



Postgraduate Summer
School on Green Chemistry
7th-13th July 2018 Venezia



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REPORT

IUPAC Postgraduate Summer School on Green Chemistry 7-13 July 2018 – Venice (Italy)

<http://www.unive.it/greenss2018>

The IUPAC Postgraduate Summer School on Green Chemistry took place in Venice on 7-13 July 2018, one of the most beautiful cities in the world, rich of history and culture, hosted in the prestigious Palazzo Ducale in St. Mark's Square and the historic Cultural Centre Don Orione Artigianelli.

The present edition of the Summer School was managed by **IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD)** (<https://iupac.org/body/041/>) and it was the first one organized under IUPAC umbrella (<https://iupac.org/project/2017-006-2-041>), ideally following 10 previous Summer Schools on Green Chemistry held in Venice from 1998 to 2008 managed by the Interuniversity Consortium Chemistry for the environment (INCA).

Three Alumni of the previous Summer Schools participated in this new edition as teachers:
Prof. Egid Mubofu – Vice Chancellor, University of Dodoma (UDOM), Tanzania
Prof. Rafael Luque – Associate Professor, Universidad de Cordoba, Spain
Prof. Peter Licence – Associate Professor, Nottingham University, UK

The event was proposed by its Chairman, Prof. Pietro Tundo from Ca' Foscari University of Venice, Member of the IUPAC Bureau and Chair of ICGCSD. He managed the event organization together with the Organizing Committee in Venice, composed of Prof. Fabio Aricó, Prof. Andrea Vavasori, from Ca' Foscari University of Venice and the Secretary of the Conference, Ms Elena Griguol.

The Organizing Committee was supported by the Database Manager, Mr Roberto Dallochio from CNR Istituto di Chimica Biomolecolare – Sassari, Italy and the Web Manager Mr Stefano Bonetta from Ca' Foscari University of Venice.

The event was also endorsed by the Italian National Commission for UNESCO, the Superintendence of Archaeology, Fine Arts and Landscape for the City of Venice and Lagoon, the City of Venice, the GREENOMiCS UNESCO/UNITWIN Network.

The School was supported by Cà Foscari University Departments: DAIS Department of Environmental Sciences, Informatics and Statistics and DSMN Department of Molecular Sciences and Nanosystems and sponsored by the platinum sponsors Eni, L'Oréal, PhosAgro and GreeNovator and the sponsors OPCW, the Organization for the Prohibition of the Chemical Weapons and the Smart City project SCN 00520 (HeMaIn).

Main topics of the Summer School were:

- Renewables & Green Energy
- New Reaction Pathways
- Green Materials
- Reaction Media
- Analytical Chemistry & Green Chemistry for Restoration

The Summer School received the endorsement of the European Year of Cultural Heritage 2018 and was listed in the calendar of the events taking place during the year for these celebrations (<http://annoeuropeo2018.beniculturali.it/en/eventi/3025/>).

The choice of Venice as Host city for the Summer School has offered the opportunity to highlight the emerging **connection of Green Chemistry with Cultural Heritage restoration and conservation field**. In fact, Monday 9th July at Palazzo Ducale was especially dedicated to restoration of cultural heritage goods through green chemistry, with the participation of important experts in the field, in collaboration with Venice Superintendence.

68 Selected post-graduated attendees and 30 teachers coming from 38 different countries participated in the Summer School in Venice.

In total, 248 applications arrived, and 35 paying students were considered eligible to attend the school after a thorough selection by the Organizing Committee based on their CVs and list of publications.

205 Scholarship applications were received by January 31st 2018 from students coming from less-advantageous countries. A Scientific Committee composed of 8 IUPAC members selected a first list of 59 applications on merit bases out of the 205 arrived. The first 33 students of the list were awarded with a scholarship to attend the school receiving each €610 from IUPAC, the Platinum Sponsors Eni, L'Oréal, and the sponsor OPCW, the Organization for the Prohibition of the Chemical Weapons.

The Organizing Committee expectations were completely met for the quality of teachers, students and the diversity of participants in terms of their geographical origin and also on their professional affiliations. During the event all of the young academicians could contribute their thoughts and ideas on relevant issues of green chemistry and sustainability, restoration and cultural values conservation, chemical weapons prohibition, innovative pharmaceutical production processes, environmental protection, renewables and much else besides.

The severe selection of the participants contributed to form a class of high cultural level students, who certainly find themselves at a point of their life where they are ready to invest their talents and scientific know-how for their future professional careers in a mature and responsible way. The top-level and diverse range of topics offered for discussion at the Summer School provided them the chance to look around, exchange their scientific knowledge and establish important links with other participants and professors for fruitful joint projects and research activities. This was a real success for this Summer School, since this opportunity will speed up the participants' careers as it occurred in the past. In fact, as far as this 2018 Summer School is concerned, indeed three Alumni who now occupy important positions in their respective countries: Prof. Egid Mubofu, Prof. Rafael Luque and Prof. Peter Licence, came back to the School as teachers.

THE PROGRAMME

SATURDAY 7TH JULY

All the participants were registered and received with a welcome buffet on the Giudecca Island.

SUNDAY 8TH JULY, MORNING, CULTURAL CENTRE DON ORIONE ARTIGIANELLI

OPENING CEREMONY: the ceremony kicked-off with Prof Fabio Aricò's welcome message. Then, the following personalities took the floor: Prof. Stefano Polizzi - on behalf of the Rector of Cà Foscari University of Venice, Prof. Qi-Feng Zhou - IUPAC President, Dr Francesco Trovò – on behalf of the Superintendency of Venice and by Prof. Pietro Tundo – Chair of the IUPAC Postgraduate Summer School on Green Chemistry.

SECOND SESSION - Chairman: Pietro Tundo, University Cà Foscari of Venice, Italy

- Siroj Loikov, *Deputy Director General for International Projects, PhosAgro, Russia*

PhosAgro is a stimulus to progress in green chemistry through the grant programme Green Chemistry for Life

SUNDAY 8TH JULY, AFTERNOON, CULTURAL CENTRE DON ORIONE ARTIGIANELLI

FIRST SESSION - Chairman: Fabio Aricò, University Cà Foscari of Venice, Italy

- Janet L. Scott, *Department of Chemistry, Centre for Doctoral Training in Sustainable Chemical Technologies, University of Bath, UK*

Designing and manufacturing materials with appropriate lifetimes – materials to fit with the circular economy

- Rafael Luque, *Departamento de Química Organica, Universidad de Cordoba, Spain*

Waste-to-wealth: biomass and waste to valuable chemicals, materials and fuels using green chemical technologies

SECOND SESSION - Chairman: Nicholas Gathergood, Tallinn University of Technology, Estonia

- Christopher Brett, *Department of Chemistry, Faculty of Sciences and Technology, University of Coimbra, Portugal*

Electrochemistry and green chemistry: from deep eutectic solvents to corrosion protection

POSTER SESSION: students had the opportunity to expose their posters from the first day

MONDAY 9TH JULY, MORNING, PALAZZO DUCALE

OPENING CEREMONY: The Ceremony opened with the welcome message of the Superintendent Arch. Emanuela Carpani and the introduction speech of Prof. Pietro Tundo. It was chaired by Prof. Christopher Brett, Coimbra University, Portugal

SECOND SESSION - Chairmen: Francesco Trovò from Venice Superintendency and Elisabetta Zendri, University Cà Foscari of Venice, Italy

- Costanza Miliani, *CNR-ISTM (National Council of Research Institute of Molecular Science and Technologies), Perugia, Italy*

Non invasive spectroanalytical methods for a sustainable diagnostic in heritage science

- Rocco Mazzeo, *Full professor of Chemistry for Cultural Heritage and Head the Microchemistry and Microscopy Art Diagnostic Laboratory of the University of Bologna, Italy*

Materials and methods for the conservation of works of art. From current practice towards a green attitude in art conservation: new bio-based organogels for the cleaning of bronzes and paintings

MONDAY 9TH JULY, AFTERNOON, PALAZZO DUCALE

FIRST SESSION - Chairman: Roberto Ballini, University of Camerino, Italy

- Antonio Sansonetti, *Institute for Conservation and valorization of Cultural Heritage National Research Council, Milan*

Green chemistry at the service of Conservation: cleaning artworks with gels

- Pietro Tundo, *Professor of Organic Chemistry, Ca' Foscari University of Venice, Italy*

The Chemistry of Dimethyl Carbonate

SECOND SESSION - Chairman: Egid Mubofu, Vice Chancellor, University of Dodoma (UDOM), Tanzania

- Eugene Rozanov, *PMOD/WRC, IAC ETHZ, KF IZMIRAN, Switzerland*

Is there any danger to ozone layer recovery in the future?

TUESDAY 10TH JULY, MORNING, CULTURAL CENTRE DON ORIONE ARTIGIANELLI

FIRST SESSION – Chairman: Jan Labuda, Slovak University of Technology in Bratislava, Slovakia

- Nicholas Gathergood, *ERA Chair of Green Chemistry, Division of Chemistry, Department of Chemistry and Biotechnology, School of Science, Tallinn University of Technology*

The Design of Safer Chemicals: Are Mineralisable Compounds an Achievable Goal?

- Cinzia Chiappe, *FRSC Department of Pharmacy, University of Pisa, Italy*

Ionic liquids: Twenty years of research to dispel myths and establish facts

SECOND SESSION - Chairman: Rafael Luque, University of Cordoba, Spain

- Alexey Zinin, *UNESCO Chair in Green Chemistry for Sustainable Development Dmitry Mendeleev University of Chemical Technology of Russia*

Ionic Liquids – Green Solvents or Not?

- Roberto Ballini, *University of Camerino, Italy*

One-pot Synthesis of a Variety of Target from Aliphatic Nitro Compounds

TUESDAY 10TH JULY, AFTERNOON, CULTURAL CENTRE DON ORIONE ARTIGIANELLI

FIRST SESSION - Chairman: Howard Colquhoun, University of Reading, UK

- Wolfgang Hoelderich, *TCHK Chemical Technology and Heterogeneous Catalysis, Frankenthal, Germany*

Renewable Feedstocks for Environmentally Friend and Sustainable Chemistry

- Alberto Figoli, *Institute on Membrane Technology (ITM-CNR), Rende (CS), ITALY*

Green Chemistry in Membrane Science and Technology

SECOND SESSION - Chairman: Klaus Kümmerer, University of Lüneburg, Germany - ISC3, Bonn, Germany

- Jan Labuda, *Institute of Analytical Chemistry, Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava, Slovakia*

Approaches of Analytical Chemistry Reflecting Principles of Sustainable Chemistry

POSTER SESSION

WEDNESDAY 11TH JULY, MORNING, CULTURAL CENTRE DON ORIONE ARTIGIANELLI

FIRST SESSION - Chairman: Wolfgang Hoelderich, TCHK Chemical Technology and Heterogeneous Catalysis, Frankenthal, Germany

- Klaus Kümmerer, *Director of the Institute of Sustainable and Environmental Chemistry (University of Lüneburg, Germany) and Scientific Director of Research and Education at the International Sustainable Chemistry Collaborative Centre (ISC3, Bonn, Germany)*

Benign by Design-Designing Materials, Chemicals and Pharmaceuticals for Sustainability

SECOND SESSION - Chairman: Mehmet Mahramanlioglu, İstanbul Üniversitesi, İstanbul, Turkey

- Fabio Aricò, *Associate Professor of Organic Chemistry, Ca' Foscari University of Venice, Italy*

Dialkyl Carbonates and Bio-Based Platform Chemicals

- Egid Mubofu, *Vice Chancellor, University of Dodoma (UDOM), Tanzania*

Standardization for sustainable development

WEDNESDAY 11TH JULY, AFTERNOON

Boat tour of the Venitian Lagoon visiting Burano and Torcello Islands

THURSDAY 12TH JULY, MORNING, PALAZZO DUCALE

FIRST SESSION - Chairman: Pietro Tundo, University Cà Foscari of Venice

A commemoration of the life and work of Prof. Ken Seddon

- Michael Graetzel, *Director of Photonics and Interfaces (LPI), Institute of Chemical Science and Engineering Faculty of Basic Science Ecole Polytechnique Federale de Lausanne, Switzerland*

Light and energy, mesoscopic photosystems mimic photosynthesis

SECOND SESSION - Chairman: Christopher Brett, University of Coimbra, Portugal

- Michel Philippe, *L'OREAL Fellow Sustainable Innovation Manager L'OREAL R&I International Raw Material Department, France*

Green Chemistry to innovate sustainably

THURSDAY 12TH JULY, AFTERNOON, PALAZZO DUCALE

FIRST SESSION - Chairman: Alberto Figoli, Institute on Membrane Technology (ITM-CNR), Rende (CS), ITALY

- Howard Colquhoun, *Chair of Materials Chemistry, Department of Chemistry, University of Reading, UK*
Materials chemistry of the fuel cell: a clean and sustainable energy-technology.

- Mehmet Mahramanlioglu, *İstanbul Üniversitesi Mühendislik Fakültesi Kimya Bölümü – Avcılar – İstanbul, Turkey*

The green approach to energy in Turkey

SECOND SESSION - Chairman: Cinzia Chiappe, University of Pisa, Italy

- Jonathan Forman, *Science Policy Adviser at the Organisation for the Prohibition of Chemical Weapons (OPCW)*

Sustainability and Disarmament: how Green Chemistry Contributes to WMD Security

FRIDAY 13TH JULY, MORNING, PALAZZO DUCALE

FIRST SESSION - Chairmen: Janet Scott, University of Bath, UK and Jonathan Forman, Organisation for the Prohibition of Chemical Weapons (OPCW)

- Giacomo Rispoli, *Executive Vice President of Portfolio Management & Supply and Licensing Department - Eni Refining & Marketin, Italy*

Biorefineries and Green Diesel: process and product innovation

- Massimo Trani, *Vice President for Proprietary Technology Licensing department at Eni, Italy*

Eni Advanced Biofuels

POSTER AWARDING & CLOSING CEREMONY – Chairmen: Christopher Brett, Coimbra University, Portugal and Pietro Tundo, Cà Foscari University of Venice.

During the poster awarding ceremony five participants were prized for their posters and gave an oral presentation on their work. (see below)

POSTER SESSION AND AWARDS

All students had the opportunity to expose their posters at the **poster sessions** on Sunday 8th and Tuesday 10th July at Don Orione Artigianelli. 52 Posters were exposed, and the session can be considered a highlight of the Summer School, for the originality and the high scientific value of the contributions, for the significant number of young people that shared their researches with the other attendees and for the interest demonstrated by the participants.

The best posters were selected by **a scientific jury composed of:** F. Aricò, R. Ballini, C. Brett, C. Chiappe, H. Colquhoun, A. Figoli, N. Gathergood, K. Kiemmerer, J. Labuda, D. Lenoir, R. Luque, E. Mubofu, J. Scott and P. Tundo.

The 5 winners were:

- Francesca Russo, Institute on Membrane Technology (ITM-CNR), Rende (Italy)

Innovative materials for membrane-based Green Chemistry development

- Manuele Musolino, Cà Foscari University of Venice

Silica Sol-Gel Chemistry & Dimethylcarbonate: A Sustainable Approach to Graffiti Removal

- Elena Álvarez González, University of Murcia, Spain

A green bioprocess for the synthesis of flavour esters in Sponge-Like Ionic Liquids

- Susana Nieto Céron, University of Murcia, Spain

Sponge-like ionic liquids as an efficient tool for green chemical processes

- Alexandra Grekova, Borekov Institute of Catalysis, Novosibirsk State University, Russia

The Working Pair "LiCl/Multi-Wall Carbon Nano-Tubes/Pva" - Water for Thermal Energy

During the closing ceremony two students were prized with a parchment by the platinum sponsors Eni and L'Oréal in recognition of their contributions to Green Chemistry correlated to their fields of interest:

Eni's winner: Susana Nieto Ceron, University of Mursia
Sponge-like ionic liquids as an efficient tool for green chemical processes

L'Oréal's winner: Nejib Kasmi, University of Monastir - Tunisia
Synthesis of New Eco-Friendly Copolyesters From Fully Renewable Resources: Poly(ϵ -Caprolactone-Co-Pentylene 2,5-Furandicarboxylate)

UNESCO-UNITWIN

Being the Summer School one of the activities foreseen in the UNESCO-UNITWIN "Green Chemistry Excellence from Baltic Sea to Mediterranean Sea and Beyond GREENOMICS Programme <https://www.eventi.polimi.it/events/unesco-unitwin-network/>, a meeting took place among the Unitwin's members present at the School: Prof. Pietro Tundo, Prof. Nicholas Gathergood, Prof. Klaus Kuemmerer and Prof. Mehmet Mehmet Mahramanlioglu. They discussed on the Summer School outcomes and on the other on-going and future activities carrying out by the GREENOMICS Network to be reported to UNESCO Paris. Dr Jinze Dou from Aalto University – Finland, Dr. Andrea Bernardi and Dr Jiemeng Li from Politecnico of Milano – Italy, participants of the Summer School, were invited to attend the meeting. Also Prof. Alexey Zanin was present as representative of UNESCO Chair in Green Chemistry for Sustainable Development from Dmitry Mendeleev University of Chemical Technology of Russia.

SOCIAL EVENT

The Summer School was not only a great scientific event, as some space and time have been dedicated to social gathering and networking as well.

A social event took place on Wednesday 11th July when all the participants were invited to make a **boat trip around the Venice Lagoon**. Starting from Zattere, on board of a big motor ship the attendees had their lunch and had the opportunity of seeing the city of Venice from the Giudecca Canal, visiting Burano and Torcello Islands. The tour ended with the boat docking at Saint Mark's Square.

NEXT SUMMER SCHOOL IN TANZANIA

The second edition of the Summer School, inspired by the IUPAC Centenary Celebrations, will be held on 12-19 May 2019 hosted by the Department of Chemistry at the University of Dar Es Salaam in Tanzania, Africa. http://www.tcs-tz.org/iupac_summer_school_2019.htm

This first edition could be the first ones of a new series of Summer Schools in Africa.

Venice, July 20th 2018

Chairman: Prof. Pietro Tundo - Ca'Foscari University of Venice.

Secretary of the Conference: Elena Griguol – Ca' Foscari University of Venice.

Organizing Committee - Venice:

Prof. Fabio Arico' - Dipartimento di Scienze Ambientali, Informatica e Statistica, Ca'Foscari University of Venice;

Prof. Andrea Vavasori - Dipartimento di Scienze Molecolari e Nanosistemi, Ca'Foscari University of Venice.

Data Manager: Roberto Dallochio - CNR Istituto di Chimica Biomolecolare – Sassari, Italy.

Web Manager: Stefano Bonetta, University Cà Foscari of Venice.



**Group photo at the conclusion of the Postgraduate Summer School on Green Chemistry:
Friday 13th July 2018, Palazzo Ducale, Venice**