



Meganne Christian

Date of birth: 04/12/1987 | **Nationality:** British, Australian, Italian |

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<https://orcid.org/0000-0001-6123-2014>

About me: Scientist, researcher, explorer. A materials science researcher with specialties in graphene and hydrogen storage at the National Research Council of Italy, passionate about developing new technologies for a cleaner and more efficient world. A keen adventurer, I have spent a winter and two summers researching atmospheric physics and meteorology at Concordia Station in Antarctica, and tested materials in zero gravity.

● WORK EXPERIENCE

31/01/2022 – CURRENT – Bologna, Italy

RESEARCHER – NATIONAL RESEARCH COUNCIL OF ITALY

- NanoMatERs research group: responsible for “Synthesis” track and “Photocatalysis” research theme
- Expert in CVD synthesis of graphene and related materials, SEM characterisation
- Additional tasks: preparation and management of grant proposals, publication of scientific articles, presentation at conferences, guest university lectures, and support of Women in STEM projects
- Mentor for Masters and PhD students

01/2020 – 30/01/2022 – Bologna, Italy

RESEARCH FELLOW – NATIONAL RESEARCH COUNCIL OF ITALY (CNR)

Research fellow at CNR-IMM (Institute for Microelectronics and Microsystems) under the project “Production and characterization of nanostructured planar and 3D materials based on graphene” funded by the European Commission-funded project, the “**Graphene Flagship**”. Recognised by the Graphene Flagship for my research insights and achievements in the article, <https://graphene-flagship.eu/graphene/news/spotlight-graphene-for-space-batteries-and-water-splitting-with-meganne-christian/> as well as by the Australian Ambassador to Italy through social media posts on International Women's Day 2021.

Responsible for independent and collaborative research activities including:

- *Synthesis* by Chemical Vapour Deposition (CVD), processing and functionalisation of 2D and 3D graphene and related materials on a variety of conventional and unconventional substrates, including biotemplates. Operation in chemical laboratories and ISO5 to ISO8 cleanrooms.
- *Integration* of graphene and related materials in applications such as solar cells, photocatalysis, batteries, sensors and fuel cells. In particular, development of an anti-icing mask for polar research, and development of graphene coatings to improve the properties of loop heat pipes for the cooling of satellite electronics. Testing of the physics of water evaporation on graphene substrates in microgravity conditions during **parabolic flight** in April 2021.
- *Analysis* of graphene and graphene nanocomposites using Scanning Electron Microscopy (SEM).

Additional activities and achievements:

- Selected for temporary assignment to the **National Antarctic Research Program** (PNRA) as scientist in charge of the atmospheric physics and meteorology observatories at Concordia Station in Antarctica for the XXXVI Italian summer campaign from October 2020 to January 2021.
- In this contract so far, published 4 *articles* in peer-reviewed journals and an *inside cover* in *Advanced Functional Materials* for the review article “Bio-inspired design of graphene-based materials”.

- Scientific divulgation: presented *1 invited talk* at an international conference and *4 invited seminars* for a high school, a university and IMM.

Business or Sector Professional, scientific and technical activities |

Department Institute for Microelectronics and Microsystems |

Address Via Gobetti 101, 40129, Bologna, Italy | **Website** www.bo.imm.cnr.it

10/2018 – 12/2019 – Concordia Station, Antarctica

WINTER-OVER SCIENTIST – NATIONAL RESEARCH COUNCIL OF ITALY

Scientist responsible for the *atmospheric physics and meteorology* projects at the Franco-Italian research base, **Concordia Station in Antarctica** for CNR-ISAC (Institute of Atmospheric Sciences and Climate) under assignment to the **National Antarctic Research Program** (PNRA) for the 15th winter-over. The 13-member crew was completely isolated from February to November 2019.

Specifically, responsible for the projects:

- BSRN (Baseline Surface Radiation Network), including management of the downwelling and upwelling radiometers, sun photometer and ground and sky cameras to study the surface fluxes of solar and thermal radiation
- Routine Meteorological Observatory, including management of weather stations and daily radiosoundings
- Stratospheric Lidar, including management of observatory for the investigation of the optical properties of Polar Stratospheric Clouds by periodic lidar measurements
- LTCPPA (Long term measurements of chemical and physical properties of atmospheric aerosol at Dome C, shared responsibility with glaciologist), including management of instruments for measuring atmospheric aerosol
- FIRLOUDS (Far Infrared Radiative closure experiment for Antarctic Clouds, shared responsibility with electroscience coordinator), including management of a radar, ice-camera and tropospheric lidar to study ice and mixed phase clouds over the Antarctic plateau

All required daily physical interventions as well as software maintenance using Bash, Python and HTML in Linux, Windows and MacOS operating systems.

Additional activities and achievements:

- Undertook training in *firefighting, first aid* and medical interventions, *rescue* at heights and in confined spaces, and *survival* in extreme conditions before and during the expedition.
- Participated in *biomedical research* run by the **European Space Agency**, including the projects ICELAND (Immune and Microbiome Changes in Environments with Limited Antigen Diversity), EFIA (Edema Formation in Antarctica), and SIMSKILL (spaceflight performance analysis using Soyuz-ISS docking simulator and aptitude and motor skills testing), with post-baseline data collection at the European Astronaut Centre in April, 2021.
- Extensively involved in *scientific divulgation* through 70+ videoconferences with schools, conferences, journalists and public events. For example, the podcast interview <https://europeanspodcast.com/episodes/the-most-isolated-place-on-earth> for "The Europeans" (starting at minute 12:00) and the video (in Italian) <https://bit.ly/2MfF1ar>, produced for the news publication, "Il Messaggero".
- Assisted with air traffic control during the summer campaigns before and after the winter-over, liaising with pilots over radio and providing regular weather observations (METAR).

Business or Sector Professional, scientific and technical activities |

Department Institute of Atmospheric Sciences and Climate |

Address Via Gobetti 101, 40129, Bologna, Italy | **Website** <https://www.pnra.aq/>

05/2014 – 11/2018 – Bologna, Italy

RESEARCH FELLOW – NATIONAL RESEARCH COUNCIL OF ITALY

Postdoctoral research grants at CNR-ISOF (Institute of Organic Synthesis and Photoreactivity, 2014-2016) and CNR-IMM (2016-2018) under the projects "Graphene based revolutions in ICT and beyond" and "THINC: Thin-film solar cell based on nanocrystalline silicon and structured backside reflectors" as part of the European Commission-funded "**Graphene Flagship**". Research theme: "Production and microscopical characterization of graphene-based polymer nanocomposites". Research highlights included testing graphene coatings for improving the properties of loop heat pipes for cooling of satellite electronic components in microgravity

conditions during **parabolic flight** in November 2017. For a spotlight on the project, see the video <https://www.youtube.com/watch?v=LKGiDoxIqzw>. It was featured on the front cover and had a story in the Graphene Week 2018 magazine for "Zero Gravity Graphene" <https://graphene-flagship.eu/media/8d8a65236e0686f/graphene-week-2018-magazine.pdf>.

Additional activities and achievements:

- *Co-supervised* two Masters Thesis and two Undergraduate Thesis in Physics students from the University of Bologna.
- Published *19 articles* in peer-reviewed journals and presented at *13 international conferences* including *2 invited talks* and *1 local committee*. Received *1 Best Poster prize*.
- Participated in around 15 Graphene Flagship meetings and lab visits.
- Ambassador for "Graphene Factory" at several international conferences and for "Women in Graphene" on the Graphene Flagship's social media profiles.
- Promoted research careers to high school students on the TV shows "Rai Campus Italia": <http://bit.ly/1UgdQNw> (from minute 11:10) and "Rai Scuola Nautilus".

Business or Sector Professional, scientific and technical activities |

Address Via Gobetti 101, 40129, Bologna, Italy

● EDUCATION AND TRAINING

01/2010 – 02/2014 – Sydney, Australia

DOCTOR OF PHILOSOPHY – University of New South Wales

PhD in Industrial Chemistry, UNSW School of Chemical Engineering, MERLin Group (Materials Energy Research Laboratory in nanoscale) with the scholarships "Australian Postgraduate Award", "Engineering Supplementary Award" and "**UNSW Research Excellence Award**".

Research theme: design, synthesis and advanced characterisation of **nanomaterials for hydrogen storage** applications. Thesis title "Core-shell borohydrides for reversible hydrogen storage". My research was recognised in numerous news articles, including <http://www.abc.net.au/science/articles/2012/08/16/3569478.htm> and is summarised in the video, <http://www.youtube.com/watch?v=A6TOGiv6pi8>.

Additional activities and achievements:

- Coursework: Engineering Postgraduate Research Essentials, Treatment of Analytical Data, Energy Storage and Alternative Generation.
- Published *5 articles* in peer-reviewed journals and presented at *9 international conferences*. Received *2 Best Poster prizes* and *1 Best Oral Presentation prize*.
- Invited and fully-funded as a visiting researcher to Empa (**Swiss Federal Laboratories for Materials Science and Technology**) in Zurich, Switzerland for two months in 2013 for the characterisation of bulk and nano- materials for hydrogen storage by high pressure apparatus and in-situ X-Ray Photoelectron Spectroscopy not available in Australia.
- Assisted in the setup of a multi-million dollar, world-class hydrogen storage research facility at UNSW.

Address UNSW, Sydney, Australia | **Website** <https://www.unsw.edu.au/> | **Level in EQF** EQF level 8 |

National classification AQF Level 10

12/2004 – 12/2009 – Sydney, Australia

BACHELOR OF ENGINEERING IN INDUSTRIAL CHEMISTRY – University of New South Wales

Bachelor of Engineering in the School of Chemical Engineering, with a specialisation in Industrial Chemistry, receiving a final grade of **Honours Class 1 and the University Medal**.

As a "*Co-op Scholar*", undertook three internships at chemical industries:

- 10 weeks at **Sydney Water**, performing literary and experimental research to optimise sewage filtration processes and resolving mechanical problems on the plant.
- 10 weeks at **Siemens Water Technologies**, optimising formulas and packing methods for water filtration membranes, and presenting new methods to managers and general staff.
- 13 months at **BlueScope Steel**, developing new steel coating formulations and investigating problems reported about those already on the market. Published *1 article* in a peer-reviewed journal.

Key subject areas studied:

- Chemistry (Organic; Inorganic; Physical Processes; Polymers; Instrumental Analysis; Industrial and Environmental; Process and Operation)
- Physics, Mathematics, Applied Statistics, Numerical Methods
- Industrial processes (Chemical Industry; Biotechnology; Energy and Mineral Resources; Chemistry, Biochemistry and Microbiology of Foods; Environment and Sustainability; Pharmaceutical Processing)
- Engineering (Engineering Drawing and Solid Modelling; Material and Energy Balances; Fluid Flow; Heat Transfer; Thermodynamics; Reaction Engineering; Process Control; Chemical Engineering Design)

Final year thesis on nanomaterials for hydrogen storage applications entitled "The future of hydrogen storage: size does matter"

Address UNSW, Sydney, Australia | **Website** <https://www.unsw.edu.au/> | **Level in EQF** EQF level 6 |

National classification AQF Level 8

● LANGUAGE SKILLS

Mother tongue(s): **ENGLISH**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ITALIAN	C2	C2	C2	C2	C2
FRENCH	B1	B2	B1	B1	B2
JAPANESE	A2	A2	A2	A2	A2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

● HONOURS AND AWARDS

08/2013

Dean's Award (postgraduate) – UNSW Faculty of Engineering

Awarded for excellence in postgraduate research, AUD3000 prize.

11/2012

National Postgraduate Student Energy Award – Australian Institute of Energy

Awarded for best research project in the "Energy in Society" category.

06/2012

Heinz Harant Award – Arc@UNSW

The most prestigious award offered by the UNSW student organisation, awarded annually for volunteer contributions made to student life at UNSW.

03/2012

Student Service Award – UNSW Faculty of Engineering

Awarded for exceptional and outstanding service to the student community, AUD1000 prize.

05/2010

University Medal in Industrial Chemistry – The University of New South Wales

Awarded for best performance in the Industrial Chemistry degree program.

01/2010

The Era Polymers Prize in Industrial Chemistry – UNSW School of Chemical Engineering

Awarded for best research project in the final year thesis of the Industrial Chemistry program. Thesis entitled "The future of hydrogen storage: size does matter".

03/2008

Dean's Award (undergraduate) – UNSW Faculty of Engineering

Awarded for exceptional performance in years 1-3 of an Engineering degree program. Received in both 2007 and 2008 for Year 2 and Year 3 Industrial Chemistry.

01/2007

The Samos Polymers Prize in Industrial Chemistry – UNSW School of Chemical Engineering

Awarded for the best overall performance in Year 2 Industrial Chemistry.

● **PUBLICATIONS**

Destabilisation of complex hydrides through size effects

Nanoscale (2010) 2, 2587-2590

<https://pubs.rsc.org/en/content/articlehtml/2010/nr/c0nr00418a> – 2010

Oxidation of 4-substituted TEMPO derivatives reveals modifications at the 1- and 4-positions

Organic & Biomolecular Chemistry (2011) 9, 4936-47

<https://pubs.rsc.org/en/content/articlehtml/2011/ob/c1ob05037k> – 2011

Core-shell strategy leading to high reversible hydrogen storage capacity for NaBH₄

ACS Nano (2012) 6, 7739-7751

<https://pubs.acs.org/doi/abs/10.1021/nn3030018> – 2012

Synthesis of core-shell NaBH₄@M (M = Co, Cu, Fe, Ni, Sn) nanoparticles leading to various morphologies and hydrogen storage properties

Chemical Communications (2013) 49, 6794-6796

<https://pubs.rsc.org/en/content/articlehtml/2013/cc/c3cc42815j> – 2013

Nanoconfinement of borohydrides in CuS hollow nanospheres: A new strategy compared to carbon nanotubes

International Journal of Hydrogen Energy (2014) 39, 9339-9349

<https://www.sciencedirect.com/science/article/pii/S0360319914009938> – 2014

An interhemispheric perspective on environment and energy

International Journal of Performability Engineering (2015) 11, 589-603

t.ly/cwcM – 2015

Graphene-based coatings on polymer films for gas barrier applications

Carbon (2015) 96, 503-512

<https://www.sciencedirect.com/science/article/pii/S0008622315303080> - 2015

STEM electron tomography in the Scanning Electron Microscope

Journal of Physics: Conference Series (2015) 644, 012012

<https://iopscience.iop.org/article/10.1088/1742-6596/644/1/012012/meta> - 2015

Supramolecular self-assembly of graphene oxide and metal nanoparticles into stacked multilayers by means of a multitasking protein ring

Nanoscale (2016) 8, 6739-6753

<https://pubs.rsc.org/no/content/articlehtml/2016/nr/c5nr08632a> - 2016

Large area fabrication of self-standing nanoporous graphene-on-PMMA substrate

Materials Letters (2016) 184, 47-51

<https://www.sciencedirect.com/science/article/pii/S0167577X16312393> - 2016

Synthesis of high-density graphene foams using nanoparticle templates

In: Morandi, V., Ottaviano, L. (eds) GraphITA. Carbon Nanostructures. Springer, Cham (2017)

https://link.springer.com/chapter/10.1007/978-3-319-58134-7_14 - 2017

Biomimetic graphene for enhanced interaction with the external membrane of astrocytes

Journal of Materials Chemistry B (2018) 6, 5335-5342

<https://pubs.rsc.org/-/content/articlehtml/2018/tb/c8tb01410h> - 2018

Permeability and Selectivity of PPO/Graphene Composites as Mixed Matrix Membranes for CO₂ Capture and Gas Separation

Polymers (2018) 10, 129

<https://www.mdpi.com/2073-4360/10/2/129> - 2018

Selective Gas Permeation in Graphene Oxide-Polymer Self-Assembled Multilayers

ACS Applied Materials & Interfaces (2018) 10, 11242-11250

<https://pubs.acs.org/doi/abs/10.1021/acsami.8b01103> - 2018

Mechanical and electrical characterization of CVD-grown graphene transferred on chalcogenide Ge₂Sb₂Te₅ layers

Carbon (2018) 132, 141-151

<https://www.sciencedirect.com/science/article/pii/S0008622318301702> - 2018

Controllable, eco-friendly, synthesis of highly crystalline 2D-MoS₂ and clarification of the role of growth-induced strain

2D Materials (2018) 5, 035035

<https://iopscience.iop.org/article/10.1088/2053-1583/aac610/meta> - 2018

Three-dimensional microporous graphene decorated with lithium

Nanotechnology (2018) 29, 405707

<https://iopscience.iop.org/article/10.1088/1361-6528/aad3f5/meta> – 2018

Benchmarking of graphene-based materials: real commercial products vs. ideal graphene

2D Materials (2019) 6, 025006

<https://iopscience.iop.org/article/10.1088/2053-1583/aafc6e/meta> – 2019

Newly developed electrochemical synthesis of Co-based layered double hydroxides: toward noble metal-free electro-catalysis

Journal of Materials Chemistry A (2019) 7, 11241-11249

<https://pubs.rsc.org/--/content/articlehtml/2019/ta/c8ta11812d> – 2019

Dispersion stability and surface morphology study of electrochemically exfoliated bilayer graphene oxide

The Journal of Physical Chemistry C (2019) 123, 15122-15130

<https://pubs.acs.org/doi/abs/10.1021/acs.jpcc.9b03395> – 2019

A robust, modular approach to produce graphene-MOx multilayer foams as electrodes for Li-ion batteries

Nanoscale (2019) 11, 5265-5273

<https://pubs.rsc.org/en/content/articlehtml/2019/nr/c8nr09195a> – 2019

Ni/Al Layered Double Hydroxide and Carbon Nanomaterial Composites for Glucose Sensing

ACS Applied Nano Materials (2019) 2, 143-155

<https://pubs.acs.org/doi/abs/10.1021/acsnm.8b01765> – 2019

Bionic synthesis of a magnetic calcite skeletal structure through living foraminifera

Materials Horizons (2019) 6, 1862-1867

<https://pubs.rsc.org/en/content/articlehtml/2019/mh/c9mh00495e> – 2019

Electrochemical approach for the production of layered double hydroxides with a well-defined Co/Me (III) ratio

Chemistry-A European Journal (2019) 25, 16301-16310

<https://chemistry-europe.onlinelibrary.wiley.com/doi/full/10.1002/chem.201903288> – 2019

Production and processing of graphene and related materials

2D Materials (2020) 7, 022001

<https://iopscience.iop.org/article/10.1088/2053-1583/ab1e0a> – 2020

Bioinspired Design of Graphene-Based Materials

Advanced Functional Materials (2020) 30, 2007458, inside cover

<https://onlinelibrary.wiley.com/doi/full/10.1002/adfm.202007458> – 2020

Electrosynthesis and characterization of Layered Double Hydroxides on different supports

Applied Clay Science (2020) 202, 105949

<https://www.sciencedirect.com/science/article/pii/S0169131720305147> – 2020

Electrosynthesis of Ni/Al layered double hydroxide and reduced graphene oxide composites for the development of hybrid capacitors

Electrochimica Acta (2021) 365, 137294

<https://www.sciencedirect.com/science/article/pii/S001346862031687X> – 2021

An Analysis of the Effect of ZIF-8 Addition on the Separation Properties of Polysulfone at Various Temperatures

Membranes (2021) 11, 427

<https://www.mdpi.com/2077-0375/11/6/427> – 2021

All-Electrochemical Nanofabrication of Stacked Ternary Metal Sulfide/Graphene Electrodes for High-Performance Alkaline Batteries

Small (2022) 18, 2106403

<https://onlinelibrary.wiley.com/doi/full/10.1002/smll.202106403> – 2022

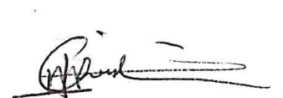
Novel Cu(I)-5-nitropyridine-2-thiol Cluster with NIR Emission: Structural and Photophysical Characterization

Journal of Physical Chemistry C (2022) 126, 10190–10198

<https://pubs.acs.org/doi/full/10.1021/acs.jpcc.2c01842> – 2022

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Munich, 07/09/2022



Meganne Christian