
# Programme

## 8th International Conference on

## Carbon Nanoparticle based Composites

**London, 17-19 July 2019**

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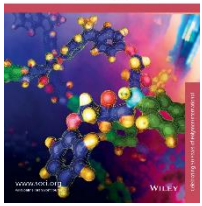

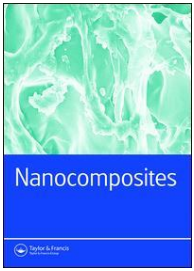


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# Welcome to CNPComp2019

We welcome you to CNPComp2019, the latest in a series of successful conferences on carbon-based nanocomposites that originated from the European thematic network CNT-NET. The conference focuses on the preparation and properties of composites containing all kinds of carbon nanoparticles (CNPs) including nanotubes, graphenes, blacks, and related materials. The goal is to share knowledge and experience, in particular between nanocarbon systems that are currently at different stages of maturity, in order to advance the state of the art in understanding and application. Whilst many useful nanocarbon-filled composite systems have emerged, there is still wide scope to exploit the intrinsic potential of this family of particles more fully. Progress relies on the continued development of nanocarbon synthesis, functionalisation, and processing methods to create practical, optimised architectures. Indeed, manufacturing processes for many advanced nanocarbons are increasingly being scaled towards commercial production, highlighting opportunities for implementation in the field.

We have an exceptional program of esteemed speakers and a warm and welcoming setting.

We hope that you will enjoy the meeting and your stay here in London, bringing new insight and new collaborations to your ongoing work.

Milo Shaffer
Imperial College London (UK)

Petra Potschke
IPF Dresden (Germany)

# Welcome to QMUL

In the current uncertain political-economical period, when beacons like multilateralism, globalisation and diversity are being questioned, if not undermined, I find the arrival of a conference like CNPComp2019 very refreshing.

On Leonardo Da Vinci's 500th anniversary, if there is one thing to celebrate at CNPComp2019 is a universal achievement: the Scientific Method*.

And what better place than the 'post-Brexit' London and, in particular, QMUL, for such celebration?

QMUL grew from the great charitable institutions of London's East End (dating back to 1785) to one of the most diverse research-leading multidisciplinary universities. It is truly global (campuses in London, Paris, China, Malta), but still with solid roots in the East End of London and a firm belief in its original mission: to embrace diversity and promote equal opportunities.

On behalf of the Local Organising Committee, I would like to welcome you to QMUL and wish you a fruitful and enjoyable experience.

*Leonardo Da Vinci put in practice the Scientific Method, a century before Galileo Galilei.

Emiliano Bilotti
QMUL (UK)

# Committees

## Local Organising Committee

Emiliano Bilotti - QMUL (UK) (**Chair of Organising Committee**)

James Elliott - University of Cambridge (UK)

Emile S Greenhalgh - Imperial College London (UK)

Ian Kinloch - University of Manchester (UK)

Ton Peijs - University of Warwick (UK)

Milo Shaffer - Imperial College London (UK) (**Conference Co-Chair**)

## International Scientific Committee

Tsu-Wei Chou - University of Delaware (USA)

Christof Hubner - Fraunhofer ICT (Germany)

Tony McNally - University of Warwick (UK)

Petra Potschke - IPF Dresden (Germany) (**Conference Co-Chair**)

Karl Schulte - Hamburg University of Technology (Germany).

Daniel Wagner - Weizmann Institute of Science (Israel)

Alan Windle - University of Cambridge (UK)

Robert Young - University of Manchester (UK)

# Keynote Speakers

**Composite Materials with Graphene**

Rodney S. Ruoff
UNIST (South Korea)

*Wednesday 17th July 11.00 – 11.45*

We have made a new type of composite material by mixing certain carbons with liquid metals (unpublished). I will introduce it and discuss some aspects. Other topics include: (i) folding A5-size graphene-polymer film 10 times (back and forth) to achieve 1023 folds and 1024 layers embedded in this polymer/CVD graphene composite, and its modulus, strength, and toughness as compared to a control sample having 1024 layers and the identical geometry, but no folds. (ii) We invented a method to measure single layer graphene mechanics at the centimetre length scale and can now explore macroscale mechanics relevant for real world applications. Strength values have been in the 3-4.5 GPa range, so there are great opportunities to improve, given the "ideal strength" of about 130 GPa. (iii) We now understand how to grow single crystal large area graphene that is absolutely free of any adlayers (and grain boundaries). This has a number of important implications, including now having the "appropriate" CVD grown graphene to stack by bottom up methods. For example, we have recently published a work that (iv) describes stacking 100 cm-size sheets of graphene "one by one" to make a 100-layer synthetic crystal that is not graphite per se, and has exceptionally high thermal conductivity in plane and a very high tensile strength compared to any graphite or multilayer graphene materials studied to date. (v) Time permitting, I will also talk about our synthesis of single layer fluorinated diamond ("F-diamane") and of high quality large area AB-stacked bilayer graphene grown on single crystal Cu/Ni(111) alloy foil, single crystal graphene under compressive stress, and how this compressive strain can "drive" certain chemical reactions near room temperature. Support from the Institute for Basic Science (IBS-R019-D1) is appreciated.

## Biomimetic Nanocomposites for Energy Technologies and Meta Optics

Nicholas A. Kotov
University of Michigan (USA)

*Friday 19th July 09.00 – 09.45*

Availability of materials with difficult-to-attain combination of multiple properties - mechanical, electrical, chemical, optical, thermal, and transport - represent the quintessential bottleneck for nearly all modern technologies. Nanocomposites with molecular, nano-, meso-, and microscale levels of structural engineering can provide such property combinations, while intrinsic ability of nanoscale components to self-assemble make them suitable for simplicity of synthesis.

One of the examples of self-assembled nanocomposites widely utilized in industry are nacre-like layered architectures from nanoplatelets. These materials based on graphene and other nanocarbons form the backbone of new energy storage devices. Laminar clay-based nanocomposites represent enable numerous separation technologies. The multidimensional structural design of these composites allows for multidimensional design of materials properties: toughness, stiffness, strength, transparency, conductivity; ion transport, polarization rotation, and biological response. As a continuation of this research, we learn that the unique mechanics of tooth enamel can be replicated combining out-of-plane nanoscale columns with molecular precision of layer-by-layer (LBL) assembly between them. As a result of that, these composites reveal remarkably high vibrational damping unusual for stiff materials that imparts them resilience to aging.

The novel type of biomimetic nanocomposites are those based on aramid nanofibers (ANFs). They spontaneously assemble into three-dimensional percolating networks reminiscent of cartilage. The nanoscale structure of ANF composites reveal nanoscale porosity that can be controlled by nanofiber branching. The latest results from multiple groups in the USA, China, UK, and France demonstrate that ANF composites resolve some of the essential property bottlenecks for ion-selective membranes, dendrite-resistant electrolytes, and structural batteries.

One of the emerging fields for biomimetic nanocomposites are optical devices. Patterning of ultrastrong nanocomposite sheets with microscale cuts leads to kirigami nanocomposites. They afford exceptionally wide design space for combining different key load-bearing and functional properties including novel optical effects originating from periodicity of the microscale cuts. The high strain and strength of kirigami composites make possible meta optical devices with diffraction and other optical properties reconfigurable in real time. As such, wide-angle diffraction gratings for visible light and highly efficient quarter wave plates for terahertz radiation can be demonstrated with emerging applications in machine vision and biomaterials imaging.

# Invited Speakers

**Graphene Polymer Composites; Interface Effects and Mechanics in Tension and Compression**

Costas Galiotis,
FORTH Patras (Greece)

*Wednesday 17th July 11.45 – 12.15*

Graphene is an ideal 2D crystal which is believed to possess a unique combination of mechanical properties in tension; that is high stiffness (~1 TPa), high strength (>100 GPa) but also high ductility (>20%). Theoretical works and simulations have indeed confirmed graphene as the stiffest and strongest material ever made but experiments on suspended graphene are scarce and problematic. A previous seminal work employing a radial tensile field by bending of graphene with an AFM probe, was converted to axial stress-strain curve, by assuming almost zero bending stiffness and quadratic stress-strain relationship. By assuming a thickness of 0.335 nm (the interlayer spacing in graphite) similar values to those mentioned above were derived. However, as it was recently confirmed experimentally, when a suspended 1LG graphene is stretched axially then the material is expected to exhibit orthogonal (lateral) Euler buckling due to its small thickness. This behaviour is analogous to that observed for all thin membranes and even for biological materials stressed in one direction. Thus out-of-plane phenomena cannot be ignored for uniaxial modes of loading.

Interface interactions are quite important for efficient load transfer in tension. For graphenes of thicknesses of one to three layers, simply-deposited onto PMMA substrates, large transfer lengths (>10 microns) are indeed required for efficient reinforcement. The values of required transfer lengths are reduced in the case of fully embedded graphenes but still they are much higher than those currently employed in commercial composites and that often explains the inferior mechanical performance of GNP composites vis-à-vis theoretical values. Moreover, the stress-built up has been found to be quite sensitive to both edge shape and number of layers (thickness) of the nano-inclusion and this is also significant since, in

commercial composites, there is a large distribution of both lateral sizes and thicknesses of embedded inclusions. Depending on lateral size, monolayer graphene flakes can be loaded up to maximum ~3% of tensile strain depending on the substrate without orthogonal buckling. Judging from the perfect linearity of the 2D Raman peak with strain it is assumed that the supported/ embedded graphenes behave linearly elastic up to that level of strain.

In compression, the mechanical behaviour of several simply-supported or embedded monolayer graphene flakes with various length-to-width ratios have also been fully examined. The critical strain to buckling for fully embedded graphene was found to be ~0.6% and independent of the flake's dimensions. This is indeed an extraordinary result for such a thin 2d crystal and its significance for engineering applications will be discussed.

**On the Role of the Nanostructure in Composites**

Larissa Gorbatikh
KU Leuvel (Belgium)

*Wednesday 17th July 16.15 – 16.45*

What is the true potential of combining reinforcements of different scales in a composite? In this talk we review a series of modelling studies that seek an answer to this question on the example of polymer composites reinforced with carbon nanotubes and microscopic fibers. Our models suggest that with the help of an intelligently designed and spatially resolved nanostructure one can change toughening mechanisms at the micro-scale. This is significantly more challenging to do than to activate mechanisms at the nano-scale, for example, nanotube pull-out, which is often reported to be the main contributor to the toughness improvement in nanocomposites. Mechanisms at different scales when activated concurrently create opportunities to design nanocomposites with both superior strength and toughness. The most efficient way to achieve this, as revealed by our computational experiments, is through optimisation of the CNTs' spatial distribution and orientation combined with moderate modifications of interfacial properties.

**Nanocomposites and Hierarchical Nanoengineered Mechanical and Multifunctional Performance**

Brian L. Wardle
MIT (USA)

*Wednesday 17th July 18.00 – 18.30*

Bulk nanostructured materials offer tremendous opportunity for re-inventing materials, but also pose many challenges both in terms of characterization, design, processing, and scaling. This presentation will focus on recent work developing nanoengineered hierarchical advanced composites for aerospace applications with a focus on enhancing mechanical properties and/or imparting multifunctionality. Such hybrid advanced composites employ aligned nanofibers (in most of our work, aligned carbon nanotubes, A-CNTs) in several architectures to enhance laminate-level bulk properties of existing aerospace-grade advanced composites. Intrinsic and scale-dependent characteristics of the nanofibers are used to engineer bulk property improvements including critical mechanical design parameters for composite laminates. Mechanistic contributions to toughening and strengthening from A-CNTs in the hybrid composites are studied utilizing ex situ and in situ mechanical testing with micro- and synchrotron- computed tomography (CT) revealing, as an example, synergistic effects between A-CNT reinforcement and thin-ply prepregs. Building multifunctionality concurrent with these mechanical property improvements includes thermal and electrical conductivity tailoring for damage sensing, ice protection, and 'out-of-oven' manufacturing via conductive curing. New research directions, in related areas including carbon nanostructure catalysis, microelectronics, energy storage, space science, and desalination, will be highlighted if time allows.

## Electrical, Mechanical and Electromechanical Properties of Novel Composites

Jonathan N. Coleman
Trinity College Dublin (Ireland)

*Thursday 18th July 11.15 – 11.45*

Here I will report on the electrical, mechanical and electromechanical properties of novel composites. First, I will discuss the electromechanical properties of composites of graphene mixed with a polysilicone, better known as the children's toy silly putty, demonstrating significant resistance changes on deformation, facilitating its use as a sensor. I will also present electromechanical data for PEO filled with $MoS_2$ nanosheets, showing significant increases in conductivity and stiffness and an unusual electromechanical response. The discussion will then move away from polymer-based composites to nano:nano composites, where I will demonstrate the effect of adding carbon nanotubes on the mechanical properties of networks of $MoS_2$ nanosheets. Finally, I will show that the properties of such nano:nano composites are well-suited for use in battery electrodes. I will report on segregated network composites where carbon nanotubes are used to facilitate charge transport and dramatically toughen thin-film battery electrodes. This results in an unusual morphology which allows the fabrication of very thick electrodes with state-of-the-art properties.

## High Power Factor, Completely Organic Themoelectric Nanocoatings Enables by Carbon Nanoparticles

Jaime Grunlan
Texas A&M University (USA)

*Thursday 18th July 14.15 – 14.45*

In an effort to create a paintable/printable thermoelectric material, comprised exclusively of organic components, polyaniline (PANi), graphene, and double-walled carbon nanotubes (DWNT) were alternately deposited from aqueous solutions using the layer-by-layer assembly technique. Graphene and DWNT are stabilized with an intrinsically conductive polymer, poly(3,4-ethylenedioxythiophene): poly(styrene sulfonate) (PEDOT:PSS). A 1 μm thick film, composed of 80 PANi/graphene-PEDOT:PSS/PANi/DWNT-PEDOT:PSS quadlayers (QL) exhibits electrical conductivity (σ) of 1.88 x $10^5$ S/m and a Seebeck coefficient (S) of 120 μV/K, producing a thermoelectric power factor ($S^2 \cdot \sigma$) of 2710 μW/(m·$K^2$). This is the highest value ever reported for a completely organic material measured at room temperature. Furthermore, this performance matches or exceeds that of commercial bismuth telluride. These outstanding properties are attributed to the highly ordered structure in the multilayer assembly. The thermoelectric power output increased with the number of cycles deposited, yielding 8.5 nW at 80 QL for ΔT = 5.6 K. A simple thermoelectric generator was prepared with selectively-patterned, fabric-based system. The electric voltage generated by each TE device increased in a linear relationship with both ΔT and the number of TE legs, producing ~ 5 mV with just five legs and a ΔT of 9.7 K. By stabilizing nanotubes and graphene with nitrogen-rich molecules, n-type multilayer thin films with relatively high power factor have also been produced. This unique TE coating system is water-based and uses only organic components. For the first time, there is a real opportunity to harness waste heat from unconventional sources, such as body heat to power devices in an environmentally-benign way.

**Soft Dielectric Materials for Sensing and Energy Harvesting Applications**

Philippe Puolin
CNRS, Bordeoux (France)

*Friday 19th July 11.30 – 12.00*

High permittivity and efficient electromechanical coupling are critical to perform energy storage or conversion between mechanical and electrical energy for various applications of electrostrictive polymers. We report a giant electrostriction effect in liquid crystalline graphene doped elastomers. The materials are formulated by graphene oxide functionalization, and by a phase transfer method which allows the solubilization of graphene oxide monolayers in non-polar solvents. It is shown in particular that a liquid crystal transition leads to an increased percolation threshold. Because of their unique liquid crystal structure, the resultant composites show a giant electrostriction coefficient ($M \sim 10^{-14}$ $m^2/V^2$ at 0.1 Hz) coupled with good reproducibility during cycles at high deformation rates. This work offers a promising pathway to design novel high performance soft dielectric materials for sensing or energy harvesting applications. We will also discuss recent developments concerning dielectric foams and multilayers systems that allow ultra-low pressure sensing via piezo-capacitive effects.

# Scientific Programme

## Day 1 - Wed 17th July

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|---|---|
| **09:00-10:30** | **Registration, Poster set-up** |
| **10:45-11:00** | **Welcome** |
| **11:00-11:45** | **KEYNOTE**<br>Composite Materials with Graphene<br>**Rodney S. Ruoff**, UNIST (South Korea) |
| | **Mechanics/Interfaces** |
| 11:45-12:15 | **INVITED**<br>Graphene Polymer Composites; Interface Effects and Mechanics in Tension and Compression<br>**Costas Galiotis**, FORTH, Patras (Greece) |
| 12:15-12:30 | From Bioinspired to Bionic Nanocomposites<br>**Nicola Pugno**, University of Trento (Italy) & QMUL (UK) |
| 12:30-12:45 | CNT Fibres: a Micromechanical Model and the Challenges for their Use in Structural Composites<br>**Juan J. Vilatela**, IMDEA (Spain) |
| 12:45-13:00 | Bioinpired Graphene-Based Nanocomposites<br>**Qunfeng Cheng**, Beihang University, Beijing (China) |
| 13:00-13:15 | The Strength of Mechanically-Exfoliated Monolayer Graphene<br>**Dimitrios Papageorgiou**, University of Manchester (UK) |
| 13:15-13:30 | Interfacial Energy Dissipation in Graphene Nanocomposites<br>**Zheling Li**, University of Manchester (UK) |
| **13:30-14:30** | **Lunch (barbecue in Arts Quarter Square)** |
| **14:30-16:15** | **Poster Session (in Mucci's)** |

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|---|---|
| **Hierarchical Composites** | |
| 16:15-16:45 | **INVITED**<br>On the Role of the Nanostructure in Composites<br>**Larissa Gorbatikh**, KU Leuven (Belgium) |
| 16:45-17:00 | Enhancing the Interlaminar Fracture Toughness of Composites by using CNT Films<br>**Weibang Lyu**, SINANO, Suzhou (China) |
| 17:00-17:15 | Continuous Production of CNT-grafted Carbon Fibres: A Route to Manufacture Hierarchical Composites<br>**Hugo G. De Luca**, Imperial College London (UK) |
| 17:15-17:30 | Hierarchical Composites with High CNT Loadings<br>**Neptun Yousefi**, University of Vienna (Austria) |
| **17:30-18:00** | **Coffee Break** |
| **Functionally Graded Nanocomposites** | |
| 18:00-18:30 | **INVITED**<br>Nanocomposites and Hierarchical Nanoengineered Mechanical and Multifunctional Performance<br>**Brian L. Wardle**, MIT (USA) |
| 18:30-18:45 | Magnetic Control of Microstructure in Graphene Nanoplatelet (GNP) Epoxy Composites<br>**Mark J. Eaton**, Cardiff University (UK) |
| 18:45-19:00 | Manipulation of Single-Walled CNT in Composites with Electric Fields<br>**Manuel Morais**, Fraunhofer Institute for Chemical Technology (Germany) |
| 19:00-19:15 | Fabrication of Functionally Graded CNT by Additive Manufacturing Technology: Promises and Challenges<br>**Devi K. Kalla**, University of Denver (USA) |

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| 19:15-19:30 | GNP/ MWCNT/MCF PEEK Composites for FDM Printing: Paving the Way Towards Smart Structures<br>**Francesca Nanni**, University of Rome Tor Vergata (Italy) |
| **19:30-21:00** | **Drinks / Refreshment (in Queen's Bld. Courtyard)** |

## Day 2 - Thurs 18th July

| **Towards Industrial Applications** | |
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| **09:00-09:10** | **INVITED**<br>**Intro Talk:** Carbon Based Nanostructures for Improved Industrial Products<br>**Karl Schulte,** TUHH (Germany) |
| 09:10-09:25 | Large Scale Production of Graphene and Related Layered Materials for Enhanced Composites<br>**Stephen A. Hodge**, Versarien Plc. (UK) |
| 09:25-09:40 | New Frontiers in Single Wall Carbon Nanotubes Applications<br>**Alexander A. Khasin**, OCSiAl (Russia) |
| 09:40-09:55 | Graphene goes Large – Industrial Scale Adoption of Carbon Nanomaterials in Composites<br>**Andy Goodwin**, First Graphene Ltd. (UK) |
| 09:55-10:10 | Characterisation of GNP Prepared by High Pressure Homogenisation: Structure and Morphology<br>**Valentina Guerra**, University of Warwick (UK) |
| 10:10-10:20 | **INVITED**<br>**Conclusions**<br>**Alan Windle**, University of Cambridge (UK) |
| **10:20-10:50** | **Open Panel Discussion** |

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| 10:50-11:15 | **Coffee Break** |
| | **Sensing** |
| 11:15-11:45 | **INVITED**<br>Electrical, Mechanical and Electromechanical Properties of Novel Composites<br>**Jonathan N. Coleman**, Trinity College Dublin (Ireland) |
| 11:45-12:00 | Electrophoretically Deposited CNT-Based Nanostructured Composites on Conventional Textiles for Novel Sensing Applications<br>**Erik T Thostenson**, University of Delaware (USA) |
| 12:00-12:15 | Development and Characterisation of Embedded Quantum Resistive Sensors for Monitoring Application<br>**Mickael Castro**, University of South Brittany (France) |
| 12:15-12:30 | Negative Gauge Factor Piezoresistive Composites based on Polymers filled with $MoS_2$ Nanosheets<br>**Sonia Biccai**, Trinity College Dublin (Ireland) |
| 12:30-12:45 | Highly Stretchable Piezoresistive Strain Sensor Based on Conductive Thermoplastic Vulcanizate<br>**Subhan Saleh**, Prince of Songkla University (Thailand) |
| | **Self-healing** |
| 12:45-13:00 | Self-healing Elastomer-Carbon Nanocomposites for Stretchable Conductors<br>**Biqiong Chen**, Queen's University Belfast (UK) |
| 13:00-13:15 | Engineering Sustainable Nanocomposites for Future Electrical Devices<br>**Ben Xu**, Northumbria University (UK) |
| **13:15-14:15** | **Lunch** |

| Energy Harvesting and Energy Storage | |
|---|---|
| 14:15-14:45 | **INVITED**<br>High Power Factor, Completely Organic Thermoelectric Nanocoatings Enables by Carbon Nanoparticles<br>**Jaime Grunlan**, Texas A&M University (USA) |
| 14:45-15:00 | Carbon Nanotubes Enable Stretchable Supercapacitors and Batteries<br>**Bingqing Wei**, University of Delaware (USA) |
| 15:00-15:15 | Effect of Preparation Conditions on Properties of GNP/PANI and rGO/PANI Composites for Supercapacitor Purpose<br>**Jürgen Pionteck**, IPFDD Dresden (Germany) |
| 15:15-15:30 | Carbon Nanostructures in Sustainable Electro- and Photo-Catalysis<br>**Michele Melchionna**, University of Trieste (Italy) |
| 15:30-15:45 | Synthesis and Dispersion of P- And N-Type MWNT for Thermoelectric Cementitious Nanocomposites<br>**Marco Liebscher**, Technical University of Dresden (Germany) |
| 15:45-16:15 | **Coffee break** |
| **Thermal** | |
| 16:15-16:30 | Multifunctional Fibre Reinforced Composites: from Smart Out-of-Oven Manufacturing to Integrated Sensing and De-icing Capabilities<br>**Han Zhang**, QMUL (UK) |
| 16:30-16:45 | Tailored Polyurethane Composite Sheets Incorporating High Nanotube Loading for Development of Multifunctional Structures and Coatings<br>**Yadienka Martinez-Rubi**, National Research Council (Canada) |

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| 16:45-17:00 | Graphene Related Materials for Thermally Conductive Nanocomposites. Which Type Works Best?<br>**Alberto Fina**, Politecnico Torino (Italy) |
| 17:00-17:15 | Compression-Enhanced Thermal Conductivity of Polymer Composites<br>**Oren Regev**, Ben-Gurion University (Israel) |
| 17:15-17:30 | CNT Sea Urchins / Mat Enhanced Highly Thermal Conductive Polymer Composites<br>**Xiao Zhang**, University of Cambridge (UK) |
| 17:30-17:45 | **Poster Prize** |
| **18:00-** | **Social Dinner (in Queen's Bld. Octagon)** |

**Day 3 - Fri 19th July**

| **Nanoparticle Dispersion: Methods, Measurement, Properties** | |
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| **09:00-09:45** | **KEYNOTE**<br>Biomimetic Nanocomposites for Energy Technologies and Meta Optics<br>**Nicholas A. Kotov**, University of Michigan (USA) |
| 09:45-10:00 | In-line Monitoring of Carbon Nanoparticle Epoxy Dispersion Processes<br>**Bodo Fielder**, TUHH (Germany) |
| 10:00-10:15 | Three-dimensional Quantitative Mapping of Particle Concentration in Carbon Nanocomposites<br>**Sandra Fisher**, Imperial College London (UK) |
| 10:15-10:30 | High Shear Mixing Processed Epoxy Composites Reinforced with Graphene Nanoplatelet-CNT Hybrid Fillers<br>**Sergejs Gaidukovs**, Riga Technical University (Latvia) |

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| 10:30-10:45 | Effect of Graphene Distribution on the Electrical Conductivity of Nanocomposites<br>**Giovanni Santagiuliana**, Queen Mary, University London (UK) & Nanoforce Tech. Ltd. (UK) |
| 10:45-11:00 | Influence of CNT in Binary Blend of Poly(Ether-Ketone) and Poly(2,5-Benzimidazole) on Morphology, Electrical Conductivity and Mechanical Properties<br>**Arup R. Bhattacharyya**, Indian Institute of Technology Bombay (India) |
| **11:00-11:30** | **Coffee Break** |
| **Surface Functionalisation** | |
| 11:30-12:00 | **INVITED**<br>Soft Dielectric Materials for Sensing and Energy Harvesting Applications<br>**Philippe Puolin**, CNRS, Bordeoux (France) |
| 12:00-12:15 | A Photo-Addressable Liquid Crystalline Phase Transition in Graphene Oxide Nanocomposites<br>**Maria Crespo**, QMUL (UK) |
| 12:15-12:30 | Tailoring The Interface between Graphene and PMMA: PMMA Grafted Graphene as Reinforcement in PMMA Composites<br>**Cristina Valles**, University of Manchester (UK) |
| 12:30-12:45 | Tissue-engineered Scaffold Consisting of Electrospun Patterned PLA-based Fibrous Membranes with Antibacterial Property and 3D-printed Skeletons with Elasticity<br>**Xuetao Shi**, NPU, Xian (China) |

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| 12:45-13:00 | Composites Fibres of PLA and Functionalised Few-Layer Graphene for Ligament Regeneration<br>**Magda Silva**, University of Minho (Portugal) |
| 13:00-13:15 | Functionalized Graphene / Silicone Rubber Composites: Enhancing the Mechanical and Thermal Properties<br>**Eunice Cunha**, University of Manchester (UK) |
| 13:15-13:30 | Effects of the Functionalisation of Flax Fibre Fabrics with Carbonaceous Particles on the Mechanical Performances of Polypropylene based Composite Laminates<br>**Pietro Russo**, National Council of Research, Pozzuoli (Italy) |
| **13:30** | **End** |

# Poster Presentations

**Wed 17th July, 14:40-16:15, at Mucci's**

P01 Facile Silane Functionalization of Graphene Oxide for In-Situ Cross-Linking with Low-Density Polyethylene

**Syeda Abbas**, University of Warwick (UK)

P02 Influence of 2D Layered Nanomaterials on the ß-Cryctalline Structure of Poly (Vinylidene Fluoride) Based Nanocomposites

**Akanksha Adaval**, Indian Institute of Technology Bombay-Monash Research Academy (India)

P03 Continuum and Molecular Modelling of Peeling of Multilayer Graphene in a Liquid

**Adyant Agrawal**, QMUL (UK)

P04 Structural Analysis of Graphene Oxide: Surface Functional Groups and Fractionated Oxidative Debris

**Elvin Aliyev**, Helmholtz-Zentrum Geesthacht (Germany)

P05 Hierarchical Carbon Nanotube/Aerogel Modified Carbon Fibre Composites: A Multifunctional Material for Structural Power Applications

**David Anthony**, Imperial College London (UK)

P06 Dielectric Properties Comparison of EVA Composites and Layered Composites, Filled with Carbon Nanotubes, Graphene and Iron Oxide Nanoparticles

**Anda Barkane**, Riga Technical University (Latvia)

P07 Synergy Effects in Epoxy Resin Composites Filled with Carbon Nanotubes and Magnesium Oxide Nanoparticles

**Povilas Bertasius**, Vilnius University (Lithuania)

P08 Electrochemical Production of Graphene Oxide

**Jianyun Cao**, University of Manchester (UK)

P09 Manipulating Optical Properties of Semiconductor Materials through Modification with Carbon Dots

**Simran Channa**, University of Leeds (UK)

P10 Smart Cellulose/Graphene Composites Fabricated by In-Situ Chemical Reduction of Graphene Oxide for Multiple Sensing Applications

**Yian Chen**, IPF Dresden (Germany)

P11 Chemical Vapour Deposition of Graphene on Selective Laser Melting Fabricated Copper Porous Scaffold for Electromagnetic Interference Shielding

**Kaka Cheng**, China University of Geosciences (China)

P12 Large Scale Production of Graphene and Related Layered Materials for Enhanced Composites

**Stephen A. Hodge**, Versarien Plc. (UK)

P13 Integration of Electrically Conductive Thermoplastic Composites in Technical Products using Additive Manufacturing Methods

**Christof Hübner**, Fraunhofer Institute for Chemical Technology (Germany)

P14 Barrier Properties of Graphene based Materials.

**Oana Istrate**, Queen's University Belfast (UK)

P15 ESR Spectroscopy as a New Method to Analyse the Synergy Between Carbon Nanotubes and Organically Modified Montmorillonite Incorporated in an Elastomeric Matrix

**Aleksandra Ivanoska-Dacikj**, Macedonian Academy of Sciences and Arts (North Macedonia)

P16 Design Synthesis of Reduced Graphene Oxide Gelatin - Nanocomposite Hydrogels

**Jelena Jovanovic**, University of Belgrade (Serbia)

P17 Stable Orientation of Graphene Nanoplatelets in Shear Flow at Finite Peclet Number

**Catherine Kamal**, QMUL (UK)

P18 Radially Aligned Hierarchical Network of Graphene Nanoflakes on Carbon Fibres with Improving of Interfacial Strength and Electrical conductivity

**Anastasios Karakasidis**, Ulster University (UK)

P19 Damping Response of Graphene Enhanced Composite Materials for High Performance Applications – A feasibility Study

**Christos Katsiropoulos**, University of Patras (Greece)

P20 Nitrogen Doped Carbon Nanotubes (NCNTs) for Implementation in Polymer Composites to Improve Thermoelectric Properties

**Katharina Kröning**, TUHH (Germany)

P21 Synthesis and Characterisation of Carbon Nanotube Reinforced Polymer Nanocomposites Fabricated Using Three-Roll-Milling for Micromachining Applications

**Bao Le**, Northumbria University (UK)

P22 Immiscible Poly(Lactic Acid)/Polystyrene Blend Composites Filled with Multi-Walled Carbon Nanotubes as Chemiresistors for Volatile Organic Compounds

**Yilong Li**, IPF Dresden (Germany)

P23 Modelling of Magnetic Field Dependent Dynamic Characteristics of Fiber Metal Laminates with Magnetorheological Elastomer Core

**Hui Li**, University of Liverpool (UK)

P24 Swelling Behaviour of a Graphene-based Elastomer Nanocomposite: Biaxial Strain and Reinforcing Mechanism

**Mufeng Liu**, University of Manchester (UK)

P25 Nanoparticle Reinforced Light Weight Magnesium Composites

**Daniel Markcoons**, Imperial College London (UK)

P26 Towards a Better Understanding of Fluorescent Carbon Nanodots

**Fabrizio Messina**, University of Palermo (Italy)

P27 Compatibilisation of Immiscible Polymer Blends with Silane Modified Graphene Oxide Nanoparticles

**Naum Naveh**, Shenkar College of Engineering and Design (Israel)

P28 Biodegradable Poly(Butylene Succinate) – Nanofibrillated Cellulose and Graphene Nanoplatelet Composite Blends and Nanofibers

**Nauris Neibolts**, Riga Technical University (Latvia)

P29 Towards Conductive Wood-based Sensors with Improved Transparency

**David Novel**, University of Trento (Italy)

P30 Nanoparticle Intercalation and Densification for Stronger and Tougher Cellulose-based Natural Materials

**David Novel**, University of Trento (Italy)

P31 Characterisation of High-Performance Viscoelastic Nanocomposite Sensing Materials

**Daniel O'Driscoll**, Trinity College Dublin (Ireland)

P32 In-Situ Prepared Nano-Graphite/Multilayer Graphene Epoxy Nanocomposites

**Marcin Orawiec**, University of Huddersfield (UK)

P33 CNT Fibre Veil Interleaved CFRP-Hybrids with Enhanced Interlaminar Fracture Toughness

**Yunfu Ou**, IMDEA (Spain)

P34 Electrically Conductive Adhesive based on Carbon Nanoparticles for PCB Assembly

**Maria C. Paiva**, University of Minho (Portugal)

P35 N-type Thermoelectric Melt-Mixed Vapour Grown Carbon Nanofiber Polypropylene Composites

**Antonio J. Paleo**, University of Minho (Portugal)

P36 Fabrication, Characterization and Modelling of Triple Hierarchic Structural PET/CB/TPU Composite Fibres for Strain Sensing

**Yijing Qin**, Friedrich-Alexander-University Erlangen-Nuremberg (Germany)

P37 Novel Definition of the Synergistic Effect between Carbon Nanotubes and Carbon Black for Electrical Conductivity

**Muchao Qu**, Friedrich-Alexander-University Erlangen-Nuremberg (Germany)

P38 Anisotropic Thermal and Electrical Conduction in Hierarchically Structured Composite using Graphene-Augmented γ-$Al_2O_3$ nanofibers

**Ali Saffar Shamshirgar**, Tallinn University of Technology (Estonia)

P39 Investigation and Application of Graphene Layers as Particulate Susceptors for Polymer Hybrid Formations

**Cláudia Silva**, IPF Dresden (Germany)

P40 Epoxy Composites with Functionalised and Metal Decorated Single Wall Carbon Nanotubes

**Mariana M Silva**, University of Minho (Portugal)

P41 Carbon Nanostructures as a Tool to Enhance $TiO_2$ Performance in the Photocatalytic Degradation of Pollutants from Water and Air

**Mariana R F Silva**, University of Aveiro (Portugal)

P42 Effect of PMMA Addition on the Electrical Conductivity and Piezoresistive Behaviour of PVDF based Composites with Carbon Black or Surface Functionalized CNTs

**Xinlei Tang**, IPF Dresden (Germany)

P43 Application of Non-Resonance Raman Spectroscopy in Boron Nitride Nanotubes-based Nanocomposites: Evaluation of Dispersion, Orientation and Interface

**Weimiao Wang**, University of Manchester (UK)

P44 Frequency or Amplitude? Rheo-Electrical Characterization of Carbon Nanoparticle Filled Epoxy Systems

**Valea Kim Wisniewski**, TUHH (Germany)

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|---|---|
| P45 | Graphene Reinforced Biodegradable Resin Composites for Stereolithographic 3D Printing of Bone Structure Scaffolds<br>**Chenxing Xin**, China University of Geosciences (China) |
| P46 | Conductive Lubricants for High Electricity Motors<br>**Omri Yadgar**, Ben Gurion University (Israel) |
| P47 | Integrated Preparation of Silane-Functionalised Graphene Oxide/Epoxy Nanocomposites<br>**Desen Zeng**, University of Manchester (UK) |
| P48 | Eco-Friendly Preparation of Graphene Derivatives to Meet Requirements as Susceptor for Magnetic Field Induction Heating<br>**Cordelia Zimmerer**, IPF Dresden, Germany |

# Notes

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# Campus Map and Venues


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|---|---|
| Main Conference Venue | 35 – Arts Two Lecturer Theatre |
| 1st day Barbecue Lunch | / – Arts Quarter Square |
| Poster Session | 29 – Mucci's |
| Reception | 19 – Queens' Bld. (Courtyard) |
| Social Dinner | 19b – Queens' Bld. (the Octagon) |

Nearest tube stations: **Mile End** (Central, District, Hammersmith & City line)
**Stepney Green** (District, Hammersmith & City line)

**CONTACTS**

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**FURTHER INFO**

www.sems.qmul.ac.uk/events/cnpcomp2019