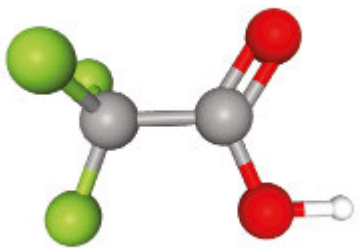
The major outcome of the project will be a Technical Report, with an overview of the terminology employed in the chemical literature on artificial molecular machines, potentially identifying the need for a unified nomenclature, and highlighting differences and similarities with the field of biological molecular machines. The Technical Report to be published in *Pure and Applied Chemistry* will provide the background for a prospective IUPAC Recommendation.

For more information and comment, contact Task Group Chair Carson J. Bruns <carson.bruns@colorado.edu> | https://iupac.org/project/2024-004-2-100/

Terminology and Classification of Per- and Poly-Fluoroalkyl Substances (PFAS)

Per- and poly-fluoroalkyl substances (PFAS) have become an issue of global concern. PFAS are a large and diverse set of compounds with a wide variety of physical, chemical, and toxicological properties. Some PFAS are persistent, bioaccumulate, and are highly toxic, others are not. Many commercially important agrochemicals, pharmaceuticals, polymers, and chlorofluorocarbon (CFC) replacements are PFAS. The European Commission is considering a proposal to ban all PFAS which has led to concerns being raised by industry. Several definitions of PFAS are in use. The European Chemical Agency (ECHA) defines PFAS as "substances containing at least one aliphatic CF2 or CF3 element." The U.S. Environmental Protection Agency defines PFAS as "per- and polyfluorinated substances that structurally contain the unit R–(CF2)–C(F)(R1)R2. Both the CF2 and CF moieties are saturated carbons and none of the R groups (R, R1, or R2) can be hydrogen."

Different definitions of PFAS lead to confusion in technical, regulatory, and public discussions. For example, it has been shown that trifluoroacetic acid (CF3C(O)OH) is a potential degradation product of many agrochemicals, pharmaceuticals, polymers, and CFC replacements. This leads to the question of do these chemicals degrade to give PFAS? Using ECHA definition the answer is "yes," while using the U.S. EPA definition the answer is "no." IUPAC has initiated a project to collect, and critically analyze existing information, providing a rigorous definition for PFAS, and standardizing terminology, classification, and nomenclature. The outcomes will benefit the global scientific, regulatory, and industrial communities, by means of a common terminology and a harmonized communication on PFAS. It will align with the IUPAC mission of providing a common language for chemistry and promoting free exchange of scientific information. These findings are expected to help national and global regulation and policy decisions, by filling information gaps and allowing targeted education campaigns.



Is trifluoroacetic acid a PFAS? (Structure from PUBCHEM)

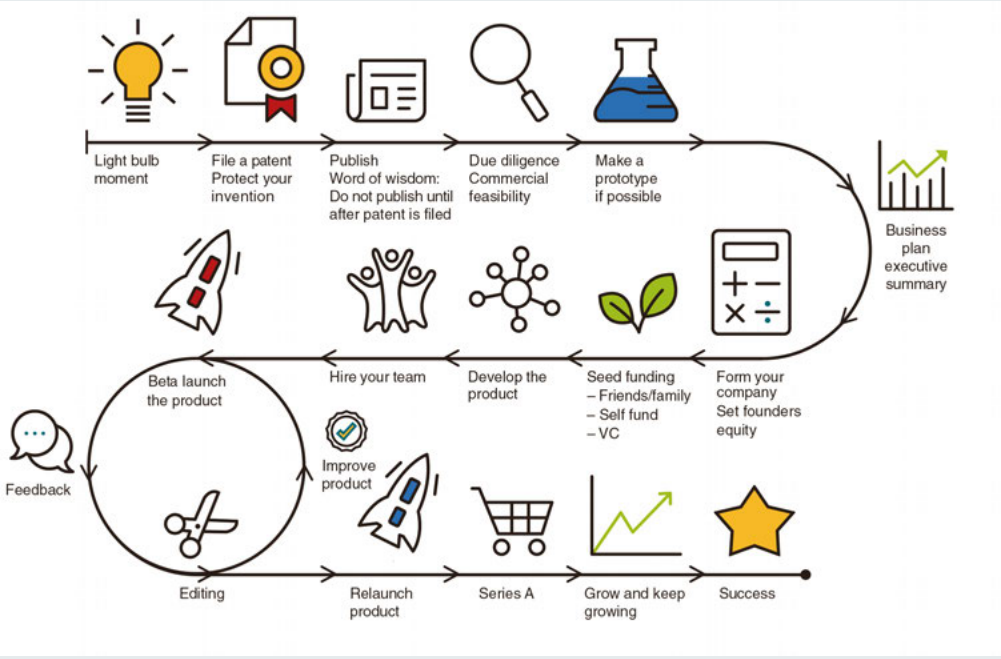
For more information and comment, contact Task Group Chair T. J. Wallington <twalling@umich.edu> or P. Metrangolo <pierangelo.metrangolo@polimi.it> | https://iupac.org/project/2024-006-3-100/

Chemistry Entrepreneurship

The world benefits when the research output of a chemistry student is commercialized to give a useful product. This requires an entrepreneurial mindset and understanding of the requirements of starting and running a business unit. The objective of a project recently initiated by the Committee on Chemistry and Industry is to create awareness about "Chemistry Entrepreneurship" and motivate chemistry students to become entrepreneurs. The project will help create more awareness of the opportunities and challenges in entrepreneurship and build bridges between academia and industry.

To achieve this objective, a series of webinars with successful entrepreneurs sharing their learnings and experiences is being planned. The first of such webinars, **"Catalyzing Chemistry Entrepreneurship"** took place on September 10 and featured Javier García Martínez and was moderated by Miguel Jimenez. The abstract of the main presentation is reproduced on the following pages.

A second webinar titled "**From Lab to Market**" was staged on 22 November and featured Vladimir Gubala, current President of the Chemistry and Human Health Division and Chief Scientific Officer and co-founder of



Steps Involved in the Creation, Growth, and Exit of a Company, duplicated from Frank L. Jaksch, Chapter 1, We Need an Entrepreneurial Culture in Chemistry: Do You Have What It Takes to be a Chemistry Entrepreneur? in Chemistry Entrepreneurship, Wiley-VCH (2022), edited by J. Garcia-Martinez and K. Li.

"Catalyzing Chemistry Entrepreneurship"

by Javier García Martínez

Chemistry is a global endeavor that has greatly contributed to improving our quality of life by protecting us against illness and by putting food and clean water on our table [1]. But now, our global challenges are so big that only if we focus all our efforts in solving our most pressing problems we can create a sustainable and better future for all [2]. From climate change to our dependence on finite natural resources, many of our most global challenges require a technical solution that only better science and technology in general and chemistry in particular can provide [3]. During its almost 100 years of existence, IUPAC has created universally accepted chemistry nomenclature and terminology as well as a global platform to discuss and advance some of the most relevant topics on pure and applied chemistry.

Chemistry education is of particular importance. We must train, engage, and inspire the new generation of young chemists able and committed to building a more sustainable future [4-5]. In order to get there, science education, from primary school to college, needs to be reinvented to put the student at the center of the learning process and provide him or her with the skills needed to become a more complete and creative scientist.

There is still a significant gap between academia and industry that needs to be bridged by bold entrepreneurs able to connect these two worlds and successfully commercialize the new and exciting research carried out in universities. Entrepreneurship is another important part of the equation, taking the discoveries made in the lab to the market place is essential to implementing the solutions we need, and scientists have a key role to play here [6,7]

References:

1. E. Serrano Torregrosa, J. Garcia Martinez, The Chemical Element: Chemistry´s Contributions to our Global Challenges, WILEY-VCH (2011)
2. F. Gomollón-Bel, J García-Martínez, Chemical solutions to the current polycrisis, Angewandte Chemie 135 (25), e202218975 (2023)
3. F. Gomollón-Bel, J García-Martínez, Emerging chemistry technologies for a better world, Nature Chemistry 14 (2), 113-114 (2022)
4. E. Serrano Torregrosa, J. Garcia Martinez, Chemistry Education: Best Practices, Opportunities and Trends, WILEY-VCH (2014)
5. J. Garcia Martinez and P. Atkins, A Perspective on Chemistry Education, Chemistry International, vol. 37, no. 4, 2015, pp. 8-9. https://doi.org/10.1515/ci-2015-0403
6. J. Garcia Martinez, The Third Way: Becoming an Academic Entrepreneur, Science Careers, March 20, 2014
7. E. Li, J. Garcia Martinez, Chemistry Entrepreneurship, WILEY-VCH (2021)

Webinar moderator, **Miguel Jimenez,** is an Assistant Professor at Boston University, where he runs el Microbial Integration Group. The group integrates engineered microorganisms with mechanical and electronic devices for applications in human health, agriculture, the environment, and entertainment. Miguel received his B.A. in Chemistry and Chemical Biology at Harvard University, with Damian Young and Stuart Schreiber as a Herchel Smith Undergraduate Fellow and then received his Ph.D. in Chemistry at Columbia University Virginia Cornish as a National Science Foundation Fellow. Miguel completed his postdoctoral work with Robert Langer at MIT as a Translational Research Institute for Space Health (TRISH) Fellow and was most recently a Research Scientist with Giovanni Traverso at MIT.

PocDoc. PocDoc is a digital health platform developed with the vision of allowing anyone with a smartphone or tablet to test themselves for a range of major diseases or conditions via a fingerprick of blood, receive a full health assessment that puts those results in context and then be offered solutions to address any health-related issues that arise. (https://pocdoc.co/). The interview was conducted by Lene Hviid, Global Key Account Manager Metals, Shell, and member of COCI.

The next webinar will be on 5 February, and discussing "**Not-for-profit and Social Entrepreneurship.**" Presenter Amy Cannon, is Executive Director and Co-Founder of Beyond Benign (https://www.beyondbenign.org/). The organization develops and disseminates green chemistry and sustainable science educational resources that empower educators, students and the community at large to practice sustainability through chemistry. The discussion will be facilitated by Francesca Kerton, from the Memorial University of Newfoundland in Canada, and chair of IUPAC CHEMRAWN.

For more information and comment, contact Task Group Chair Bipul Saha <drbipulsaha@gmail.com> or Hemda Garelick <h.garelick@mdx.ac.uk> | https://iupac.org/project/2023-012-2-022/

Multilingual Encyclopedia Polymer Science—Improving Communication in Science and Education

by Jan Merna and Michael Hess

One of the benchmark documents of the IUPAC Polymer Division (Division IV) is the *Glossary of Basic Terms in Polymer Science* (IUPAC recommendations) [1]. The original document was published in English—the official language of IUPAC—however, there are numerous authorized translations existing, written in Roman characters (Portuguese, Spanish, French, Italian, German, Czech, Polish) and also in special characters, *e.g.* Chinese, Japanese, or Korean. This gave rise to the idea to put together a multilingual encyclopedia giving not only a collection of the most important terms in polymer science translated in as many languages as possible but also provide in the same text the corresponding definitions in a free, on-line available web version. Such Multilingual Encyclopedia project is supported by the Polymer Division as project 2007-008-1-400.

Today, after several years of intense work, a version in the languages simplified and traditional Chinese, Czech, French, German, Hebrew, Italian, Japanese, Malay, Polish, Portuguese, Russian and Spanish is available at https://iupac.org/polymer-edu/multilingual-polymer-glossary/ or https://multilingual.iupac.org.

The database was originally created by the IUPAC working group lead by Claudio dos Santos and hosted on web of Federal University of Ouro Preto. In 2021 the database was redesigned by Petr Čech (University of Chemistry and Technology Prague) and migrated to IUPAC server. Since then, inclusion of languages with special characters has been enabled like Chinese, Hebrew, Russian, and Japanese. It contains 135 basic terms in polymer science in 14 languages (Fig. 1).

The database can be searched by language or terms which can be filtered to the following classes:

- Structure (66 terms)
- Substances (44 terms)
- Reactions (25 terms)

Selecting a term (*e.g.* atactic macromolecule) and a click shows the translation of the term in the languages presently available, and a click on a language displays the complete IUPAC definition as published in *Pure and Applied Chemistry* [1] and the IUPAC Compendium of Polymer Terminology and Nomenclature (The Purple Book) [2].

For another example, choose the term "irregular macromolecule."

Some translations of this example are listed below; additional presented online include Hebrew, Polish, Chinese, Italian, Japanese, Malay.

irregular macromolecule (English)

Macromolecule, the structure of which essentially comprises the repetition of more than one type of constitutional unit, or a macromolecule the structure of which comprises constitutional units not all connected identically with respect to directional sense.

macromolécula irregular (Portugese)

Macromolécula cuja estrutura compreende essencialmente a repetição de mais de uma tipo de unidade constitucional ou uma macromolécula cuja estrutura compreende unidades constitucionais, sendo que nem todas estão conectadas identicamente com relação a um sentido direcional.

macromolécula irregular (Spanish)

Una macromolécula cuya estructura comprende esencialmentela repetición de más de un tipo de unidad constitucional, o una macromolécula cuya estructura