GRAPHENE FLAGSHIP

GRAPHENE CONNECT – MATERIALS AND PRODUCTION

European Commission

PROGRAMME

GRAPHENE CONNECT

Monday 9 March

10:00 – 10:15 **Introduction**
Helena Theander, Chalmers Industriteknik

10:15 – 11:00 **State of the art popular presentation of graphene material and production**
Mar Garcia Hernandez, CSIC
Ken Teo, AIXTRON

11:00 – 11:30 **Standardisation**
Norbert Fabricius, Karlsruhe Institute of Technology

11:30 – 12:30 **Industry perspective on graphene**
Julio Gomez, Avanzare
Amaia Zurutuza, Graphenea

12:30 – 13:30 *Lunch*

<u>Parallel session</u>

1. Liquid based production – LPE/GO

13:30 – 14:00 **Flagship presentation: "Challenges in the Industrial-Scale Production of Graphene Nanocomposites"**
Ben Hargreaves, coordinator, POLYGRAPH project

14:00 – 15:00 **Group discussion: Scaling up and integration**
Moderator: Ben Hargreaves, NetComposites

2. Thin film deposition – CVD/SiC

13:30 – 14:00 **Flagship presentation: "Challenges in Graphene Film Production"**
Beatrice Beyer coordinator of the GLADIATOR project

14:00 – 15:00 **Group discussion: "Growth Challenges – Catalyst Pre-treatment, Growth (Mono vs Controlled Multilayers), Grain Size"**
Moderator: Ken Teo, AIXTRON

15:00 – 15:30	*Coffee*
	1. Liquid based production – LPE/GO
15:30 – 16:30	**Group discussion: "Standarization: How to Parametrized and Grade Your Products"** Moderator: Mar Garcia Hernandez, CSIC
	2. Thin film deposition – CVD/SiC
15:30 – 16:30	**Group discussion: "Transfer challenges – Adhesion, Flatness, Residue, Defects"** Moderator: Beatrice Beyer
16:30 – 17:00	**Plenary session: Summary of the group discussions**
17:00 – 17:30	**Summary and value proposition** Helena Theander, Chalmers Industriteknik
17:30 – 19:00	**Exhibition and matchmaking**
19:30	*Optional dinner*

Dr. Nobert FabriciusProf Frank Koppens

Karlsruhe Institute of Technology

Dr. Norbert Fabricius graduated in Physics and received his PhD from the University of Essen in 1985 for research on the interaction of high intensity laser radiation with semiconductor surfaces. In his industrial career between 1986 and 2002 he developed materials and processes for the manufacturing of integrated optical components used in telecommunication networks. His last industrial position was Director Operations at JDS Uniphase in Germany. In 2003 he joined the Research Centre Karlsruhe (now KIT) as the head of the Helmholtz Programmes Microsystem Technologies and Nanotechnology. Since 2008 he is responsible for nanotechnology standardization. He has experience in standardization on the national (DKE, DIN) and international (IEC, ISO) level since 25 years in different technology areas in industrial and academic environments. He acts as the Secretary for the IEC Technical Committee 113 “Nanotechnology standardization for electrical and electronic products and systems” and is a member in a number of related technical committees, like IEC Technical Committee 119 “Printed Electronics”. His most recent activity is the establishment of a standardization committee within the EU FET Flagship Initiative Graphene.

Dr. Beatrice Beyer

Fraunhofer COMEDD

Dr. Beatrice Beyer studied Chemistry in Jena and Eindhoven, finished her PhD studies dedicated to organic solar cells in Physics at the Technical University of Dresden in 2013, and works for Fraunhofer COMEDD since 2009. Amongst others, she synthesised organic materials for OLED and organic photoelectric devices, developed high performance and application specific stack systems and its devices; published 9 scientific papers and holds 1 patent. Currently she coordinates the European projects GLADIATOR (no. 604000) and LOMID (no. 644101).

Dr. Ken Teo

AIXTRON

Dr. Ken Teo is the Director of Nanoinstruments at AIXTRON. He holds a BE (Elec) from the University of Canterbury, MBA and PhD from the University of Cambridge. In 2005, Dr. Teo founded and ran Nano-instruments Ltd (UK) which manufactures innovative Graphene and Carbon Nanotube growth equipment for research and industry; Nano-instruments was acquired by AIXTRON where Dr Teo is presently responsible for driving the Graphene and Carbon Nano-tube business and technology. His previous roles include Lecturer in Electrical Engineering at University of Cambridge, Fellow/Director of Studies at Christ's College Cambridge, Royal Academy of Engineering Research Fellow, Fellow of the Institute of Nano-technology, Project Engineer at Defence Material Organisation (Singapore) and Product Engineer at PDL Holdings (NZ). Dr Teo has extensive experience in the area of carbon nanomaterials and is the author/co-author of >150 papers and 11 patents.

Prof. Mar García-Hernández

CSIC

Mar García-Hernández (Madrid, 1959) received her PhD degree on Molecular Physics in 1988 from Universidad Complutense de Madrid. She is currently CSIC Research Professor at the Instituto de Ciencias de Materiales de Madrid where she is leading the research group on Magnetism and Transport Properties. Through her career, she has been visiting scientist at the University of Reading, the J. Heyrowsky Institute in Prague, the Ecole Polytechnique Federale de Lausanne and the Rutherford Appleton Laboratory. Her current research interests are 2D materials and highly correlated systems. She has co-authored more than 230 papers in Experimental Condensed Matter Physics and Material Science. She leads the WP "Materials" in the Graphene Flagship.

Dr. Amaia Zurutuza

Graphenea

Amaia Zurutuza received her Ph.D. degree in polymer chemistry from the University of Strathclyde in 2002. From 2001 to 2003, she was a Postdoctoral Research Fellow working in two European projects with regard to molecularly imprinted polymers. In 2004, she joined Ferring Pharmaceuticals (previously Controlled Therapeutics) where she was a Senior Polymer Scientist researching new controlled drug delivery systems. Her contribution led to the granting of three patents in novel biodegradable and biostable polymers for the controlled release of active compounds. In 2010, she became the Scientific Director of Graphenea S.A., San Sebastian, Spain. At Graphenea, she leads the research and development activities on graphene-based materials. Since joining Graphenea, she has so far filed for two patents and published in Nature and Science. Through her position at Graphenea, she is working in close cooperation with different companies and research centers to examine a wide range of applications of graphene, such as: energy storage, solar cells, touch screen and display technology, sensors, optical transistors, and light harvesting devices. Her research interests include the synthesis, characterization, and potential industrial applications of graphene.

Dr. Julio Gomez Cordón

AVANZARE

Julio Gomez Cordón has a PhD in Chemistry at Universidad de La Rioja and a Graduate in Universidad Complutense de Madrid. He received a Best Graduate in Chemistry Award from Universidad Complutense de Madrid, and a Best PhD in Science Award in 2001 from Universidad de La Rioja. He has received the European New Product Innovation 2012 for the development in graphene nanocomposites; the National Entrepreneur 2008 Award (Spanish Ministry of Industry), Nanoaward2008 award (Best Product category), 5 national and regional award in innovation, R&D and young businessman. He is the author of 39 papers in international reviewed journals, 6 books, and 8 patents in exploitation and has been working in more than 150 R&D projects. From October 2004 is the General Manager of the AVANZARE Group.

Dr. Ben Hargreaves

NetComposites

Ben joined NetComposites in 2009, initially working on the development of halogen-free fire retardant unsaturated polyester nanocomposites. He is currently responsible for the management of NetComposites commercial consultancy business and also leads NetComposites research and development activities in the field of nanocomposites. Prior to joining NetComposites, he worked for Mettler Toledo Ltd, specialising in process analytical instrumentation for the chemical, pharmaceutical, semi-conductor and brewery sectors. He holds a degree in chemistry and PhD in active food packaging, both obtained at the University of Sheffield with the latter being sponsored by Sealed Air Ltd.

EXHIBITORS

Catalan Institute of Nanoscience and Nanotechnology (ICN2)

The ICN2 is a renowned research centre. Its research lines focus on the newly discovered physical and chemical properties that arise from the fascinating behaviour of matter at the nanoscale. The patrons of ICN2 are the Government of Catalonia (Generalitat), the Consejo Superior de Investigaciones Científicas (CSIC), and the Autonomous University of Barcelona (UAB).

With 15 research Groups and 4 Technical Divisions, the Institute promotes collaboration among scientists from diverse backgrounds (physics, chemistry, biology, and engineering) to develop basic and applied research, always seeking interactions with local and global industry. ICN2 also trains researchers in nanotechnology, develops numerous activities to facilitate the uptake of nanotechnology by industry, and promotes networking among scientists, engineers, technicians, business people, society, and policy makers.

ICN2 was accredited in 2014 as a Severo Ochoa Centre of Excellence. The Severo Ochoa Program, sponsored by the Spanish Ministry of Economy and Competitiveness, aims to identify and support Spanish research centres that are among the world's best in their specialty. This award is the highest recognition of centres of excellence in Spain, and it is granted after international scientific committees carry out a rigorous evaluation of project proposals submitted by Spanish research centres.

The ICN2 proposal for this call focused on the development of nanoscale devices that are effective and marketable. Based on scientific advances in the development of materials, nanofabrication, characterisation, and theoretical simulation, practical applications will be developed in three main areas: **Biosystems** (e.g. sensors, devices for selective drug delivery, nanomedicine, environmental applications); **Energy** (e.g. solar cells, batteries and supercapacitors, thermoelectric devices); **Information technology and telecommunications** (e.g. miniaturisation, applications of physical phenomena that are unique to nanoscale materials).

For more information
www.icn2.cat
Twitter: @icn2nano

SECO/WARWICK

The SECO/WARWICK Group is one of the world's leading manufacturers of heat processing equipment and a technology leader. With our research and development facility and cooperation with the academic centers in Europe, we are able to provide innovative solutions not offered anywhere else in the world. The Group is made up of companies located in five countries on three continents, and we sell our products worldwide. SECO/WARWICK Europe in cooperation with Institute of Electronic Materials Technology in Warsaw developed an industrial reactor for growth of large format Graphene on copper foil by CVD method. This equipment allows mass production of high-quality Graphene in the world's largest sizes up to 500x500 mm.

AIXTRON

At AIXTRON, we combine expertise and innovation required to develop highly complex technologies. With the most productive MOCVD systems in the world, we are enabling future applications, such as the LEDs, power electronics, and photovoltaic materials.

We encourage a creative and sometimes an even revolutionary approach to delivering customer solutions. We take progress personally. The only limitations we accept are the laws of physics. In close collaboration with renowned research centers, universities and industry partners, we continue to push the boundaries in this scientific field. And that is how we pursue technological advances for our customers – every day.


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