

General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Pietro Tundo Standing Committee Chair



ICGCSD Interdivisional Committee on Green Chemistry for Sustainable Development

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

INTERNATIONAL UNION OF

PURE AND APPLIED CHEMISTRY

Established by the President of IUPAC and the Executive Committee in November 2016, ICGCSD replaces the previous Subcommittee on Green Chemistry - Div III. Its Membership (8 Core-Members only) is enhanced by the participation of all IUPAC Divisions and Standing Committees.



ICGCSD Interdivisional Committee on Green Chemistry for Sustainable Development

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Aims:

To assist in advancing the objectives set out in the Strategic Plan adopted by IUPAC in 2015.

The Interdivisional Committee will initiate, promote, and coordinate the work of the Union in the area of green chemistry for sustainable development.



ICGCSD Terms of Reference:

- advancing IUPAC Strategic Plan for green and sustainable chemistry
- coordinating all the work of IUPAC in this area to develop a coherent programme of action
- initiating and coordinating projects in green and sustainable chemistry
- encouraging activities in these areas from across the Divisions and Standing Committees
- harmonization, regulation and standardization in green and sustainable chemistry

https://iupac.org/wp-content/uploads/2021/05/ICGCSD-Minutes-of-Meeting-22-March-2021.pdf

UPAC INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY			CONTACT	JOIN LOGIN SHOP IYPT 2019
WHO WE ARE	WHAT WE DO	EVENTS	PROJECTS	NEWS
UPAC INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY > WHO WE AR	RE > COMMITTEES > COMMITTEE DETAILS			
WHO WE ARE MEMBER DIRECTORY	INTERDIVISION SUSTAINABLE	INTERDIVISIONAL COMMITTEE ON GREEN CHEMISTRY FOR SUSTAINABLE DEVELOPMENT (ICGCSD) Aims >Description >Subcommittees and Commissions >Meeting Minutes >Activity Reports >Current Projects >Terms of Reference >Terms of Office		
OUR LEADERSHIP SECRETARIAT	>Aims >Description >Sub >Current Projects >Terms of			
OUR HISTORY	Aims To assist in advancing the objectives set out in the Strategic Plan adopted by IUPAC in 2015, this Interdivisional Committee will initiate, promote, and coordinate the work of the Union in the area of green and sustainable chemistry. It supersedes the sub-committee on Green Chemistry (of Division III).			Pietro R. Tundo Standing Committee Secretary Buxing Han
STRATEGIC PLAN ORGANIZATIONAL CHART				
DIVISIONS COMMITTEES EMERITUS FELLOWS GOVERNANCE NATIONS AFFILIATED WITH IUPAC	Description	Description Definition & Statement Subcommittees and Commissions ICGCSD Advisory Board		
	Subcommittees and Co			
	Meeting Minutes Virtual Meeting 22 March 2021 PDF, edited by Aurelia Visa. Virtual Meeting December 2020 PDF, edited by Aurelia Visa. Virtual Meeting October 2020 PDF, edited by Aurelia Visa.			Aurelia Visa Jane Wissinger
				Division Representative Ana Aguiar-Ricardo Jorge L. Colón Alan T. Hutton
	Newsletter March 2020 PDF, edite Attendees of the ICGCSD Conferen	Newsletter March 2020 PDF, edited by Aurelia Visa. Attendees of the ICGCSD Conference Call Jan 2020		
https://iupac.org/who-w	ve-are/committees/co	mmittee-details/?body code	=041	



INTERDIVISIONAL COMMITTEE ON GREEN CHEMISTRY FOR SUSTAINABLE DEVELOPMENT

Standing Committee Chair •<u>Pietro R. Tundo</u>

Standing Committee Secretary •Buxing Han

Titular Member •Jonathan Forman •Klaus Kümmerer •Natalia P. Tarasova

Associate Member

<u>Florent Allais</u>
<u>Aurelia Sorina Visa</u>
<u>Jane Wissinger</u>

- Jorge L. Colón
 - <u>Liliana L. Mammino</u>

Division Representatives

Pierangelo Metrangolo

- <u>Ana Aguiar-Ricardo</u>
- Zoltán Mester
- Nadia Kandile
- <u>Alan T. Hutton</u>



INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

Particular focus of ICGCSD: to deliver the IUPAC goal of "Fostering sustainable development" (IUPAC Mission, Strat. Review, 2014/15) and the UN Sustainable Development Goals SDGs, provide a clear framework for this.

Sustainable Development Through Green Chemistry

Green Chemistry is mandatory to the realization of these goals. ICGCSD seeks to unite chemists, from different sub-disciplines, in multidisciplinary teams to address specific tasks *via* **projects and activities**.



• ICGCSD is already complying with the proposed guidelines, as our side is concerned; that is, there is a need for an effective involvement of the Divisions/Committees/NAOs in our projects

• We already have interdivisional Projects which fit in (Metrics, IUPAC and the 17UNSDGs, Green Industrial Processes, Survey on Green Chemistry Landscape, Green Chemistry in Africa, etc.) and others will follow soon. ICGCSD has established relationships (and in a few cases collaboration) with: UNESCO, OPCW, UNEP, OECD, TWAS, ACS/GCI, EuCheMS, ISC₃ and with *Industry*: PhosAgro and NHU.

Collaborations with International Bodies

- **UNEP**: Preparation of Green and Sustainable Chemistry Manuals for Education and the related Survey.
- **OPCW**: events in collaboration with ICA-ICB Division.
- **ISC3**, Collaboration on Green and Sustainable Chemistry
- **UNESCO/TWAS**, collaboration on the Summer Schools
- **UNESCO/PhosAgro/IUPAC** Partnership on Green Chemistry
- **NHU**: Grants for experienced and young researchers

I U P A C

Statement of ICGCSD on Green Chemistry and IUPAC

While we pay attention to the increasing emission of CO_2 and the increasing number of new chemical compounds that are spreading in the environment, it is difficult to foresee an end to this damaging trend.

Because Nature is not in a hurry but humankind is.

I U P A C

Statement of ICGCSD on Green Chemistry and IUPAC

The Sustainable Development Goals — our shared vision to rescue the planet and build a peaceful world — are gaining global momentum.

Green Chemistry is a powerful tool to move the 2030 Agenda for Sustainable Development forward.

I U P A C

Statement of ICGCSD on Green Chemistry and IUPAC





Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Statement

Green Chemistry and IUPAC

Increasing Importance of Green Chemistry

The concept of Green Chemistry was introduced in 1996. It aims at finding synthesis procedures and chemical products that would prevent pollution and environmental hazards. IUPAC adopted the Green Chemistry concept in the late 1990ies through the "Subcommittee on Green Chemistry", and since 2017 as "Committee on Green Chemistry for Sustainable Development". It is noteworthy that the first world conference on Green Chemistry was sponsored by IUPAC (President Albert Fischli, Venice, September 28th - October 1st, 1997); and that the IUPAC Workshop on Green Chemistry Education was held in Venice on the late September 12-14, 2001.

Meanwhile Green Chemistry has been evolved all over the world. While originally focused on mass-economic and non-toxic synthesis, the term is now used in a wider sense, including environmental degradability, recyclability, chemical waste management and conservation of natural resources. At present, various governments see Green Chemistry as the ideal tool for realising their particular sustainability needs. Different countries have different problems to solve; thus, decision-makers all around the world have high expectations for the science of chemistry, since they believe that their problems can be solved by novel chemical approaches. This is an emergent, positive and unexpected benefit.

The increasing importance and recent development of Green and Sustainable Chemistry cannot be attributed solely to the intuition that the pioneers of the field had 25 years ago, rather is comes from the increasing international agreement and support, which underpins the Green and Sustainable Chemistry concept as an ideal tool for realising green and sustainable principles, and for solving regional problems.

Accordingly, Green Chemistry might be seen as the field in Chemistry which directly responds to the requests of humankind. Green Chemistry is a future-oriented approach to reconcile and foster the research in the chemical sciences with society and its needs.

- -- Increasing Importance of Green Chemistry
- -- Green Chemistry and the Need for Chemical Research
- -- IUPAC and Green Chemistry Education

-- **Co-operations:** A new partnership is necessary among academic, governmental and industrial researchers, to share available knowledge bases and cooperate in the management of sustainable development related issues.

A direct connection and shared responsibilities should be established among IUPAC and Industry for sustainable development to be pursued.

Current Projects

- 2021-001-2-041 Green and Sustainable Chemical Processes
- 2021-012-2-400 <u>Personal Protective Equipment Disposal for the Future</u>
- 2021-010-2-041 <u>Surveying the Green Chemistry Landscape From</u> <u>Research to Policy</u>
- 2021-014-1-041 <u>Summer School on Green Chemistry 2021</u>
- 2021-005-1-041 Green Chemistry in Sub-Saharan Africa
- 2020-011-2-041 <u>Assessment of the Contribution of IUPAC Projects to</u> the Achievement of the United Nations Sustainable Development Goals
- •2020-014-3-050 <u>Systems Thinking in Chemistry for Sustainability:</u> <u>Toward 2030 and Beyond (STCS 2030+)</u>
- •2017-030-2-041 <u>Metrics for Green Syntheses</u>



METRICS FOR GREEN SYNTHESES

Project No.: 2017-030-2-041

Task Group Chair

Pietro R. Tundo

Members

<u>Fabio Aricò</u> James Clark <u>Marco Eissen</u> <u>Dieter Lenoir</u> <u>Peter Licence</u> <u>Nikolay E. Nifantiev</u> <u>David Smith</u> <u>Helen Sneddon</u> <u>Ronald Weir</u>

To develop **Green Metrics** and harmonize the correct application of green metrics analysis in syntheses. **Introduction, Green Metrics, Glossary and Algorithm Database List**

Partners
Physical and Biophysical Chemistry Division
Inorganic Chemistry Division
Organic and Biomolecular Chemistry Division

TECHNICAL REPORT to PAC

Metrics for Green Syntheses

John Andraos, Pietro Tundo, Fabio Aricò, James Clark and Marco Eissen

Introduction

- 1. History
- 2. Increasing Importance of Green Chemistry
- 3. Moving Forward
- 4. The Need of Metrics
- 5. The IUPAC Project "Metrics for Green Syntheses" (# 2017-030-2-041)
- **1.** Algorithm database list. All of them have their literature references
- 2. A List of metrics and related terms taken from papers published in the literature on the subject (formal definition for each term, literature and some example in short).

1. A Glossary, that is, a comprehensive compilation of metrics that are currently used to gauge material, energy, and environmental impact metrics performances for individual reactions and synthesis plans.

Current Projects

 2020-011-2-041 - <u>Assessment of the Contribution of IUPAC Projects to</u> the Achievement of the United Nations Sustainable Development Goals



47th IUPAC CHEMISTRY CONGRESS 7 -12 July, Paris, France

SYMPOSIUM 8.5

CHEMISTRY ADDRESSING THE UN-17 SUSTAINABLE DEVELOPMENT GOALS

(invited lectures and expert panel discussion)

MONDAY 8th JULY

2019

Time: 14:00-18:00

Room: 242 B



ORGANISER:

IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development

Pietro TUNDOOChair ICGCSDII

Christopher BRETTJanet SCOTTIUPAC President ElectSecretary ICGCSD

Fabio ARICÒCSDIUPAC Division VIII



ASSESSMENT OF THE CONTRIBUTION OF IUPAC PROJECTS TO THE ACHIEVEMENT OF THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

Project No.: 2020-011-2-041 Start Date: 01 October 2020

Task Group Chair <u>Pietro R. Tundo</u> - ICGCSD

Members

<u>Ana Aguiar-Ricardo</u> - **Div. IV** lan Apotheker CCE <u>lorge L. Colón</u> –**Div. II** Buxing Han - ICGCSD Peter Hotchkiss - OPCW Nadia Kandile – **Div. VI** Francesca (Fran) M. Kerton - CHEMRAWN Liliana L. Mammino- Div. III <u>Pierangelo Metrangolo</u> – **Div. I** Bipul Behari Saha - COCI Natalia P. Tarasova - ICGCSD Aurelia Sorina Visa - ICGCSD Jane Wissinger - ICGCSD

Impact

Broad IUPAC Division and Committee participation and representation in project outcomes



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Jane Wissinger

Assessment of the Contribution of IUPAC Projects to the

Achievement of the United Nations Sustainable

Development Goals Project no. 2020-011-2-041

Project Update: Aug. 10, 2021 General Assembly Jane E. Wissinger, Pietro Tundo



The International Union of Pure and Applied Chemistry (IUPAC)

PROJECT 2020-011-2-041 OBJECTIVES

- Reflect and disseminate the contributions IUPAC projects have made to achieving the UN SDGs
 - Through knowledge sharing and standards of chemical practice
 - Representation across all divisions and committees
 - Demonstrate IUPAC as major international contributor to the goals



+ 169 Targets

https://iupac.org/who-we-are/



DESCRIPTION

Task 1: Analysis of IUPAC Projects according to IUPAC Committees and Divisions

✓ 264 projects gathered and organized into a spreadsheet (2000-2020)

Task 2/3: Survey of all IUPAC Projects and categorize them according to the SDGs

✓ Interdisciplinary effort from divisions and committee representatives

Committee/Division Task Group Member

• Completed 3 rounds of category assignments

Categorization refined to **PRIMARY** and **SECONDARY** goals

Additional categorization based on SDG targets added



PRIMARY/SECONDARY ASSESSMENTS OF PROJECTS

- 264 Projects reviewed for associated UN SDGs
- 253 Projects categorized according to primary relationship to a UN SDG
 - 12/17 highlighted
- 175 Projects indicated secondary goals related to <u>ONE OR MORE</u> UN SDG and targets
 - 15/17 Goals
- 32 Specific Targets cited
 - SDG 3: Good Health & Well-Being
 - SDG 4: Quality/Sustainability Education
 - SDG 12: Responsible Consumption & Production
 - SDG 17: Partnerships for the Goals





Current Projects

• 2020-014-3-050 - <u>Systems Thinking in Chemistry for Sustainability:</u> <u>Toward 2030 and Beyond (STCS 2030+)</u>



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Aurelia Visa



SYSTEMS THINKING IN CHEMISTRY FOR SUSTAINABILITY: TOWARD 2030 AND BEYOND (STCS 2030+)

Project No.: 2020-014-3-050 Start Date: 01 September 2020 End Date: Cite: <u>https://iupac.org/project/2020-014-3-050</u> Task Group Chair Peter Mahaffy Stephen Matlin Marietjie Potgieter→ CCE Bipul Behari Saha → COCI Aurelia Visa → ICGCSD

Members Jan Apotheker **Amy Cannon Seamus Delaney Alison Flynn Ruby Hansen** Felix M. Ho Tom Holme Klaus Kümmerer **Rachel Mamlok-Naaman** MaryKay Orgill Jean Pelin Michael Seery Vicente Talanquer Jane Wissinger Vivian W. W. Yam Sarah York Vânia G. Zuin



Partners

Three IUPAC standing committees

- 1. Committee on Chemistry Education (CCE)
- 2. Committee on Chemistry and Industry (COCI)
- 3. Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD)

Other organizations

• International Organization for Chemical Sciences in Development (IOCD)

Individuals from organizations

Stockholm Resilience Centre
ACS Green Chemistry Institute

International Year of Basic Sciences for Sustainable Development (IYBSSD 2022)

- Chemistry educators from around the world
- Chemical industry



WG2-Forma

Chemist

Education



Objectives

Highlight and support chemistry education's contributions to strengthening the centrality of chemistry as a **sustainability science**, engaging with IYBSSD 2022 to NG1-Sustainability incorporate Systems Thinking (ST) as a fundamentally important approach to support integrating human needs and science in the service of planetary sustainability.

Formulate recommendations to guide use of ST in **chemistry education**; and establish and maintain for at least the duration of the project a website to facilitate uptake.

Initiate discussions with COCI to explore (a) ways **chemical industry** can contribute to outcomes of the IYBSSD, (b) ways chemical industry views systems thinking and its incorporation into chemistry education, and (c) the potential for mechanisms to increase the capacity of industry to incorporate ST



WG1- Sustainability

IUPAC

IYBSSD 2022 Chemistry

Education

UN SDGs

Planetary Boundaries

AIM- to articulate the strong contribution that chemistry education and practice will make to achieving sustainability.

Progress:

- ✓ Editorial *Journal of Chemical Education*, titled, "Integrating Sustainability into Learning in Chemistry" <u>https://doi.org/10.1021/acs.jchemed.1c00284</u>
- ✓ Systems Thinking in Chemistry for Sustainability: 2030 and Beyond (STCS 2030+)- to be published in *Chemistry International* this Fall
- Two frameworks driving global sustainability efforts can be integrate into curricula:
 - the UN Sustainable Development Goals (UN SDGs)
 - the Planetary Boundaries Framework (King's Centre for Visualization in Science (KCVS); <u>http://www.planetaryboundaries.kcvs.ca/</u>

Chemistry educators have the responsibility to teach the central role chemistry will play in concert with other disciplines, in building a sustainable future for people and the planet

A C INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

P

WG2– Formal Chemistry Education



AIM

Developing a common understanding of systems thinking in chemistry education, outlining basic questions that need to be answered to define:

- What aspects of ST could be integrated in chemistry education?
- > *Why* that integration is important?
- How that integration could be best accomplished?

WG2 has agreed to develop guidelines and resources that help chemistry educators incorporate ST into courses



WG3– Chemical Industry

As STCS 2030+ it is engaging in dialogue with people working in chemistry-related industries



ustry perspectives and needs can help to portant to be included in: nemistry education approaches and curricula

and cross-disciplinary perspectives of chemistry

ways that chemistry engages with other basic sciences in neling efforts in the IYBSSD

Current Projects

 2021-010-2-041 - <u>Surveying the Green Chemistry Landscape From</u> <u>Research to Policy</u>



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Jonathan Forman

Surveying the Green Chemistry Landscape: From Research to Policy Project No.: 2021-010-2-041 € 6,000, 2 years

What Does Green Chemistry Look Like in Practice?



Survey Academia, Industry, Policy Publication and Patent Indicators

Accessible Resources


Finalize Membership Kick-off Meeting: September (TBA)

Current Projects

• 2021-005-1-041 - Green Chemistry in Sub-Saharan Africa



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Liliana Mammino

Project naturepreparation of a collaborative book on GreenChemistry in Sub-Saharan Africa

Project number 2021-005-1-041

Divisions: Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD)

Division III

Task Group Chair Liliana Mammino

MembersNeil Coville, Engida Temechegn, Ekaterina S. LoktevaGloria Obuzor, Natalia P. Tarasova, Pietro R. Tundo

MOTIVATIONS AND OBJECTIVES

- third of a 'tradition' of books considering Sub-Saharan Africa
 - + Green Chemistry in Africa (IUPAC project 2002-018-1-300)
 - Biomass Burning in Sub-Saharan Africa: Chemical Issues
 and Action Outreach (IUPAC Project 2007-025-1-300)
- aims at providing an updated picture of the situation of green chemistry in Sub-Saharan Africa considering crucial contexts and activities:
 - ✦ academia: research and education
 - pre-university instruction: education
 - production activities
 - ✦ legislation
 - + public perceptions and dissemination of information

MAIN STAGES

invitations for contributions

- information about the project is disseminated through suitable mailing lists and through personal contacts
- ✦ authors willing to contribute a chapter prepare an abstract
- feedback on the abstracts and guidelines for chapter preparation are provided to interested authors
- preparation of manuscripts by authors
- review of submitted manuscripts and feedback to authors
 - the feedback often includes recommendations for manuscripts' improvement.
- submission of final (complete) manuscript

Current Projects

• 2021-012-2-400 - Personal Protective Equipment Disposal for the Future



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Ana Aguiar Ricardo



PERSONAL PROTECTIVE EQUIPMENT DISPOSAL FOR THE FUTURE



Objective A "forward facing" project to provide suitable recommendations for the future

General public

- evaluate existing data about the components used in personal protective equipment (PPE)
- propose ways of disposing the waste related to PPE
- to raise awareness about problems related to the use of PPE
 - educational material (a series of videos) and a technical note
 - written recommendations to inform scientists, policy makers and industry



PERSONAL PROTECTIVE EQUIPMENT DISPOSAL FOR THE FUTURE

 Project No.:
 2021-012-2-400

 Start Date:
 21 June 2021

 Cite:
 <u>https://iupac.org/project/2021-012-2-400</u>

The project integrates expertise from Division IV, VI, VII and CCE and ICGCSD to ensure all required expertise is on board. The project will also strengthen ongoing activities in cooperation with OPCW. The outcome will strengthen IUPAC's role in the public image of organic polymers, solving environmental problems, and enhancing quality of life on a global scale.

Partners

- •<u>Chemistry and the Environment Division</u>
- Chemistry and Human Health Division
- •Interdivisional Committee on Green Chemistry for Sustainable
- **Development (ICGCSD)**
- •<u>Committee on Chemistry Education</u>

Task Group Chair Marloes Peeters Michael Walter

Members Ana Aguiar-Ricardo Jan Apotheker Jonathan Forman Hemda Garelick Vladimir Gubala Peter Hotchkiss Nadia Kandile Jan Merna Graeme Moad Jane Wissinger Weiping Wu Cláudio G dos Santos

I. Lifecycle analysis of PPE

Calculations on CO2 excess associated with different masks Effect masks ending up in environment (link to <u>Microplastics project</u>)

II. Non-medical Waste

1) Different Materials for PPE and different requirement

2) Facemask vs faceshield

3) Balancing between safety and effectiveness to costs to masks (countries with limited resources).

4) Effective disposal and clean up of COVID contaminated area and/or materials.

III. Remediation Technologies and Solutions Limiting waste – cradle-to-cradle design

1) Sustainability aspects of different masks, considering things around reusability.

- 2) Face mask production
- 3) Social behaviors around PPE
- 4) New materials to avoid spreading virus

1st Project meeting August 17

Current Projects

• 2021-001-2-041 - Green and Sustainable Chemical Processes



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Pietro Tundo

•2021-001-2-041 - Green and Sustainable Chemical Processes

Objective

This project will involve some big, medium and small chemical companies in the publication of papers dealing with their own chemical processes. The target is to promote the scientific dissemination of knowledge of chemical production from a green and sustainable perspective, under IUPAC impetus and umbrella. NO Greenwashing.

Description

IUPAC cannot afford to report trivial and obsolete examples concerning green manufacturing, but it should report the best and most recent updates on the implementation of green chemistry applications in industrial processes. Pivotal examples on green processes and products from major chemical industries will be reported and effective examples to industries all over the world under IUPAC impetus will be provided. Task Group Chair Pietro R. Tundo

Members

<u>Florent Allais</u> <u>Buxing Han</u> <u>Mary Kirchhoff</u> <u>Klaus Kümmerer</u> <u>Tsuneyuki Yamane</u>



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Natalia Tarasova



ICGCSD PURE AND APPLIED CHEMISTRY

> Interdivisional Committee on Green Chemistry for Sustainable Development

IUPAC Participation in the Jury of the **PhosAgro/UNESCO/IUPAC** Partnership in **Green Chemistry for Life Grant Programme**

INTERNATIONAL UNION OF





RELIABILITY QUALITY INNOVATION



LONG-STANDING PARTNER

TO UNESCO AND IUPAC IN

SCIENCE AND EDUCATION

GLOBAL MINERAL FERTILIZER INDUSTRY LEADER

1

GLOBAL PRODUCER OF HIGH-GRADE PHOSPHATE ROCK

EUROPEAN PRODUCER OF PHOSPHATE-BASED FERTILIZERS

>50 GRADES OF PURE FERTILIZERS
 GLOBAL PRESENCE >100 COUNTRIES

PHOSAGRO CONTRIBUTES TO FOOD SECURITY IN RUSSIA AND WORLDWIDE



The UN Sustainable Development Goals most relevant for PhosAgro

- Goal 2 Zero Hunger: producing nutrients for plants to feed the world
- **Goal 3** Good Health: producing safer and cleaner fertilizers with close to zero contaminant content
- **Goal 12 Responsible Production:** implementing best available technologies to preserve environment

IN 2019, 2020 PHOSAGRO IS RECOGNIZED AS THE UN GLOBAL COMPACT LEAD,

demonstrating ongoing commitment to the United Nations Global Compact and its Ten Principles for responsible business



UN FOOD AND AGRICULTURE ORGANIZATION (FAO)

PhosAgro/FAO project Implementation of Sustainable Soil Management through the Global Soil Laboratory Network and the Soil Doctors programme



SEALNET - Asian Soil Laboratory Network LATSOLAN - Latin American Soil Lab. Network AFRILAB - African Soil Laboratory Network NENA – Near East and North Africa Soil Lab. Network



PHOSAGRO/UNESCO/IUPAC GREEN CHEMISTRY FOR LIFE GRANT PROGRAMME

- PhosAgro/UNESCO/IUPAC grant programme "Green Chemistry for Life" was launched in 2013 by the three partnering organizations – UNESCO, IUPAC and PhosAgro – as a follow-up to the International Year of Chemistry 2011
- Grant programme "Green Chemistry for Life" addresses global challenges focusing on support to promising young scientists specializing in green chemistry
- 7 Years of supporting innovative research projects by young scientists that adhere to the 12 principles of green chemistry: 700+ applications, 40+ grants awarded to researchers from 29 countries



PHOSAGRO/UNESCO/IUPA С **GREEN CHEMISTRY FOR** In Fahuary 2019, The Bareemen Roas Signed to extend "Green Chemistry for Life" programme until the 2022 at UNESCO Headquarters during a ceremony to mark the opening of the International Year of the Periodic Table of Chemical Elements

- This initiative became the first in the history of UNESCO and the entire UN to be implemented on an extra-budgetary basis with funding from a Russian company
- PhosAgro has allocated the total of USD 2,500,000 to support the programme





PHOSAGRO/UNESCO/IUPA

GREEN CHEMISTRY FOR LIFE GRANT PROGRAMME

http://www.unesco.org/new/en/natural-sciences/science-

technology/basic-sciences/chemistry/green-chemistry-for-life/







General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Buxing Han

I U P A C

IUPAC- Zhejiang NHU International Award for Advancements in Green Chemistry

IUPAC- Zhejiang NHU International Award for Advancements in Green Chemistry

Codicil to the Project agreement IUPAC - Zhejiang NHU Award

As agreed by both parties, the project (dated 16 January 2019) covered the biennia of 2018 - 2019, and can be renewed with mutual agreement of IUPAC and NHU.

Both parties agree to renew the project for the biennia of 2020- 2021. Renewal can be made by both parties.

All the terms of initial agreement remain the same.

Soby, Executive Direct On behalt of IUPAC

Signed Cooperation Director fof Zheijang NHU Company, Ltd.

Date: 09 MARCH 2020

Date: 17 March 2020

 \triangleright

Just renewed on March 2020

The Second Awarding Ceremony is now, August 19th, 2021

Three prizes awarded to three young persons, 2.000 US\$ each, who received their Ph.D. degree.

One prize awarded to an experienced chemist, 10.000 US\$) who have made significant contribution to green chemistry



ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

IUPAC- Zhejiang NHU International Award for Advancements in Green Chemistry







Funding: \$20,000 every two years

Main topics: Renewable Feedstocks, Synthetic Routes, Solvents, Green Catalysis, Green Products, Green Energy.

PURE AND APPLIED CHEMISTRY

- > <u>One award</u> is for experienced chemist (1 award, US \$ 10000) who should have made significant contribution to green chemistry.
- **Three awards are young scholars, US** \$ 2000 each. The winners must have received their Ph.D. degree (or equivalent), or completed all Ph.D. requirements including successful defence of the doctoral thesis.
- > The remaining US \$ 4000 for supporting expenses for the winners to participates in the Awarding Ceremony



ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

The Prize was announced in 2018

2019: The 4 winners were awarded 47th IUPAC World Chemistry Congress, Paris, France, July 7-12.

2021: The 4 winners will be awarded during the 48th IUPAC World Chemistry Congress, Montreal, Canada.

In August 19, the winners will present talks at the Workshop of IUPAC Awards and Projects on Green Chemistry , 8:00-11:15 am.



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

Pietro Tundo



ICGCSD Interdivisional Committee on Green Chemistry for Sustainable Development

CHEMRAWN VII Prize for Green Chemistry

- The Prize of USD 5000 is granted to a young investigator (less than 45 years of age) from an emerging region who is actively contributing to research in Green Chemistry.
- The previous four prizes have been awarded to Noureddine Yassaa (Algeria) in 2010, Rashimi Sanghi (India) in 2012, Vania G. Zuin (Brazil) in 2014, and Ali Maleki in 2016 (Iran)
- The 5th 2018 Award was presented at the 8th International Conference on Green Chemistry, Bangkok, Thailand.



ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

CHEMRAWN VII Prize for Green Chemistry 2018, 5th edition

has been awarded to:

INTERNATIONAL UNION OF

PURE AND APPLIED CHEMISTRY

Dr. Mirabbos Hojamberdiev



ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

CHEMRAWN VII Prize for Green Chemistry 2020, 6th edition

INTERNATIONAL UNION OF

PURE AND APPLIED CHEMISTRY

has been awarded to: Hulzhen Liu (China) and Banothile Makhubela (South Africa)

Chemrawn VII Prize on Green Chemistry (7th edition, year 2022) will be awarded in Athens, at the next IUPAC/ICGCSD Green Chemistry Conference.

Relations and/or collaborations with

- **OPCW**, many meetings in The Hague.
- **OECD**, Chemical Program on risk and hazard reduction. Regular Contacts
- **EuChemS** Division on Green and Sustainable Chemistry. Regular Contacts
- ACS/Green Chemistry Institute. Regular Contacts
- ISC3, Germany. Many meetings in presence and by remote
- UNESCO, Small States Developing Countries, SIDS. Cabo Verde Islands Meeting, July 2019
- UNEP, Genève, Switzerland
- UNESCO/TWAS, Trieste, Italy





INTERNATIONAL CONFERENCE ON

GREEN CHEMISTRY CHALLENGING PERSPECTIVES

Venezia (Italy), September 28 - October 1, 1997

Sponsored by the International Union of Pure and Applied Chemistry

Co-sponsored by ACS, EPA and UNESCO

YYYYYYYYY

LOCAL ORGANIZING COMMITTEE

Chairman: Maurizio Selva Mauro Nicolai Stefano Paganelli Alvise Pernsa

Fax. +39-41-5298620 E-mail. inca@unive.it

SECRETARIAT ADDRESS Consorzio Interuniversitario Nazionale "La Chimica per l'Ambiente" Calle Larga S. Marta, 2137 30123 Venezia, Italy Tel. +39-41-5298642

Sergio Faechetti, JRC (Ispra, Italy) Dieter Lenoir, GSF, Germany Tim Lester, Deft Technology and Design, UK Ugo Romano, EniChem, Italy Martin Scholten, TNO, The Netherlands

INTERNATIONAL SCIENTIFIC

Pietro Tundo, University of Venezia CO-CHAIRMAN

Albert E. Fischli, President IUPAC

Tracy C. Williamson, EPA, USA NATIONAL COMMITTEE

CHAIRMAN

Switzerland

COMMITTEE

Paul Anastas, EPA, USA

Joseph J. Breen, ACS, USA

Ivano Bertini, University of Firenze Vittorio Carassiti, University of Ferrara, Salvatore Coluccia, University of Torino Francesco Fringuelli, University of Perugia Giovanni Giovannozzi, University of Viterbo Fernando Montanari, University of Milano Gennaro Russo, University of Napoli Ferruccio Triffirò, University of Bologna



• CHEMICAL PROCESSES: STATE OF THE ART FOR THE ENVIRONMENT

- INHERENTLY SAFE PROCESSES
- INHERENTLY SAFE PRODUCTS
- CATALYSIS AND BIOCATALYSIS

SOLVENTLESS PROCESSES AND ALTERNATIVE SOLVENTS

• RESEARCH POLICIES

Poster of the First International Conference on Green Chemistry (Venice, 1997)

Information is available on the Consortium Home Page:



SEPTEMBER 10-15, 2006 • DRESDEN, GERMANY

FIRST CIRCULAR

IUPAC ICGC-1

1st International IUPAC Conference on Green-Sustainable Chemistry





CALL FOR PAPERS OPENS: January 2, 2010 · CLOSES: April 22, 2010

1st, 2nd and 3rd International IUPAC conferences on Green Chemistry



INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

IUPAC 6th International Conference on Green Chemistry 4-8 September 2016, Venice



https://en.wikipedia.org/wiki/Internation al_Conference_on_Green_Chemistry

The **International IUPAC Conferences on Green Chemistry** (ICGCs) gathered several hundreds scientists, technologists, and experts from all over the world

Chair: **Pietro R. Tundo**


ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

7th IUPAC Conference on Green Chemistry, Moscow - Russia, 2-5 October 2017





ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

8th IUPAC Conference on Green Chemistry, Bangkok -Thailand, September 2018

Chair: Supawan Tantayanon



ICGCSD

Interdivisional Committee on Green Chemistry for Sustainable Development

9th IUPAC International Conference on Green Chemistry Greece, 2020.

Asociation of Greek Chemists with the Hellenic Network on Green Chemistry with cooperation of Chemistry departments of Greek Universities.

Venue: Athens

Time: September – October, 2022.

Chair: Konstantinos Triantafyllidis *Aristotle University of Thessaloniki, Thessaloniki, Greece*





Home

The School

Programme

An example of our interdivisional work: https://www.greenchemistry.school/privacy-e-cookie-policy/

GREEN CHEMISTRY *LIVE AND ONLINE* **POSTGRADUATE SUMMER SCHOOL** 4th-10th July 2021 Venice, Italy

Apply

Sponsors



www.greenchemistry.school

The Summer School **breadth of topics**:

- Benign synthesis routes
- Green catalysis
- Alternative solvents
- Renewable and green raw materials
- Green chemistry for energy
- Clean processes
- Green chemistry education



Tenth Edition of the Summer School on Green Chemistry Cà Dolfin, Cà Foscari University, Venezia, 2008

IUPAC FOR AFRICA

Postgraduate Summer School on Green Chemistry Inspired by IUPAC Centenary and the International Year of the Periodic Table Celebrations 12th - 19th May 2019, Dar es Salaam, Tanzania



Registration open until 30th April 2019: <u>http://www.tcs-tz.org/iupac2019/</u> Abstract Submission deadline – 14th April 2019

INTRODUCTION

The 2019 IUPAC Summer School on Green Chemistry will be held in Tanzania. This is the first time this event is being held in Africa managed by the IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD). The Summer School will be hosted by the University of Dar es Salaam (UDSM). University of Dodoma (UDOM), the Tanzania Bureau of Standards (TBS) and the Government Chemist Laboratory Authority (GCLA) in collaboration with the Tanzania Chemical Society (TCS).

The 2019 Summer school is special in that it will be held during the **100th Anniversary of IUPAC** and further to that, 2019 is the **International Year of the Periodic Table** as declared by United Nation, The event will be held at the University of Dar es Salaam, will provide the participants with an understanding of the latest developments of the concepts and management of green/sustainable chemistry.

SUMMER SCHOOL TOPICS

Basic materials on green chemistry will be covered including state of art topics not limited to Exploitation of Natural Resources, Green Methodologies Chemistry, Green Analysis, Green Synthesis of materials, and Industrial Green Technologies

POSTERS AND ABSTRACTS

All students attending the summer school will be required to present posters. The abstracts for the posters should be submitted through the online registration system. The deadline for submission of abstracts is 14^{th} April 2019. There will be awards for the best posters at the end of the summer school.

CONTACTS AND ENQUIRIES

Contacts and Information

Chairman of Organizing Committee: Prof. Egid B. Mubofu, E-mail- <u>cbmubofu@gmail.com</u>.

Phine- +255 784 538 344

Dr. Kessy F. Kilulya (Secretary) +255 222 410 038 +255 763 369 858 Dr. Clarence A. Mgina (Program Officer) +255 222 410 038 +255 767 547 970 cmgina@yahoo.com, cmgina@udsm.ac.tz

kefidel@gmail.com, kessykilulya@udsm.ac.tz

 Website:
 http://www.tcs-tz.org/iupac_summer_school_2019.htm

 Online Registration:
 http://www.tcs-tz.org/iupac2019/

 Important Deadlines:
 30th April 2019 - Registration

 14th April 2019 - Abstract Submission





Group Picture after the opening ceremony IUPAC Summer School on Green Chemistry Monday 13th May 2019, Dar es Salaam Tanzania





Information: secretariat@gssd-foundation.org



GREEN CHEMISTRY LIVE AND ONLINE POSTGRADUATE SUMMER SCHOOL 4th-10th July 2021

Venice, Italy

GREEN SCIENCES FOR SUSTAINABL DEVELOPMENT

Organizers: Pietro Tundo Chairman Fabio Aricò **Aurelia Visa**

Topics: **Benign synthesis routes Green catalysis Alternative solvents Renewable and green raw materials** Green chemistry for energy Clean processes **Green Chemistry education**

Info at: https://www.gssd-foundation.org

a' Foscar Iniversity

of Venice nt of Environmen **HeMaIn**





INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

www.greenchemistry.school

www.gssd-foundation.org



United Nations Educational, Scientific and

• Network "Green Chemistry Excellence · from the Baltic Sea to Cultural Organization . the Mediterranean Sea and Beyond"

The Summer School was organized and managed by

The Green Sciences for Sustainable Development Foundation, www.gssd-foundation.org

Established in February 2020 and based in Venice.



The 2021 Edition was organized by the

Green Sciences for Sustainable Development Foundation

www.gssd-foundation.org

The Foundation promotes innovation and dissemination, both nationally and internationally, of chemical, physical and environmental sciences, of the disciplines that foster sustainability and of their applications, through the coordination and management of activities and services as laboratories and research centres.











Results from the 12th 2020 Green Chemistry Summer school participants (190 students) by country



130 Students from 39 countries



130 PhD students : 117 PhD students online
13 PhD students onsite
34 outstanding teachers: form all over the world
24 teachers online
10 teachers onsite

13 scientific sessions on 7 topics 8 poster session – 6 online poster sessions -79 posters - 2 in person poster sessions -13 posters

11 Awards: 4 by PhosAgro (500 € each) for in person poster presenters 7 by Jury of the Summer School for online poster presenters



Summer School Award for online poster presenters



Courtesy by GSSD Foundation

190 page Proceedings 104 abstracts from Students just published

Exploitation of renewable resources	27
New reaction pathways	25
Energy saving	5
Food safety	6
Climate Change damages mitigation	27
Education	1
Health	13

https://www.greenchemistry.school/



Comments and Proposals

• This is therefore the right occasion for some proposals and for proper implementation. ICGCSD Projects are truly interdivisional.

• We noticed that sustainable development is mentioned everywhere and the transformation of matter through green processes and products is a priority. These guidelines must be implemented with operational facts; this is a very responsible task which needs practical and effective support form all Divisions/Committees/NAOs.



General Assembly August 10th, 2021

Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

THANK YOU

Pietro Tundo Standing Committee Chair