

# Dr Christos Melios

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## PROFILE |

- Highly self-motivated individual with demonstrated research expertise in electrical measurements, graphene and 2D materials electrical and structural characterization and environmental sensing. Strong leadership, communication and problem-solving skills.
- Experimental techniques: Magneto-transport measurements in controlled environments, functional scanning probe microscopy and Raman spectroscopy, precise electrical measurements.
- Ability to design and perform complex experiments.

## EDUCATION |

### University of Surrey / National Physical Laboratory, UK

EngD Micro- and NanoMaterials and Technologies, 2013 - 2017

**Thesis:** Graphene metrology: Substrate and environmental effects on graphene

**Key taught components:** Nanomaterials, Surface analysis, Characterisation of advanced materials, Research methods.

### University of Surrey, UK

MSc Nanotechnology and Nanoelectronic devices (Distinction), 2012 - 2013

**Dissertation:** Enhanced solar cell performance via plasmonic energy coupling

**Key taught components:** Molecular Electronics, Advanced experimental methods, Nanoelectronic devices, Nanophotonics, RF and Microwave fundamentals.

### University of Surrey, UK

BEng Electronic Engineering (Hons 2:1), 2009 - 2012

**Final Year Project:** Study of Thin Film Plasmonic Silicon Solar Cells

**Key taught components:** Electronics 1-6, Optoelectronics, Silicon device technology, Power electronics

### Apostolos Varnavas Lyceum, Cyprus

(79.6% with excellent conduct), 2003 - 2006

## RESEARCH INTERESTS |

- Cathodic corrosion / protection
- Magneto-transport measurements of graphene and 2D materials
- Renewable energy generation
- Surface analysis using Functional scanning probe microscopy
- Environmental sensing
- High precision electrical measurements

## RESEARCH EXPIRIENCE |

### PSM Lab, Department of Electrical and Computer Engineering, University of Cyprus, Cyprus

#### Research Fellow (2019-present)

Research under the project PVrosion. Accelerated Corrosion Blind Spots Inherent to Photovoltaic Systems' Operation and Undetected DC Faults – Trojan horse for Deteriorating the Integrity of Critical Infrastructures and Buildings. The project involves (a) The impact of accelerated dc corrosion on critical infrastructures, such as natural gas pipelines and oil tanks that are operated near large-scale Photovoltaic plants. (b) The impact of accelerated dc corrosion on the envelope and metallic infrastructure of energy efficient buildings that benefit from Building-Applied Photovoltaic Systems (BAPVs) and Building-Integrated Photovoltaic systems (BIPVs). Responsible for electrical measurements, design and undertaking complex experiments as well as project management.

## University of Surrey / National Physical Laboratory, UK

### Engineering Doctorate student (2013-2017) / Higher Research Scientist at NPL (2017-2019)

- *Graphene structural characterization*

Extensive investigation of graphene layer structure using Raman spectroscopy and mapping of graphene grown by different methods (chemical vapour deposition and sublimation) on a variety of substrates (SiO<sub>2</sub>, PET, SiC). Important parameters such as layer number and stacking, strain as well as defects were measured for optimisation of growth process. Use of surface enhanced Raman scattering for enhancement of the Si-H stretching bond to reveal the interface structure of hydrogen intercalated epitaxial graphene.

- *Local electrical measurements of graphene*

Use of functional scanning probe measurements, such as Kelvin probe force microscopy to provide information about layer distribution and the surface potential of graphene grown by different methods on a variety of substrates. Calibrated Kelvin probe force microscopy measurements to provide a nanometre work function maps of the sample in ambient air, vacuum and highly controlled environmental conditions (humidity and gases). During my research project, I had the opportunity to use a wide variety of SPM systems.

- *Magneto-transport measurements*

Extensive use of magneto-transport measurements of graphene for electrical characterization, and environmental sensing to provide information about carrier concentration, mobility and resistance. Design and development of an environmental transport properties measurement system for graphene nano-devices and unpatterned films in conventional Hall bars and van der Pauw geometry. The system is capable of measurements in ambient conditions as well as highly controlled environments (humidity and mixture of gases) and temperatures up to 200 °C.

## University of Surrey, UK

### MSc Nanotechnology and Nanoelectronic devices

- *Solar cell design and simulation*

Extensive use of process and device simulation package Silvaco Atlas. I have developed my own code for simulating solar cells made of different materials such as c-Si, a-Si and organic photovoltaics. Moreover I have used the simulation package to understand the effects of plasmonic structures to enhance the performance of thin-film solar cells.

- *Organic photovoltaic fabrications*

Experience in fabrication of organic photovoltaics with active layers consisting of P3HT:PCBM and implementation of metal nanoparticles which enhance the performance due to plasmonic coupling effects. The simulations of these devices helped me gain a deep understanding of the physical mechanisms behind the principle of operation and obtain the optimum layer dimensions, composition and nanoparticle type and size.

## PUBLICATIONS |

- [Electrostatic transparency of graphene oxide sheets](#)  
C. E. Giusca, F. Perrozzi, C. Melios, L. Ottaviano, E. Treossi, V. Palermo and O. Kazakova  
Carbon, **86**, pp 188–196 (2015)
- [Carrier type inversion in quasi-free standing graphene: studies of local electronic and structural properties](#)  
C. Melios, V. Panchal, C. E. Giusca, W. Strupiński, S. R. P. Silva and O. Kazakova  
Sci Rep, **5**, 10505 (2015)
- [Effects of humidity on the electronic properties of graphene prepared by chemical vapour deposition](#)  
C. Melios, A. Centeno, A. Zurutuza, V. Panchal, S. Spencer, S. R. P. Silva and O. Kazakova  
Carbon, **103**, pp 273–280 (2016)
- [Surface and interface structure of quasi-free standing graphene on SiC](#)  
C. Melios, S. Spencer, A. Shard, W. Strupiński, S. R. P. Silva and O. Kazakova  
2D Mater, **3**, 025023 (2016)

- [Characterization and physical modeling of MOS capacitors in epitaxial graphene monolayers and bilayers on 6H-SiC](#)  
M. Winters, E. Ö. Sveinbjörnsson, C. Melios, O. Kazakova, W. Strupiński and N. Rorsman  
AIP Advances, **6**, 085010 (2016)
- [Excitonic Effects in Tungsten Disulfide Monolayers on Two-Layer Graphene](#)  
C. E. Giusca, I. Rungger, V. Panchal, C. Melios, Z. Lin, Y. Lin, E. Kahn, A. L. Elías, J. A. Robinson, M. Terrones and O. Kazakova  
ACS Nano, **10** (8), pp 7840–7846 (2016)
- [Tuning epitaxial graphene sensitivity to water by hydrogen intercalation](#)  
C. Melios, M. Winters, W. Strupiński, V. Panchal, C. E. Giusca, K. D. G. .I Jayawardena, N. Rorsman, S. R. P. Silva and O. Kazakova  
Nanoscale, **9**, pp 3440-3448 (2017)
- [Water on graphene: Review of recent progress](#)  
C. Melios, V. Panchal, C. E. Giusca, and O. Kazakova  
2D Materials, **5**, 022001 (2018)
- [Detection of Ultralow Concentration NO<sub>2</sub> in Complex Environment Using Epitaxial Graphene Sensors](#)  
C. Melios, V. Panchal, K. Edmonds, A. Lartsev, R. Yakimova, and O. Kazakova  
ACS Sens., **3** (9), pp 1666–1674 (2018)
- [Electrical Homogeneity Mapping of Epitaxial Graphene on Silicon Carbide](#)  
P. R. Whelan, V. Panchal, D. H. Petersen, D. M. A. Mackenzie, C. Melios, I. Pasternak, J. Gallop, F. W. Østerberg, P. U. Jepsen, W. Strupinski, O. Kazakova, and P. Bøggild  
ACS Appl. Mater. Interfaces, **10** (37), pp 31641–31647 (2018)
- [Confocal laser scanning microscopy for rapid optical characterization of graphene](#)  
V. Panchal, Y. Yang, G. Cheng, J. Hu, M. Kruskopf, C-I. Liu, A. F. Rigosi, C. Melios, A. R. H. Walker, D. B. Newell, O. Kazakova and R. E. Elmquist  
Communications Physics, **1**, (83) (2018)
- [Highly resonant graphene plasmon hotspots in complex nanoresonator geometries](#)  
W. S Hart, V. Panchal, C. Melios, W. Strupiński, O. Kazakova and C. C. Phillips  
2D Materials, **6** 021003, 022001 (2019)

## MEMBERSHIPS |

- Institute of Materials, Minerals and Mining (IOM<sup>3</sup>), 2013 - 2017
- British Standards Institution (BSI), NTI/001 Nanotechnologies committee, 2017 - Present
- International Electrotechnical Commission (IEC), TC-113/WG8 committee, 2017- Present
- Institution of Engineering and Technology (IET) 2012 - Present

## LANGUAGES |

Greek (native), English (fluent)

## SOFT SKILLS |

- Willing to perform basic tasks and move on to solve complex problems.
- Strong independent work style and excellent teamwork skills.
- Well-organized and passionate.
- Trustworthy and approachable gave me the opportunity of being a team leader within various group projects.
- Collaborative work with several partners
- Supervision of 2 summer students during my four-year EngD project.
- ILM Certificate in Development Programme in First Line Management.

## TECHNICAL SKILLS |

- Design and implementation of electronic circuits.
- General workshop skills.

- Extensive use of wide range of SPM systems (NT-MDT, Bruker, Anasys) for AFM, KPFM and s-SNOM measurements.
- Extensive use of Raman spectroscopy systems (Horiba and Renishaw).
- Magneto-transport measurements using Lock-in amplifiers.
- Ability to design and perform complex experiments.
- IT: MS Word, Excel and Powerpoint, OrogenLab, LabView, Silvaco Atlas.

## PREVIOUS EXPIRIENCE |

### **National Physical Laboratory, Quantum science, UK (2017 - 2019)**

*Higher Research Scientist*

- Standardisation of electrical measurements for future graphene-based electronics
- Ultra-low gas sensing using graphene-based sensors for environmental monitoring

### **University of Cyprus, PSM Lab, Department of Electrical and Computer Engineering, Cyprus (2019 – present)**

*Research Fellow*

- Accelerated Corrosion Blind Spots Inherent to Photovoltaic Systems' Operation and Undetected DC Faults – Trojan horse for Deteriorating the Integrity of Critical Infrastructures and Buildings.

### **Cyprus National Guard, 28<sup>th</sup> Armoured Division, Cyprus (2006 - 2008)**

*Tank Driver*

## INTERESTS |

- Photography

## REFERENCES |

Available upon request