Cluster system Application : Display 	<ul style="list-style-type: none"> 8" 4 Slot Cluster (PE) ALD Cluster system Application : Display 	<ul style="list-style-type: none"> 12" 5 Slot Cluster (PE) ALD Cluster system Application : Semiconductor

ALD for small and large scale powder

iPV DX3	iPV DX10	iPV MX15
<ul style="list-style-type: none"> Reactor Volume 3L Process Temp. 280°C Automated Reactor Loading & Un-Loading 	<ul style="list-style-type: none"> Reactor Volume 10L X 2ea Process Temp. 280°C Full Automated System 	<ul style="list-style-type: none"> Reactor Volume 15L X 3ea Process Temp. 280°C Full Automated System

ETC

iCV MX4	Flexible / Roll to Roll
<ul style="list-style-type: none"> 4" wafer substrate Manual loading type 	<ul style="list-style-type: none"> 300mm width film Transparent conductive Oxide/Metal/Oxide film production

Session 3&4 : Remote and van der Waals epitaxy 13:35 – 16:05

Chair: Jian Shi & Berangere HYOT

13:35 to 14:15 Plenary	Chang-Beom Eom – University of Wisconsin – Madison, USA	Twisted oxide membrane interface by local atomic registry design
14:15 to 14:45 Keynote	Young Joon Hong – SKKU, South Korea	Nitride-based MOCVD remote epitaxy for high-performance device applications
14:45 to 15:05	Hyun S. Kum – Yonsei University, South Korea	Rapid low-temperature formation of graphene-coated SiC substrates for remote and vdW epitaxy
15:05 to 15:35	Jian Shi- RPI, USA	Electrical and Optoelectronic Phenomena at van der Waals 2D–3D Phase-Transition Compound Interfaces
15:35 to 16:05 Keynote	Abdallah Ougazzaden – Georgia Institute of technology, USA	2D hBN in GaN Optoelectronics: Dual Roles in Epitaxial Engineering and Device Innovation

Coffee break– 15 min

Panel Discussion –Meet Editors 16:30 – 17:15

Karl Ziemelis (Nature, Chief Applied & Physical Sciences Editor)

Mathew Parker (Nature Electronics)

Olga Bubnova (Nature Review Electrical Engineering)

Open discussion with panels, organizers, and attendees

17:15 – 18:15 Poster Session

Wine and Cheese Tasting

18:15–20:00



Join us on July 7th at MINATEC for a Wine & Cheese social event! Discover the rich flavors of the region's finest wines, carefully selected by a local sommelier, and paired with a refined assortment of cheeses, charcuterie, and vegetarian & dairy-free options.

TuoTuo Technology is an optical equipment manufacturer specializing in optical microscopy processing and inspection. The company has evolved into a high-tech enterprise integrating design, research and development, manufacturing, sales, and customer consulting services, dedicated to providing comprehensive technical support to our customers.

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[Magnetic Optical Kerr Angle: 0.1 mrad]



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Maskless UV Photolithography

[Critical dimension(min.) : 0.4 μm]



Microfluidics, Metamaterials, Sensors, Microelectronics, Medical microdevices

PROGRAM

July 8th

Room Titane 2

Session 5 : Remote and van der Waals epitaxy 09:10 – 10:30

Chair: Hyun S. Kum

09:10 to 09:30 Sungkyu kim – Sejong University, South Korea

09:30 to 09:50 Celesta Chang – SNU, South Korea

09:50 to 10:10 Wei Kong – Westlake University, USA

10:10 to 10:30 Takuji Maekawa – ROHM Co., Ltd., Japan

Visualizing freestanding membranes in 3D by electron ptychography

Interfacial Mechanisms of Single-crystalline MoS_2 on Sapphire

Fabrication of SiC remote epitaxial membranes for wafer cost reduction

Room Chrome 1

08:30 – 10:30 Session 6 : Synthesis and Applications of 2D Materials

Chair: Jinkyong Yoo

08:30 to 09:10 Plenary	Jiwoong Park – University of Chicago, USA	More Magic with 2D Materials
09:10 to 09:30	Ying-Hao Eddie Chu – National Tsing Hua University, Taiwan	Van der Waals heteroepitaxy of $\text{Bi}_2\text{O}_2\text{X}$ (X=S, Se, Te).
09:30 to 09:50	Kibum Kang – KAIST, South Korea	Towards Ultimate Nucleation-Control in 2D Film Growth
09:50 to 10:10	Adrien Michon – CNRS-CRHEA, France	Self-limited monolayer graphene growth on SiC with propane-hydrogen CVD
10:10 to 10:30	Varun Harbola – Max Planck Institute, Germany	Heterointegration and interface design beyond epitaxy

Coffee break – 15 min

Room Titane 2

Session 7 : Growth and Applications of membrane 10:45 – 12:25

Chair: Jiho Shin

10:45 to 11:05	Tobias Henksmeier – Paderborn University, Germany	Remote Epitaxy of III-V films on monolayer amorphous carbon covered substrates
11:05 to 11:25	Jinkyong Yoo – Los Alamos National Laboratory, USA	
11:25 to 11:45	Yoshitaka Taniyasu – NTT Basic Research Laboratories, Japan	MOCVD growth of 1D structures based on group III-VI layered semiconductors
11:45 to 12:05	Yuta Saito – Tohoku University, Japan	Growth and Synthesis of layered tellurides for field effect transistor application
12:05 to 12:25	Pavan Nukala – IISc, India	Device quality epitaxial ferroelectric oxides obtained through various layer transfer techniques

Room Chrome 1

10:45 – 12:45 Session 8 : Applications of free-standing membranes

Chair: Kyusang Lee

10:45 to 11:15 Keynote	Nanshu Lu – UT-Austin, USA	Graphene E-Tattoos
11:15 to 11:45 Keynote	Nini Pryds – DTU, Denmark	Oxide Membranes: Fabrication, Transfer, and Stacking – Current Advances and Future Outlook
11:45 to 12:05	Minjoo Larry Lee – University of Illinois Urbana Champaign, USA	
12:05 to 12:25	Abderraouf Boucherif – University of Sherbrooke, Canada	Engineering Flexible Nanomembranes Using Porous Semiconductors and Graphene
12:25 to 12:45	Junwoo Son, Seoul National University (SNU), South Korea	Single-crystalline rutile oxide membrane, a versatile platform to overcome lattice mismatch

Room Titane 2

Session 9 : Monolithic 3D integrations 13:45 – 15:55

Chair: Saptarshi Das

13:45 to 14:25 Didier Landru – SOITEC, France
Keynote

Membranes manufacturing with SOI & SmartCut™ technology

14:25 to 14:45 Perrine Batude – Leti, France
Keynote

Status on 3D sequential integration with low temperature stacked Silicon devices

14:45 to 15:05 Kyusang Lee – UVA, USA

CMOS + X towards edge intelligence

15:05 to 15:25 Jianshi Tang – Tsinghua University, China

Monolithic 3D Integration with BEOL-Compatible Materials and Devices for Energy-Efficient Computing-in-Memory

15:25 to 15:55 Washington University in St. Louis, USA
Keynote

Materials Innovation through 2D materials and 3D nanomembranes: From artificial heterostructures to M3D integration

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Session 10 : Synthesis and Applications of 2D materials 13:45 – 15:45**Chair: Celesta Chang**

13:45 to 14:15 Keynote	Deji Akinwande – UT-Austin, USA	2D materials for hydrogen fuel cells and clean energy
14:15 to 14:45 Keynote	Lain-Jong Li – National University of Singapore, Singapore	The Potential of Transition Metal Dichalcogenides for Low-Power Electronics: CFET Demonstration
14:45 to 15:05	Salim El Kazzi – AIXTRON	Enabling Next-Gen 3D Integration via Wafer-Scale Epitaxy on 2D Materials
15:05 to 15:25	He Ding – BIT, China	Ripple-free, high-performance DC voltage converter based on integrated optoelectronic devices
15:25 to 15:45	Sanghoon Chae – Nanyang Technological University, Singapore	Electrically Tunable Nonlinear Photonics using Ferroelectric 2D Materials Integration

Coffee break – 15 min

Showroom visit**16:00 – 18:15**

Refreshments: 18:15–19:00

Gala Dinner**19:30–22:30**

Conference dinner at Château de la Commanderie
(for Oral presenters, Panelists, and Organizers.)

There will be a shuttle bus from MINATEC
to Château de la Commanderie



PROGRAM

July 9th

Room Titane 2

Session II : Applications of free-standing membranes 8:30 – 10:40

Chair: Hyunseok Kim

09:10 to 09:50 Plenary	Sheng Xu – University of California San Diego, USA	Controlled epitaxial growth and fabrication of hybrid halide perovskite membranes
09:50 to 10:20 Keynote	Dong-Seon Lee – GIST, South Korea	
10:20 to 10:40	Yun Seog Lee – SNU, South Korea	Freestanding Solid-Electrolyte Membranes for High-Energy-Density All-Solid-State Batteries
10:40 to 11:00	Fabien Chabuel – CEA, Leti, France	General presentation of Leti

Room Chrome 1

09:10 – 10:40 Session 12 : Synthesis and Applications of 2D Materials

Chair: Muhno Kim

09:10 to 09:30	Hanako Okuno – CEA-Irig, France	4D-STEM : A new approach to studying large-scale 2D materials synthesized for device applications
09:30 to 09:50	Yui Ogawa – NTT Basic Research Laboratories, Japan	Investigation of the Growth Mechanism of Graphene in CVD Process via In-Situ Ultraviolet Optical Observation
09:50 to 10:10	Matthieu Jamet – CEA-Spintec, France	Large area epitaxial van der Waals heterostructures : new materials for tunable spintronic THz emission

Coffee break – 45 min

Room Titane 2

Session 13 : Applications of free-standing membranes 10:55 – 12:15

Chair: Yun Seog Lee

11:35 to 11:55	Ning Li – Penn State University, USA	Benchmarking phase change memory for analog in-memory computing
11:55 to 12:15	Yimo Han – Rice University, USA	Strain and strain relaxation in van der Waals epitaxy revealed by advanced electron microscopy. (online)
12:15 to 12:35	Haozhe Wang – Duke University, USA	Foundation Model Agent for 2D Materials Characterization. (online)

Room Chrome 1

10:55 – 12:15 Session 14 : Synthesis and Applications of 2D Materials

Chair: Wei Kong

11:35 to 11:55	Jens Martin – Leibniz Institute, Germany	Fabrication pathways for freestanding oxide membranes and novel crystalline interfaces
11:55 to 12:15	Matthew Lefevre – Park Systems, France	Characterizing the electronic properties of graphene on silicon carbide via Atomic Force Microscopy
12:15 to 12:35	Munho Kim – Nanyang Technological University (NTU), Singapore	Nanostructured Inorganic Wide Bandgap Semiconductors for Advanced Ultraviolet Photodetectors

Lunch Break 12:35 to 14:00

**Included in the registration fees*

Closing Remark

2025 is the **5th edition** of the Advanced Epitaxy for Freestanding Membranes and 2D Materials (AEFM) conference.

After a virtual edition in 2021, the Massachusetts Institute of Technology (MIT, USA) in 2022, the Seoul National University (SNU, South Korea) in 2023 and the University of Tokyo (Tokyo, Japan) in 2024, the CEA-Leti, MINATEC site in Grenoble, France, located in the heart of the Alps, is hosting the fifth edition of AEFM.

The conference is held to discuss **recent advancements and breakthroughs** in the field of **freestanding membranes** in four major symposia :

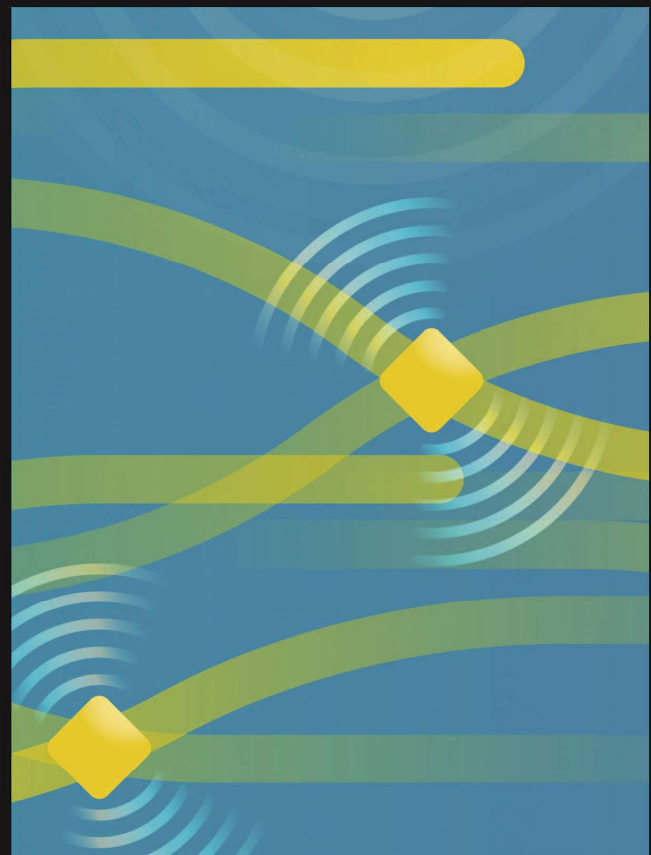
- Remote epitaxy & van der Waals epitaxy
- Synthesis of large-scale 2D materials and their applications
- Applications of freestanding membranes (in fields such as medical, display, and energy) and other lift-off techniques
- Monolithic 3D integrations

nature sensors

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