

The 1st Graphene Flagship EU-Singapore Workshop on Graphene and related 2D materials

Research innovation in 2D materials and beyond

27-28 March 2023, Singapore
National University of Singapore

This first Singapore - EU Graphene Flagship workshop, co-organised by the EU Graphene Flagship and the Institute for Functional Intelligent Materials (I-FIM) at the National University of Singapore, aimed at presenting the ongoing research activities on both sides and discuss possible international collaborations.

The EU Graphene Flagship delegation comprises key leaders of fundamental research, materials production, and applications, including representations from EU industries. I-FIM is one of the world's newest Research Institutes, headed by Physics Nobel Laureate Kostya Novoselov, dedicated to the design and creation of new intelligent materials. This two-day workshop will provide the opportunity for researchers in Europe and Singapore to discuss topics of common interest and to explore possible new collaborations.

Workshop chairs: Prof. Kostya Novoselov (Singapore) and Prof. Stephan Roche (Spain)



Event activities report

The Graphene flagship delegation has visited the National University of Singapore (NUS) and its newly launched NUS's Institute for Functional Intelligent Materials (I-FIM) on 27-28 March 2023, to identify novel direction of international collaborations in the field of 2D materials and beyond (functional intelligent materials). To accelerate the interlinking between European and Singaporeans, a two-day workshop has been organized and co-chaired by Professor Sir Kostya Novoselov, Director of the Institute for Functional Intelligent Materials, and ICREA Research Professor Stephan Roche, DIVISION 1 leader of the Graphene Flagship.

The workshop content has covered main aspects of current research in Europe and Singapore but with more particular focus on the field of health and medicine, industrial production & applications of 2DM, fundamental of 2DM, and medical applications. Fruitful scientific exchanges have been achieved, evidencing several important directions of common interest and possible future enhanced collaborative frameworks. Indeed, I-FIM and the Center for Advanced 2DM (CA2DM) are pushing the frontier of advanced materials science and innovation, combining more conventional 2DM with novel types of (bio)materials in the search for novel paradigm of stimuli-responsive (intelligent) materials which could adapt their properties depending on the surrounding (e.g. (bio)chemical) environment and hence provide novel materials solutions to highly complex problems (such as food monitoring, environment-dependent material (optical, thermal, electrical) responses, brain-machine interfaces, etc). Very importantly, the increasing role and importance of Artificial intelligence as accelerator of technology innovation has been clearly identified by both parties and has given rise to inspiring discussions, which could be furthered consolidated by bilateral collaborations between I-FIM and some EU partners of the delegation.

A visit of I-FIM laboratories has shown to the EU Graphene Flagship delegation the status, achievement, and main long-term goals of I-FIM and Singapore research and innovation ecosystem, indicating some alternative pathway to scientific developments in topics of considerable societal interests. Despite the difference in scale between the European scientific ecosystem and the Singaporean one, institutions such as CA2DM and I-FIM are showing the way to novel types of creative environments tackling challenging problems with properly sized resources. The EU Graphene flagship delegation has truly appreciated the visit and open mindedness of researchers at NUS and other Singaporean institutions, which call for further exploration of international collaborations in the large context of global and sustainable economy and societies.

Stephan Roche and Kostya Novoselov

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List of participants

Title	Last name	First name	Institution	Country
Prof.	Kinaret	Jari	Chalmers University	Sweden
Prof.	Roche	Stephan	Institut Català de Nanociència i Nanotecnologia (ICN2)	Spain
Dr.	Bonaccorso	Francesco	Bedimensional	Italy
Dr.	Palermo	Vincenzo	Consiglio Nazionale delle Ricerche	Italy
Prof.	Fal'ko	Vladimir	University of Manchester	United Kingdom
Prof.	Kostarelos	Kostas	University of Manchester	United Kingdom
Prof.	Ballerini	Laura	Scuola Internazionale Superiore di Studi Avanzati (SISSA)	Italy
Dr.	Teo	Ken	Aixtron	United Kingdom
Dr.	Bouchiat	Vincent	Grapheal	France
Prof.	Ferrari	Andrea	University of Cambridge	United Kingdom
Dr.	Garrido	José	Institut Català de Nanociència i Nanotecnologia (ICN2)	Spain
Dr.	Ek Weis	Johan	Chalmers Industriteknik (CIT)	Sweden
Prof.	Ozyilmaz	Barbaros	National University of Singapore (NUS)	Singapore
Prof.	Bin	Liu	National University of Singapore (NUS)	Singapore
Prof.	Echeverrigaray	Sergio	National University of Singapore (NUS)	Singapore
Prof.	Hippalgaonkar	Kedar	Nanyang Technological University (NUT)	Singapore
Prof.	Trushin	Maxim	National University of Singapore (NUS)	Singapore
Prof.	Berdyugin	Alexey	National University of Singapore (NUS)	Singapore
Prof.	Song	Justin	Nanyang Technological University (NUT)	Singapore
Prof.	Guevara Carrio	Juan Alfredo	National University of Singapore (NUS)	Singapore
Prof.	Keitel Donato	Ricardo	National University of Singapore (NUS)	Singapore
Prof.	Bazan	Guillermo	National University of Singapore (NUS)	Singapore
Prof.	Andreeva	Daria	National University of Singapore (NUS)	Singapore
Prof.	Zheng	Liu	Nanyang Technological University (NUT)	Singapore

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Workshop Programme

27-28 March 2023, Singapore

Venue:

University Hall Auditorium
 Level 2, Lee Kong Chian Wing
 National University of Singapore
 21 Lower Kent Ridge Rd, Singapore 119077

Programme chairs: Prof. Kostya Novoselov (Singapore) and Prof. Stephan Roche (Spain)

March 27th, 2023 Day1		
09:00 – 09:40	Opening remarks	
Plenary session Chair: Stephan Roche		
09:15 – 09:45	<i>Jari Kinaret</i>	Graphene Flagship: a look at its ten years' voyage and the way ahead
09:45 – 10:15	<i>Barbaros Ozyilmaz</i>	Monolayer Amorphous Carbon and its Applications
Scientific Session 1: Health & Medicine		
10:15 – 10:35	<i>Liu Bin</i>	Artificial skin for wound healing
10:35 – 10:55	<i>Laura Ballerini</i>	2D materials to modulate brain networks and synapses
11:00 – 11:30	Coffee break	
Scientific Session 2: Industrial Production & Applications of 2DM Chair: Maciej Koperski		
11:30 – 11:50	<i>Andrea C. Ferrari</i>	Layered Materials for Optoelectronics and Quantum Technologies
11:50 – 12:10	<i>Sergio Echeverrigaray</i>	Graphene Materials on Next-Generation Battery Technologies
12:10 – 12:30	<i>Ken Teo</i>	Wafer scale deposition of Graphene and 2D materials and their integration into devices
12:30 – 14:00	Lunch	

Scientific Session 3: Fundamental of 2DM Chair: Aleksandr Rodin		
14:00 – 14:20	<i>Vladimir Falko</i>	Twistronics of 2D transition metal dichalcogenides
14:20 – 14:40	<i>Kedar Hippalgaonkar</i>	Thermoelectric Physics in 2D Materials – Discrete Density of States and Kondo Resonance
14:40 – 15:00	<i>Stephan Roche</i>	Two-dimensional materials for spintronics
15:00 – 15:20	<i>Maxim Trushin</i>	Two-dimensional water: How does it flow?
15:20 – 15:40	<i>Alexey Berdyugin</i>	Giant Magnetoresistance of Dirac plasma in high-mobility graphene
15:40 – 16:00	<i>Justin Song</i>	Quantum non-reciprocity in moiré materials
16:00 – 18:00	End of Day 1	
19:00	Dinner	

March 28th, 2023 Day 2		
Scientific Session 4: Industrial Applications Chair: Kari Hjelt		
09:00 – 09:20	<i>Vincent Bouchiat</i>	Graphene-on-polymer for sensors & healthcare applications
09:20 – 09:40	<i>Juan Alfredo Guevara Carrio</i>	The use of graphene membranes for hydrogen separation
09:40 – 10:00	<i>Francesco Bonaccorso</i>	Industrial production of 2D materials for energy
10:00 – 10:20	<i>Vincenzo Palermo</i>	Laser patterning of 2DM-polymer composites for automotive applications: an example of transnational technology within the Graphene Flagship
10:20 – 10:40	<i>Ricardo Keitel</i>	2D electrolytes and its applications
10:40 – 11:10	Coffee break	
Scientific Session 5: Medical applications and new horizons Chair: Johan Ek Weis		
11:10 – 11:30	<i>Guillermo Bazan</i>	Living Bioelectrochemical Composites
11:30 – 11:50	<i>José-Antonio Garrido</i>	Graphene technology for neural interfaces
11:50 – 12:10	<i>Daria Andreeva</i>	2D composites for biointerfaces
12:10 – 12:30	<i>Kostas Kostarelos</i>	Clinical Translation Pathway of Advanced Materials: The Graphene Paradigm
12:30 – 12:50	<i>Liu Zheng</i>	Synthesis of 2D materials via CVD and CVT methods for electronic and optoelectronics
12:50	Concluding Remarks	
12:50 – 14:00	Lunch	
	Lab tour Institute for Functional Intelligent Materials, National University of Singapore	