




The 22nd International Conference on the Science and
Applications of Nanotubes and Low-Dimensional Materials

The background of the lower half of the page is a grayscale image of a carbon nanotube. It shows a series of interconnected hexagonal rings forming a cylindrical structure that recedes into the distance, creating a sense of depth.

Conference Schedule at a Glance


Tutorial	Keynote	Invited	Contributed
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Main Conference Time Table

Date	June 19th (SUN)	June 20th (MON)	June 21st (TUE)	June 22nd (WED)	June 23rd (THU)	June 24th (FRI)	Date	
08:50-09:00		Opening					08:50-09:00	
09:00-09:50		Rodney Ruoff	Philip Kim	Yutaka Ohno	Michael Arnold	Sarah Haigh	09:00-09:50	
09:50-10:10		Ksenia Bets	Esko Kauppinen	Youfan Hu	James Elliott	Daniel A. Heller	09:50-10:10	
10:10-10:20							10:10-10:20	
10:20-10:30		Yan Li	Hyeonsik Cheong	(c) Micah Green	Yuichiro Kato	Xuedan Ma	10:20-10:30	
10:30-10:40							10:30-10:40	
10:40-10:50				Coffee break			10:40-10:50	
10:50-11:00		Coffee break	Coffee break		Coffee break	Coffee break	10:50-11:00	
11:00-11:10				(c) Cheol Jin Lee			11:00-11:10	
11:10-11:20		Emmanuel Flahaut	Ado Jorio	Stephanie Reich (Recorded)	Benjamin S. Flavel	Seokwoo Jeon	11:10-11:20	
11:20-11:40							11:20-11:40	
11:40-11:50		(c) Feng Ding	(c) Katalin Kamaras		(c) Martin Koehne	(c) Katsutoshi Hori	11:40-11:50	
11:50-12:00				Lunch			11:50-12:00	
12:00-13:00		Lunch	Lunch		Lunch	Lunch	12:00-13:00	
13:00-13:15				Ncenter Tour			13:00-13:15	
13:15-13:30		Poster 1	Poster 3	Advance reservation is necessary	Poster 5	Parallel symposia	13:15-13:30	
14:00-14:30	Manish Chhowalla							
14:30-15:15							14:30-15:15	
15:15-15:45	Huiming Cheng	Parallel symposia	Parallel symposia	Excursion	Parallel symposia		15:15-15:45	
15:45-16:00						Coffee break	15:45-16:00	
16:00-16:30						Sergei Tretiak	16:00-16:30	
16:30-16:45	Coffee break				(c) Nicola Curreli	16:30-16:45		
16:45-16:50	FORUM Current challenges and future perspectives in low dimensional materials	Coffee break	Coffee break		Coffee break	Poster award & Closing ceremony	16:45-16:50	
16:50-17:00								16:50-17:00
17:00-17:15								17:00-17:15
17:15-17:30							17:15-17:30	
17:45-18:00	Poster 2	Poster 4		Poster 6			17:45-18:00	
18:00-18:30	Welcome reception			Conference banquet			18:00-18:30	
18:30-20:30							18:30-21:00	



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Conference Schedule at a Glance

Parallel Symposia Time Table

Venue		Auditorium Room 701129	N Center Room 86120			Chemistry Building Room 330102	Chemistry Building Room 330110		Chemistry Building Room 330118		Venue
Date	Time	2D material	Industry	Spectroscopy	Energy	Low D electronics	Theory	Bio	Synthesis	Macromaterials	Time
Mon JUNE 20	14:30-15:00		Mitsugu Uejima			Chul-Ho Lee	Christophe Bichara		Shigeo Maruyama		14:30-15:00
	15:00-15:30		Peiyu Sun			Jang Ung Park	Qinghong Yuan		Sofie Cambré		15:00-15:30
	15:30-15:40	Short Break									15:30-15:40
	15:40-16:10		Hakmin Lee			Yang Chai	Jeil Jung		Jaegeun Lee		15:40-16:10
	16:10-16:40		Taneli Juntunen			Yanqing Wu	Mikito Koshino		Yuan Chen		16:10-16:40
	16:40-17:00		(c) Hee Jin Jeong			(c) Haomin Wang	(c) Youngkuk Kim		(c) Miguel Vazquez-Pufieu		16:40-17:00

Venue		Auditorium Room 701129	N Center Room 86120			Chemistry Building Room 330102	Chemistry Building Room 330110		Chemistry Building Room 330118		Venue
Date	Time	2D material	Industry	Spectroscopy	Energy	Low D electronics	Theory	Bio	Synthesis	Macromaterials	Time
TUE JUNE 21	14:30-15:00	Lain-Jong Li		Sebastian Heeg		Sanghoon Bae	Hyoung Joon Choi		Jing Kong		14:30-15:00
	15:00-15:30	Kibum Kang		Kaihui Liu		Albert G. Nasibulin	Ting Cao		Wencai Ren		15:00-15:30
	15:30-15:40	Short Break									15:30-15:40
	15:40-16:00	Jong-Hyun Ahn		Sang-Yong Ju		Chuanhong Jin	Alister Page		(c) Byeong Wook Cho		15:40-16:10
	16:00-16:10						(c) Soo Ho Choi		16:00-16:10		
	16:10-16:20	Jiaxing Huang		Laura Kim		Kosuke Nagashio	(c) Daniel Hedman				16:10-16:20
	16:20-16:30						Qingwen Li		16:20-16:30		
	16:30-16:40									16:30-16:40	
	16:40-16:50	(c) Pilkyung Moon		(c) Ji-Hee Kim		(c) Tzu-Ang Chao	(c) Tenta Tani				16:40-16:50
	16:50-17:00								16:50-17:00		

Parallel Symposia Time Table

Venue		Auditorium Room 701129	N Center Room 86120			Chemistry Building Room 330102	Chemistry Building Room 330110		Chemistry Building Room 330118		Venue
Date	Time	2D material	Industry	Spectroscopy	Energy	Low D electronics	Theory	Bio	Synthesis	Macromaterials	Time
THU JUNE 23	14:30-15:00	Xinran Wang			Jong Beom Baek	Jana Zaumseil		Yutaka Majima		John Bulmer	14:30-15:00
	15:00-15:30	Hyeon Suk Shin			Michael De Volder	Dmitri Golberg		Laurent Cognet		Bon-Cheol Ku	15:00-15:30
	15:30-15:40	Short Break									15:30-15:40
	15:40-16:10	Vincent Tung			Fei Wei	Shinpei Ogawa		Gili Bisker		Changsik Song	15:40-16:10
	16:10-16:30	(c) Sayyed Sajjadi			Morinobu Endo	Gregory Pitner		Jong-Ho Kim		Alexander Balandin	16:10-16:30
	16:30-16:40	(c) Young seo Jeon									16:30-16:40
	16:40-16:50				(c) Yoonbin Kim			(c) Sanghwa Jeong		(c) Cristina Madrona	16:40-16:50
	16:50-17:00					Harri Lipsanen					16:50-17:00
	17:00-17:10										17:00-17:10

Venue		Auditorium Room 701129	N Center Room 86120			Chemistry Building Room 330102	Chemistry Building Room 330110		Chemistry Building Room 330118		Venue
Date	Time	2D material	Industry	Spectroscopy	Energy	Low D electronics	Theory	Bio	Synthesis	Macromaterials	Time
FRI JUNE 24	13:15-13:35	Clément FAUGERAS			Hyoyoung Lee	(c) Arindam Bala		Markita Landry		Milo Shaffer	13:15-13:35
	13:35-13:45					Jeff Blackburn					13:35-13:45
	13:45-14:05	Christoph STAMPFER			Hong Jin Fan			(c) Nicole Iverson		Philippe Poulin	13:45-14:05
	14:05-14:15										14:05-14:15
	14:15-14:25	Short Break			Short Break	Short Break		(c) Chaejeong Heo		Short Break	14:15-14:25
	14:25-14:35	Guillaume CASSABOIS			(c) Dimitrios Perivoliotis	(c) Patrick Edwards		Short Break		Geoff Wehmeyer	14:25-14:45
	14:35-14:45							(c) Mijin Kim			14:35-14:45
	14:45-14:55				(c) Mariam Ezzedine	(c) Vikram Deshpande					14:45-14:55
	14:55-15:05	(c) Naoto Nakatsuji						Tae-il Kim		Dmitry Rybkovskiy	14:55-15:05
	15:05-15:15										15:05-15:15
	15:15-15:25	(c) Mohammed Alamri									15:15-15:25
	15:25-15:35									(c) Bharath Natarajan	15:25-15:35
	15:35-15:45										15:35-15:45



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Main Conference Program & Abstract

Tutorial Session

Auditorium

Sunday, JUNE 19th, 2022

14:00 - 15:15	T2	Chair: Hyeonjin Shin (SAIT) Manish Chhowalla (University of Cambridge, UK) <i>Tutorial on metallic two-dimensional transition metal dichalcogenides and their applications in electrochemistry</i>
15:15-16:30	T3	Chair: Kikang Kim (Sungkyunkwan University) Hui-Ming Cheng (IMR CAS, China) <i>Low-dimensional materials towards global mission of carbon neutrality</i>
16:30-16:45	Coffee break	
16:45-18:00		Chair: Young Hee Lee (Sungkyunkwan University) FORUM <i>Current challenges and future perspectives in low dimensional materials</i>
18:00-20:30	Welcome reception	

Main Session

Auditorium

Monday, JUNE 20th, 2022

08:50-09:00 Opening

09:00-09:50 Keynote Chair: Seunghyun Baik (Sungkyunkwan University)
Rodney Ruoff (UNIST & IBS Center for Multidimensional Carbon Materials)
Dissolving, and growing, diamond; Protonation of diamondoids; Large area single crystal metal foils and their use to make F-Diamane and 'perfect' single crystal large area graphene; Zeolite Templated Carbons (Schwartzites)

09:50-10:20 Invited **Ksenia Bets** (Rice University, USA)
 I1 *Lateral epitaxy of 2D materials and its practical applications*

10:20-10:50 I2 **Yan Li** (Peking University, China)
Behavior of catalysts at atomic scale for single-walled carbon nanotube growth

10:50-11:10 Coffee break

11:10-11:40 Chair: Christophe Bichara (CNRS)
 I3 **Emmanuel Flahaut** (CNRS, France)
Surface chemistry and its influence on the environmental impact of carbon nanomaterials

11:40-12:00 Contributed **Feng Ding** (IBS Center for Multidimensional Carbon Materials, Korea)
 Talk
 C1 *Why carbon nanotube grow?*

12:00-13:15 Lunch @ 'Shin-Kwan' Dormitory

13:15-14:30 P1 Poster Session 1 @ Auditorium

14:30-17:00 Parallel Symposia

17:00-17:15 Coffee break

17:15-18:30 P2 Poster Session 2 @ Auditorium

Main Session

Auditorium

Tuesday, JUNE 21st, 2022

Chair: Junichiro Kono (Rice University)	
09:00-09:50	Keynote Philip Kim (Harvard University, USA)
	K2 <i>Electrical and Thermal Transport in Nanotube-Graphene Hybrid Systems</i>
09:50-10:20	I10 Esko Kauppinen (Aalto University School of Science, Finland)
	<i>Towards SWNT (n,m) structure control during floating catalyst CVD synthesis</i>
10:20-10:50	I5 Hyeonsik Cheong (Sogang University, Korea)
	<i>Optical spectroscopy of twisted heterostructures of transition metal dichalcogenides</i>
10:50-11:10	Coffee break
Chair: Hyeon Suk Shin (UNIST)	
11:10-11:40	I6 Ado Jorio (Universidade Federal de Minas Gerais, Brazil)
	<i>Tip-enhanced Raman Spectroscopy in Low Dimensional Carbon Materials: graphene, nanoflakes and carbon nanotubes</i>
11:40-12:00	C2 Katalin Kamaras (IBS Center for Multidimensional Carbon Materials, Korea)
	<i>Near-field infrared microscopy and spectroscopy on nanotubes: structure, metallicity, and quasiparticles on the nanoscale</i>
12:00-13:15	Lunch @ 'Shin-Kwan' Dormitory
13:15-14:30	P3 Poster Session 3 @ Auditorium
14:30-17:00	Parallel Symposia
17:00-17:15	Coffee break
17:15-18:30	P4 Poster Session 4 @ Auditorium

Wednesday, JUNE 22nd, 2022

09:00-09:50	Chair: Manish Chhowalla (University of Cambridge)
	Keynote Yutaka Ohno (Nagoya University, Japan)
K3	<i>Carbon nanotube analog-digital mixed-signal integrated circuits for epidermal electronics</i>
09:50-10:20	I7 Youfan Hu (Peking University, China) <i>Carbon nanotube-based epidermal electronic systems</i>
10:20-10:40	C3 Micah Green (Texas A&M University, USA) <i>Additive Manufacturing of Thermosetting Resins via Radio Frequency Heating of Carbon Nanotubes</i>
10:40-11:00	Coffee break
11:00-11:20	Chair: Jong-Hyun Ahn (Yonsei University)
	C4 Cheol Jin Lee (Korea University, Korea) <i>High performance cold cathode X-ray tubes based on CNT field electron emitter</i>
11:20-11:50	I8 Stephanie Reich (Freie Universitaet Berlin, Germany) <i>Raman scattering by exciton-polaritons in carbon nanotubes</i>
11:50-13:15	Lunch @ 'Shin-Kwan' Dormitory
13:15-18:00	Excursion
18:00-21:00	Banquet @ Novotel hotel

Main Session

Auditorium

Thursday, JUNE 23rd, 2022

Chair: Shigeo Maruyama (University of Tokyo)	
09:00-09:50	Keynote Michael Arnold (University of Wisconsin-Madison, USA) K4 <i>Organizing and Growing Semiconducting Carbon</i>
09:50-10:20	I9 James Elliott (University of Cambridge, USA) <i>Highly Oriented Direct-Spun Carbon Nanotube Textiles Aligned by In-Situ Radio-Frequency Fields</i>
10:20-10:50	I4 Yuichiro Kato (RIKEN Tokyo, Japan) <i>Exciton physics and cavity quantum electrodynamics in air-suspended carbon nanotubes</i>
10:50-11:10	Coffee break
Chair: Laurent Cognet (University of Bordeaux & CNRS)	
11:10-11:40	I11 Benjamin S. Flavel (KIT, Germany) <i>Global Alignment of Carbon Nanotubes via High Precision Microfluidic Dead-End Filtration</i>
11:40-12:00	C5 Martin Koehne (Robert Bosch GmbH, Germany) <i>Intercalation of aluminium chloride in graphene sheets boosts electrical conductivity to 20 MS/m</i>
12:00-13:15	Lunch @ 'Shin-Kwan' Dormitory
13:15-14:30	P5 Poster Session 5 @ Auditorium
14:30-17:00	Parallel Symposia
17:00-17:15	Coffee break
17:15-18:30	P6 Poster Session 6 @ Auditorium

Friday, JUNE 24th, 2022

		Chair: Jana Zaumseil (University Heidelberg)
09:00-09:50	Keynote	Sarah Haigh (University of Manchester, UK)
	K5	<i>Atomic Imaging in Liquid Environments using 2D material heterostructures</i>
09:50-10:20	I12	Daniel A. Heller (Memorial Sloan Kettering Cancer Center, USA) <i>Carbon Nanotubes for Cancer Research and Diagnosis</i>
10:20-10:50	I13	Xuedan Ma (Argonne National Laboratory, USA) <i>Developing Quantum Photon Sources from Low-dimensional Semiconductor Materials</i>
10:50-11:10	Coffee break	
		Chair: Kikang Kim (Sungkyunkwan University)
11:10-11:40	I14	Seokwoo Jeon (KAIST, Korea) <i>Broad Applications using Graphene Quantum Dots with Discrete Bandgap</i>
11:40-12:00	C6	Katsutoshi Hori (Nagoya University, Japan) <i>Degradation of Carbon Nanotubes in the Presence of Bacterial Enzymes</i>
12:00-13:15	Lunch @ 'Shin-Kwan' Dormitory	
13:15-15:45	Parallel Symposia	
15:45-16:00	Coffee break	
		Chair: Ji-Hee Kim (Sungkyunkwan University)
16:00-16:30	I15	Sergei Tretiak (Los Alamos National Laboratory, USA) <i>Theoretical Insight into New Strategies of Carbon Nanotube Functionalization</i>
16:30-16:50	C7	Nicola Curreli (Italian Institute of Technology, Italy) <i>Control of Electronic Band Profiles by Depletion Layer Engineering in Core-Shell Metal Oxide Nanocrystals</i>
16:50-17:30	Poster award & Closing ceremony @ Auditorium	



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Parallel Symposia Program & Abstract

2D Material

Tuesday, JUNE 21st, 2022

		Chair: Vincent Tung (KAUST)
14:30-15:00	P-2D-I1	Lain-Jong Li (The University of Hong Kong, Hong Kong) <i>Towards high-performance transistors based on 2D transition metal dichalcogenide monolayers</i>
15:00-15:30	P-2D-I2	Kibum Kang (KAIST, Korea) <i>Beyond Binary 2D Metal-Chalcogenides: 2D Ternary Metal Chalcogenides and 2D Oxides</i>
15:30-15:40	Short break	
		Chair: Kibum Kang (KAIST, Korea)
15:40-16:10	P-2D-I3	Jong-Hyun Ahn (Yonsei University, Korea) <i>Direct growth of MoS₂ on III-V semiconductor for optoelectronics applications</i>
16:10-16:40	P-2D-I4	Jiaxing Huang (Northwestern University, USA) <i>Seeing 2D Materials with Fluorescence quenching microscopy: An Update</i>
16:40-17:00	P-2D-C1	Pilkyung Moon (New York University Shanghai, China) <i>Resonant interaction in chiral Eshelby-twisted van der Waals atomic layers</i>

Thursday, JUNE 23rd, 2022

		Chair: Lain-Jong Li (The University of Hong Kong)
14:30-15:00	P-2D-I5	Xinran Wang (Nanjing University, China) <i>Recent advances in 2D semiconductor growth, high-performance devices, and heterogeneous integration</i>
15:00-15:30	P-2D-I6	Hyeon Suk Shin (UNIST) <i>Growth of Monolayer and Few-Layer Hexagonal Boron Nitride by Chemical Vapor Deposition</i>
15:30-15:40	Short break	
		Chair: Kikang Kim (Sungkyunkwan University)
15:40-16:10	P-2D-I7	Vincent Tung (KAUST, Kingdom of Saudi Arabia) <i>Wafer-scale synthesis of 2D semiconductors on structured and reusable substrate</i>
16:10-16:30	P-2D-C2	Sayyed Sajjadi (EPFL, Switzerland) <i>Photoluminescence brightening of single-walled carbon nanotubes through conjugation with Graphene quantum dots</i>
16:30-16:50	P-2D-C3	Young Seo Jeon (Sungkyunkwan University, Korea) <i>Wafer-scale 2D MoSe₂ phototransistor array via liquid-precursor-assisted chemical vapor deposition</i>

Friday, JUNE 24th, 2022

Chair: Maeng Je Seong (Chung-Ang University)

13:15-13:45

P-2D-I8

Clément FAUGERAS (EMFL, France)*High Pressure tuning of magnon-polarons in the layered antiferromagnet FePS3*

13:45-14:15

P-2D-I9

Christoph STAMPFER (RWTH Aachen University, Germany)*Spin-valley coupling in graphene quantum dots*

14:15-14:25

Short break

Chair: Ksenia Bets (Rice university)

14:25-14:55

P-2D-I10

Guillaume CASSABOIS (Montpellier University, France)*Efficient light-matter interaction in hexagonal boron nitride*

14:55-15:15

P-2D-C4

Naoto Nakatsuji (Osaka University, Japan)*The moiré distortion effect on the flat band of the magic-angle twisted bilayer graphene*

15:15-15:35

P-2D-C5

Mohammed Alamri (University of Umm Al-Qura, Saudi)*Ultraviolet-activation improved H2 gas sensing using ALD Pt decorated 3D carbon nanotube/graphene nanostructures*



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Parallel Symposia Program & Abstract

Industry

Monday, JUNE 20th, 2022

Chair: Suguru Noda (Waseda University)

- | | | |
|-------------|---------|--|
| 14:30-15:00 | P-In-I1 | Mitsugu Uejima (Zeon Corporation, Japan)
<i>Mass production and application development of single-walled carbon nanotubes</i> |
| 15:00-15:30 | P-In-I2 | Peiyu Sun (Jiangsu Shanyuan Technology Co., Ltd, China)
<i>New generation graphene conductive slurry for LIB application and its development trend</i> |

15:30-15:40 Short break

Chair: Geon-Woong Lee (KERI)

- | | | |
|-------------|---------|---|
| 15:40-16:10 | P-In-I3 | Hakmin Lee (HNS Co. Ltd., Korea)
<i>Silicon/Graphene Composite Anode Material for High Capacity Li-Ion Batteries</i> |
| 16:10-16:40 | P-In-I4 | Taneli Juntunen (Canatu, Finland)
<i>The most advanced carbon nanotubes for industry-transforming products</i> |
| 16:40-17:00 | P-In-C1 | Hee Jin Jeong (KERI, Korea)
<i>Copper/graphene hybrid materials-based conductive inks for environmentally stable printed electrodes</i> |



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Parallel Symposia Program & Abstract

Spectroscopy

Parallel Symposia

SPECTROSCOPY @ N-Center # 86120

Tuesday, JUNE 21st, 2022

		Chair: Sofie Cambré (University of Antwerp)
14:30-15:00	P-SP-I1	Sebastian Heeg (Humboldt Universität zu Berlin, Germany) Raman spectroscopy of single carbyne chains confined in CNTs
15:00-15:30	P-SP-I2	Kaihui Liu (Peking University, China) <i>Optical Spectroscopy of Individual Carbon Nanotubes</i>
15:30-15:40	Short break	
		Chair: Sunmin Ryu (POSTECH)
15:40-16:10	P-SP-I3	Sang-Yong Ju (Yonsei University, Korea) <i>Raman Enhancement of Copper Phthalocyanine Promoted by Excited State Charge Transfer of Twisted Bilayer Graphenes</i>
16:10-16:40	P-SP-I4	Laura Kim (California Institute of Technology, USA) Bright Hot Plasmons Emitted from Non-Equilibrium Electronic States in Graphene
16:40-17:00	P-SP-C1	Ji-Hee Kim (Sungkyunkwan University, Korea) <i>Hot-carrier photovoltaics in MoS₂/Graphene heterostructures</i>



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Parallel Symposia Program & Abstract

Energy

Parallel Symposia

ENERGY @ N-Center # 86120

Thursday, JUNE 23rd, 2022

		Chair: Jong Hun Han (Chonnam National University)
14:30-15:00	P-En-I1	Jong Beom Baek (UNIST, Korea) <i>Mechanochemistry for Materials Synthesis</i>
15:00-15:30	P-En-I2	Michael De Volder (University of Cambridge, UK) <i>Low Dimensional Materials for Light-Enhanced Energy Storage Devices</i>
15:30-15:40	Short break	
		Chair: Seokwoo Jeon (KAIST)
15:40-16:10	P-En-I3	Fei Wei (Tsinghua University, China) <i>Large Scale Synthesis of Single and Bundled Defect-free Carbon Nanotubes and Its Mechanical Behavior</i>
16:10-16:40	P-En-I4	Morinobu Endo (Shinshu University, Japan) <i>Applications of Carbon Nanotubes toward Energy and Sustainability</i>
16:40-17:00	P-En-C1	Yoonbin Kim (Sungkyunkwan University, Korea) <i>Na-Coordinated Polymeric Phthalocyanines as Stable High-Capacity Organic Anodes for Sodium-Ion Batteries</i>

Friday, JUNE 24th, 2022

		Chair: Sang Ouk Kim (KAIST)
13:15-13:45	P-En-I5	Hyoyoung Lee (Sungkyunkwan University, Korea) <i>Selective Disorder of Rutile Phase-only and Anatase Phase-only in P25 TiO₂ for Visible-light Photocatalyst</i>
13:45-14:15	P-En-I6	Hong Jin Fan (Nanyang Technological University, Singapore) <i>Carbon fibers and tubes for stable Zn anode and flexible devices</i>
14:15-14:25	Short break	
		Chair: Michael De Volder (University of Cambridge)
14:25-14:45	P-En-C2	Dimitrios Perivoliotis (Umeå University, Sweden) <i>Cation (Li⁺, Na⁺, Co²⁺) intercalated 1T-MoS₂ on carbon nanotubes as hydrogen evolution electrocatalyst in proton exchange membrane (PEM) water electrolyzer</i>
14:45-15:05	P-En-C3	Mariam Ezzedine (IPParis, France) <i>New Hybrid Nano-Architecture of Sulfur Electrode for Lithium-Sulfur Batteries.</i>



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Parallel Symposia Program & Abstract

Low Dimensional Electronics

Parallel Symposia

LOW DIMENSIONAL ELECTRONICS @ Chemistry Building # 330102

Monday, JUNE 20th, 2022

		Chair: Yutaka Ohno (Nagoya University)
14:30-15:00	P-Lo-I1	Chul-Ho Lee (Korea University, Korea) <i>Interface Band Engineering Toward High-Performance 2D van der Waals Electronics</i>
15:00-15:30	P-Lo-I2	Jang Ung Park (Yonsei University, Korea) <i>Wearable electronics using nanomaterials</i>
15:30-15:40	Short break	
		Chair: Sungjoo Lee (Sungkyunkwan University)
15:40-16:10	P-Lo-I3	Yang Chai (The Hong Kong Polytechnic University, Hong Kong) <i>Two-Dimensional Semiconductors for Post-Moore's Law Computing</i>
16:10-16:40	P-Lo-I4	Yanqing Wu (Huazhong University of Science and Technology, China) <i>High-performance low-dimensional transistors based on ultra-thin body channel materials</i>
16:40-17:00	P-Lo-C1	Haomin Wang (Shanghai Institute of Microsystem and Information Technology, China) <i>Towards chirality control of graphene nanoribbons embedded in hexagonal boron nitride</i>

Tuesday, JUNE 21st, 2022

		Chair: Heejun Yang (KAIST)
14:30-15:00	P-Lo-I5	Sanghoon Bae (Institute of Materials Science and Engineering, Korea) <i>Understanding nucleation theory to produce freestanding nanomembranes for artificial heterostructures</i>
15:00-15:30	P-Lo-I6	Albert G. Nasibulin (Skolkovo Institute of Science and Technology, Russia) <i>Transparent Conducting Films Based on Carbon Nanotubes: Rational Design Towards the Theoretical Limit</i>
15:30-15:40	Short break	
		Chair: Woo-Jae Kim (Ehwa Womans University)
15:40-16:10	P-Lo-I7	Chuanhong Jin (Zhejiang University, China) <i>An electron microscopy analysis of challenges of carbon nanotube transistors: an electron microscopy viewpoint</i>
16:10-16:40	P-Lo-I8	Kosuke Nagashio (The University of Tokyo, Japan) <i>Ultrafast 2D nonvolatile memory operation provided by the strong short-Time dielectric breakdown strength of h-BN</i>
16:40-17:00	P-Lo-C2	Tzu-Ang Chao (Taiwan Semiconductor Manufacturing Company, Taiwan) <i>Small Molecular Additives to Suppress Bundling in Dimension-Limited Self-Alignment Method for High-Density Aligned CNT Arrays</i>

Thursday, JUNE 23rd, 2022

		Chair: Tae-Woo Lee (Seoul National University)
14:30-15:00	P-Lo-I9	Jana Zaumseil (Heidelberg University, Germany) <i>Charge Transport in Networks of Semiconducting Single-Walled Carbon Nanotubes</i>
15:00-15:30	P-Lo-I10	Dmitri Golberg (Queensland University of Technology, Australia) <i>In-situ transmission electron microscopy studies of graphene and carbon nanotube properties</i>
15:30-15:40	Short break	
		Chair: Dmitri Golberg (Queensland University of Technology)
15:40-16:10	P-Lo-I11	Shinpei Ogawa (Mitsubishi Electric Corporation, Japan) <i>Graphene photogated diodes for high-performance infrared imaging</i>
16:10-16:40	P-Lo-I12	Gregory Pitner (Taiwan Semiconductor Manufacturing Company, USA) <i>Carbon Nanotube Transistors: Recent progress towards applications in highly-scaled and high-performance CMOS logic</i>
16:40-17:00	P-Lo-I13	Harri Lipsanen (Aalto University, Finland) <i>Multilayer MoTe₂ Field Effect Transistor under Extreme Operating Conditions</i>

Friday, JUNE 24th, 2022

		Chair: Woojong Yu (Sungkyunkwan University)
13:15-13:35	P-Lo-C3	Arindam Bala (Sungkyunkwan University, Korea) <i>Highly Responsive Photonic Detection with Uniform Thin-film Transistors Array Using Large-Area Bilayer WS₂</i>
13:35-14:05	P-Lo-I14	Jeff Blackburn (National Renewable Energy Laboratory, USA) <i>Energy Harvesting and Low-Power Electronic Devices with Semiconducting Single-Walled Carbon Nanotubes</i>
14:05-14:25	Short break	
		Chair: Jana Zaumseil (Heidelberg university)
14:25-14:45	P-Lo-C4	Patrick Edwards (Physical Sciences Laboratories, USA) <i>Electrical Measurement of Water Assisted Ion Desorption and Solvation on Isolated Carbon Nanotubes</i>
14:45-15:05	P-Lo-C5	Vikram Deshpande (University of Utah, USA) <i>Vernier Spectrum and Valley Polarization Control in Carbon Nanotube Quantum Dots</i>



The 22nd International Conference on the Science and
Applications of Nanotubes and Low-Dimensional Materials

Parallel Symposia Program & Abstract

Theory

Monday, JUNE 20th, 2022

		Chair: Young Woo Son (Korea Inst. For Advanced Study)
14:30-15:00	P-Th-I1	Christophe Bichara (CNRS and Aix-Marseille University, France) <i>Swinging interfaces of growing carbon nanotubes</i>
15:00-15:30	P-Th-I2	Qinghong Yuan (East China Normal University, China) <i>Structure and property engineering of two-dimensional carbon nitride materials</i>
15:30-15:40	Short break	
		Chair: Sergei Tretiak (Los Alamos National Laboratory)
15:40-16:10	P-Th-I3	Jeil Jung (University of Seoul, Korea) <i>Electronic structure of lattice relaxed alternating twist tNG multilayer graphene</i>
16:10-16:40	P-Th-I4	Mikito Koshino (Osaka University, Japan) <i>Topological quasicrystals in twisted 2D systems</i>
16:40-17:00	P-Th-C1	Youngkuk Kim (Sungkyunkwan University, Korea) <i>Higher-Order Topological Corner State Tunneling in Twisted Bilayer Graphene</i>

Tuesday, JUNE 21st, 2022

		Chair: Feng Ding (IBS UNIST)
14:30-15:00	P-Th-I5	Hyoungh Joon Choi (Yonsei University, Korea) <i>Electronic structures and interactions in graphene moiré superlattices</i>
15:00-15:30	P-Th-I6	Ting Cao (University of Washington, USA) <i>Tunable Magnetism and Excitonic Effects in 2D Magnetic Semiconductors</i>
15:30-15:40	Short break	
		Chair: James Elliott (University of Cambridge)
15:40-16:10	P-Th-I7	Alister Page (University of Newcastle, Australia) <i>Structure, Properties and Growth of 1D van der Waals Heterostructures - Computational Challenges</i>
16:10-16:30	P-Th-C2	Daniel Hedman (IBS CMCM, Korea) <i>Atomistic simulations of carbon nanotube growth using machine learning force fields - from a clean Fe cluster to a fully grown tube</i>
16:30-16:50	P-Th-C3	Tenta Tani (Osaka University, Japan) <i>Topological edge and corner states and fractional corner charges in blue phosphorene</i>

Swinging interfaces of growing carbon nanotubes

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In classical crystal growth, the interaction of the growing object with its support and the energies of the different facets determine the growth mode and the resulting crystalline structures. The synthesis of carbon nanotubes by chemical vapor deposition poses somewhat similar yet more complex issues. The catalytic particle is both a support and a reactive interface with the growing tube, and many properties are altered because of the nanometric size of the objects.

In this context, we have identified different growth modes driven by the thermodynamic properties of the interface [1, 2] and developed a model of the interface [3], emphasizing the importance of the configurational entropy of the nanotube edge to stabilize chiral tubes and to account for the temperature dependence of tube helicity distributions. This simple model is pushed further to account for more general interface structures and kinetic Monte Carlo (KMC) simulations are developed [4] to study the growth mechanisms and kinetics, and analyze growth rates in relation with the chiral selectivity of the synthesis.

In this presentation we theoretically investigate new *in situ* measurements of individual CNT growth rates by homodyne polarization microscopy [5] with better temporal and statistical resolution than previous studies [6]. The growth kinetics are surprisingly complex and exhibit instabilities characterized by stochastic alternations of growth, etching, stops and sometimes restarts. These events occur with or without changes in the structure of the single-walled nanotube. We study the latter case, propose a simple modeling and KMC simulations, thus shedding new light on the role of the tube/catalyst interface dynamics for both thermodynamic and kinetic aspects of the growth.

[1] Fiawoo M.-F. C. *et al.*, Phys. Rev. Lett. **108**, 195503 (2012).

[2] He M. *et al.*, Nanoscale **10**, 6744, (2018)

[3] Magnin Y. *et al.*, Science **362**, 212–215 (2018)

[4] Förster G. D., *et al.*, AIP Adv. **11**, 045306 (2021).

[5] Pimonov V., *et al.* Nano Letters, **21**(19), 8495–8502 (2021).

[6] Koyano B. *et al.*, Carbon **155**, 635–642 (2019)



The 22nd International Conference on the Science and
Applications of Nanotubes and Low-Dimensional Materials

Parallel Symposia Program & Abstract

Bio

Parallel Symposia

BIO @ Chemistry Building # 330110

Thursday, JUNE 23rd, 2022

		Chair: Dan Heller (sloan kettering)
14:30-15:00	P-Bi-I1	Yutaka Majima (Tokyo Institute of Technology, Japan) <i>Nanogap Gas Sensors and Electroless Au-Plated Nanopore DNA Sequencer</i>
15:00-15:30	P-Bi-I2	Laurent Cognet (CNRS & University of Bordeaux, France) <i>Single carbon nanotube localization microscopy reveals brain extracellular space landscapes around synapses and in neurodegenerative conditions</i>
15:30-15:40	Short break	
		Chair: Woo-Jae Kim (Ehwa Womans University)
15:40-16:10	P-Bi-I3	Gili Bisker (Tel Aviv University, Israel) <i>In vivo imaging of fluorescent single-walled carbon nanotubes within C. elegans nematodes</i>
16:10-16:40	P-Bi-I4	Jong-Ho Kim (Hanyang University, Korea) <i>2D-TMD Antibody Mimics for Diagnosis and Therapy of Bacterial Infections</i>
16:40-17:00	P-Bi-C1	Sanghwa Jeong (Pusan National University, Korea) <i>Optical Nanoprobes for Dynamic Neurochemical Imaging</i>

Friday, JUNE 24th, 2022

		Chair: Gyu Jin Cho (Sungkyunkwan University)
13:15-13:45	P-Bi-I5	Markita Landry (University of California Berkeley, USA) <i>Imaging Neuromodulation in the Brain with Near-Infrared Fluorescent Nanosensors</i>
13:45-14:05	P-Bi-C2	Nicole Iverson (University of Nebraska Lincoln, USA) <i>Removable, Real Time Carbon Nanotube Sensors for Long-term in Vivo Analysis</i>
14:05-14:25	P-Bi-C3	Chaejeong Heo (Sungkyunkwan University, Korea) <i>New strategy of molecular structure-specific label-free THz monitoring for Alzheimer's disease diagnosis</i>
14:25-14:35	Short break	
14:35-14:55	P-Bi-C4	Mijin Kim (Memorial Sloan Kettering Cancer Center, USA) <i>Machine-learning-enabled nanosensor array to detect a disease fingerprint</i>
14:55-15:25	P-Bi-I6	Tae-il Kim (Sungkyunkwan University, Korea) <i>Unconventional Band Pass Filters for Bioelectronics</i>



The 22nd International Conference on the Science and
Applications of Nanotubes and Low-Dimensional Materials

The background of the lower section is a detailed, grayscale illustration of a carbon nanotube. It shows a hexagonal lattice of atoms forming a cylindrical tube that recedes into the distance, creating a strong sense of perspective. The atoms are represented as small spheres connected by lines.

Parallel Symposia Program & Abstract

Synthesis

Parallel Symposia

SYNTHESIS @ Chemistry Building # 330118

Monday, JUNE 20th, 2022

		Chair: Seung Min Kim (KIST)
14:30-15:00	P-Sy-I1	Shigeo Maruyama (The University of Tokyo, Japan) <i>Chemical Vapor Deposition synthesis of 1D vdW heterostructures based on SWCNTs</i>
15:00-15:30	P-Sy-I2	Sofie Cambré (University of Antwerp, Belgium) <i>Shedding light on the mechanisms of aqueous two-phase separation of single-wall carbon nanotubes</i>
15:30-15:40	Short break	
		Chair: IL Jeon (Sungkyunkwan University)
15:40-16:10	P-Sy-I3	Jaeyeun Lee (Pusan National University, Korea) <i>Decoupling Catalyst Dewetting, Gas Decomposition, and Surface Reactions in Carbon Nanotube Forest Growth</i>
16:10-16:40	P-Sy-I4	Yuan Chen (The University of Sydney, Australia) <i>Synthesis, purification, and applications of carbon onions from catalytic methane decomposition on iron ore catalysts</i>
16:40-17:00	P-Sy-C1	Miguel Vazquez Pufleau (IMDEA, Spain) <i>Kinetic insight for CNT synthesis via floating catalyst provided by decoupling Fe nanoparticle formation, S promoter addition and C decomposition</i>

Tuesday, JUNE 21st, 2022

		Chair: Paola Ayala (University of Vienna)
14:30-15:00	P-Sy-I5	Jing Kong (Massachusetts Institute of Technology, USA) Engineering, Korea <i>Synthesis and Integration of Carbon Nanotubes for Electronics Applications</i>
15:00-15:30	P-Sy-I6	Wencai Ren (Chinese Academy of Sciences, China) <i>Discovery of layered 2D MoSi₂N₄ family</i>
15:30-15:40	Short break	
		Chair: Myung Jong Kim (Gachon University)
15:40-16:00	P-Sy-C2	Byeong Wook Cho (Sungkyunkwan University, Korea) <i>Facile substitutional metal doping in two-dimensional transition metal dichalcogenides by liquid-phase precursor mixing</i>
16:00-16:20	P-Sy-C3	Soo Ho Choi (Sungkyunkwan University, Korea) <i>Single-crystal growth of transition metal dichalcogenide films on atomic sawtooth Au surface</i>
16:20-16:50	P-Sy-I7	Qingwen Li (Suzhou Institute of Nano-Tech and Nano-Bionics, China) <i>Multifunctional CNT films: Scalable synthesis and applications</i>



The 22nd International Conference on the Science and
Applications of Nanotubes and Low-Dimensional Materials

Parallel Symposia Program & Abstract

Macromaterials

Parallel Symposia

MACROMATERIALS @ Chemistry Building # 330118

Thursday, JUNE 23rd, 2022

		Chair: Changsik Song (Sungkyunkwan University)
14:30-15:00	P-Ma-I1	John Bulmer (Air Force Research Laboratory, USA) <i>Forecasting CNT Diameter and Yield in Floating Catalyst CVD</i>
15:00-15:30	P-Ma-I2	Bon-Cheol Ku (KIST, Korea) <i>Structure-controlled ultrahigh performance carbon nanotube fibers</i>
15:30-15:40	Short break	
		Chair: Bon-Cheol Ku (KIST)
15:40-16:10	P-Ma-I3	Changsik Song (Sungkyunkwan University, Korea) <i>Green Malleable Thermoset Polymers for Highly Conductive Thermal Interface Materials with Ultra-Low Thermal Contact Resistance</i>
16:10-16:40	P-Ma-I4	Alexander Balandin (University of California, USA) <i>Graphene composites for thermal management and electromagnetic interference shielding</i>
16:40-17:00	P-Ma-C1	Cristina Madrona (IMDEA, Spain) <i>Intercalation of Carbon Nanotube Yarns with Acceptor Dopants</i>

Friday, JUNE 24th, 2022

		Chair: Chang-Soo Han (Korea University)
13:15-13:45	P-Ma-I5	Milo Shaffer (Imperial College London, UK) <i>Wet-spinning Carbon and Inorganic Nanotube Fibres</i>
13:45-14:15	P-Ma-I6	Philippe Poulin (CNRS Bordeaux, France) <i>Super flexibility of graphene oxide: a key for processing graphene based macromaterials</i>
14:15-14:25	Short break	
		Chair: Seunghyun Baik (Sungkyunkwan University)
14:25-14:55	P-Ma-I7	Geoff Wehmeyer (Rice University, USA) <i>Axial thermal conductivity and thermal diffusivity measurements in high-conductivity aligned wet-spun carbon nanotube fibers</i>
14:55-15:25	P-Ma-I8	Dmitry Rybkovskiy (Skolkovo Institute of Science and Technology, Russia) <i>Structure of Phosphorus formed inside carbon nanotubes</i>
15:25-15:45	P-Ma-C2	Bharath Natarajan (ExxonMobil Research and Engineering, USA) <i>Fundamentals of resin infiltration into carbon nanotube rich articles</i>