

Report for Council Meeting – GA 2021 about ongoing and planned activities since the GA 2019 Council Meeting in Paris.**Executive Summary**

Division II deals primarily with three subfields, seen as part of the “Inorganic Chemistry” area, and with periodic table issues such as the approval and name-giving process of newly discovered elements. The periodic table issues are essential for the objective “Brand IUPAC in the minds of stakeholders”.

The division initiated contacts with the International Union of Physics, IUPAP, Commission 12 Nuclear Physics (C12) to facilitate future collaborations on approval and name-giving process of newly discovered elements. The two bodies now have a good working relationship. The final version of *On the discovery of new elements Report of the 2017 Joint Working Group of IUPAC and IUPAP*, Project 2017-014-2-200 was published in 2020.

The IUPAC Periodic Table Challenge 2.0 (Project 2020-004-1-050 a follow up from the 2019 International Year of the Periodic Table) went online in June 2020. The division was involved IYPT activities throughout 2019 and PP Reedijk and DP Öhrström were members of the management committee. DP Öhrström was special issue editor for Chemistry International, Issue 4 2019, “Elements of X”, featuring nine essays on the elements in somewhat different setting, from the class room (famous chemistry textbook author professor Peter Atkins) to the Lagos Fashion Week.

A report (Project 2015-039-2-200) on group 3 of the periodic table was published in the January issue of Chemistry International 2021 stating “...there is no objective means to adjudicate between group 3 consisting of Sc, Y, La and Ac or as Sc, Y, Lu and Lr.” The division considers the project closed.

The “Atom” members in our Division are associated with the Commission on Isotopic Abundances and Atomic Weights CIAAW, and its Subcommittee on Isotopic Abundance Measurements. We want to highlight *Atomic Weights of the Elements 2017* to be published soon in Pure and Applied Chemistry. This publication will include the recommended changes to the standard atomic weight of lead from 207.2 ± 0.1 : to [206.14, 207.94], reflecting the occurrence of variations in the atomic weights of lead in normal terrestrial materials. Press release: <https://iupac.org/standard-atomic-weight-of-lead-revised/>.

The ownership of the ciaaw.org domain has been transferred to IUPAC.

The division membership 2020-21 was 17 men and 9 women (officers 2 men, 1 woman) and for 2022-23 it will be 18 men and 10 women (officers 2 men, 1 woman). The upcoming division president Lidia Armelao is the second woman to be DP, the first was the recently deceased Mary L. Good (1931-2019). Number of countries represented is up from 22 in this biennium to 23 in the coming. The geographic diversity is still good with members from western, central and eastern Europe, USA, Canada, Latin America, Africa, Middle East, South East Asia, China, Japan and Australia.

Plans and priorities for the remainder of this biennium, and beyond

We need to stay tuned to the needs of our communities and stakeholders, nationally and internationally. An important task for all members is to identify these needs, and not just within their own special interests, and help initiate IUPAC projects that will keep us relevant and with a high visibility in all areas of inorganic chemistry

The division will resume the production and distribution of its annual Newsletter to keep the union and our stakeholders informed about division activities. Last issue was distributed 2019.

1. Atom: Isotopic Abundances and Atomic Weights

The “Atom” members in our Division have continued to be highly active and productive both inside and outside of IUPAC. These members are closely associated with the Commission on Isotopic Abundances and Atomic Weights CIAAW, and the Subcommittee on Isotopic Abundance Measurements, and most of them are involved in IUPAC projects. CIAAW has a primary role to publish evaluated isotopic compositions of the elements and their atomic weights and to provide technical opinion on related matters.

The CIAAW conducts active dialogue between external organizations and also with the IUPAC. The former is best reflected in the recent Memorandum of Understanding between the IUPAC and the BIPM (International Bureau of Weights and Measures) which explicitly recognizes the work of the CIAAW. In this capacity, members of the CIAAW work closely with the CCQM Isotope Ratio working group in the area of isotope ratio measurement capability and maintenance of isotope delta scales for light elements. Members of the CIAAW are also actively engaged with the Joint Committee on Guides in Metrology where IUPAC is one of the eight member organizations. In addition, the CIAAW formally collaborates with IUPAC Committee on Publications and Cheminformatics Data Standards towards making our work more accessible and transparent in the digital space.

2. Elements and Periodic Table issues

A key strategy is to maintain close connections with the International Union of Physics, IUPAP, and its Commission 12 Nuclear Physics (C12). Interdivisional collaborations with for example the Committee on Chemical Education is important for all issues related to the periodic table.

3. Molecular Inorganic Chemistry: A significant fraction of Division members belongs to the “molecules” area, including coordination chemistry, organometallic chemistry, bioinorganic chemistry, transition metal catalysis and main group chemistry. Nomenclature of inorganic chemistry is primarily covered in Division VIII, although terminology of new classes of compounds is of particular interest to our Division.

4. Solid State Inorganic and Materials Chemistry. The members of this group are associated with the activity of Subcommittee on Materials Chemistry, and with contribution from Solid State High-temperature Materials Chemistry. The Subcommittee on Materials Chemistry is exploring together with Division I ways of expanding the significance of Materials Chemistry with IUPAC and increasing the interaction between IUPAC and the Materials Chemistry user communities.

An overall report of Division/Committee activities and achievements

Our activities are displayed in relation to the unions Goals and Objectives

1. GOALS

1.1 Provide scientific expertise to address critical world needs.

- Variation of lead isotopic composition and atomic weight in terrestrial materials (IUPAC Technical Report) by Xiang-Kun Zhu et al [Oct 2020]. Pure Appl Chem 93, 155-166 (2021)
- Interpretation and use of standard atomic weights (IUPAC Technical Report) by Adriaan van der Veen et al [ASAP, March 2021].
- Project 2019-001-2-100, Preparation of the 5th Edition of the IUPAC Green Book, chaired by J. Frey (IUPAC Div I). Recently the CIAAW has endorsed a symbol for the standard atomic weight, Aro(E), so it can be distinguished from the more general atomic weight, Ar(E). This symbol is in agreement with the guidance of the Green Book and will appear in the TSAW-2019.
- Project 2018-030-2-200, Toward a comprehensive definition of valence, Chair Pavel Karen
- Project 2015-053-1-200, Survey of Definitions and Use of Common Solid-State Chemistry Terminology
- Project No.: 2019-016-3-800 Nomenclature and Associated Terminology for Inorganic Nanoscale Particles
- Gold Book Update of Terms for Inorganic Chemistry Project No.: 2020-022-1-200
- Project 2019-001-2-100, Preparation of the 5th Edition of the IUPAC Green Book. CIAAW has endorsed a symbol for the standard atomic weight, Aro(E), so it can be distinguished from the more general atomic weight, Ar(E).
- The Division is involved in the Interdivisional Subcommittee of the Critical Evaluation of Chemical Data
- After discussions between the task group and the division the final version of On the discovery of new elements (IUPAC/IUPAP Report) Report of the 2017 Joint Working Group of IUPAC and IUPAP, Project No.: 2017-014-2-200 was published online in PAC, August 4, 2020.
- Project 2018-030-2-200 Toward a comprehensive definition of valence, Chair Pavel Karen.
- Project 2015-053-1-200, Survey of Definitions and Use of Common Solid-State Chemistry Terminology delivered an interim report in July 2020.
- Project 2019-016-3-800 Nomenclature and Associated Terminology for Inorganic Nanoscale Particles

- Project 2014-001-2-200, Terminology guidelines and database issues for topology representations in coordination networks, metal-organic frameworks and other crystalline materials
- Project 2011-035-1-800, Terminology and Nomenclature of Inorganic and Coordination Polymer

1.2 Increase the value of our products and services.

- In 2020 the legal ownership of the ciaaw.org domain was transferred to IUPAC (from CIAAW emeritus Dr Ty Coplen). Among others, this allowed ciaaw.org to operate under the secure hypertext transfer protocol ([https](https://)). In addition, operating in the new environment provides CIAAW the ability to host computational facilities from its own server at added cost. The beta release of the IUPAC Molecular Weight Calculator is now accessible from <https://apps.ciaaw.org> and will soon be advertised publicly.
- Project 2019-020-2-024, Machine-Accessible Periodic Table, co-chaired by L. McEwen (IUPAC Committee on Publications and Cheminformatics Data Standards) and J. Meija (CIAAW). The current standard atomic weights, nuclide masses, and isotopic abundances are openly available in a tabular and searchable format on the website of the CIAAW. This joint project between the CIAAW and the CPCDS is to revise the data management practices for ciaaw.org and to also make its data machine readable and richly annotated to enable accurate dissemination in chemical computer systems and to further adhere to the FAIR Data Principles.

1.3 Improve the vitality, effectiveness and efficiency of our Union.

- The division will resume the production and distribution of its annual Newsletter to keep the union and our stakeholders informed about division activities. Last issue was distributed 2019

2. OBJECTIVES

2.1 Brand IUPAC in the minds of stakeholders

- The IUPAC Periodic Table Challenge 2.0 (Project No.: 2020-004-1-050)
- A provisional Report (Project No.: 2015-039-2-200) on *Discussions on Group 3 of The Periodic Table* was published by Eric Scerri in the January 22 issue of *Chemistry International* 2021 (p31-34). It is noted in the very beginning that "...we have concluded that there is no objective means to adjudicate between group 3 consisting of Sc, Y, La and Ac or as Sc, Y, Lu and Lr." Therefore the division do not expect a formal final report in PAC and considers the project closed.
- The division is running a Gold Book Update of Terms for Inorganic Chemistry Project No.: 2020-022-1-200
- The DP and the division have initiated contacts with the IUPAP Commission 12 Nuclear Physics (C12). The C12 Chair Claes Fahlander gave a short presentation via internet at the Division II meeting in Paris, and the DP gave a similar presentation of Division II and the IUPAC Periodic Table activities at the C12 meeting in Glasgow at the end of July. The C12 Chair and the DP meet again at the end February 2020. The DP has also established and met with the incoming C12 chair Ani Aprahamian.

2.2 Improve quality and frequency of communication with stakeholders

-The aforementioned Newsletter and our new relation with C12 of IUPAP. https://iupac.org/wp-content/uploads/2019/01/Div_II_newsletter2018_0104.pdf

2.3 Increase revenue

- We have no explicit actions for increased revenue to report, however, the successful co-location of off-year meetings have significantly reduced expenditure and also increased the attendance of these.

2.4 Expand and retain Member and volunteer base with an emphasis on diversity and inclusion.

- The two recent nominating committees have worked hard on this. The division membership 2020-21 was 35% women and for 2022-23 it will be 36%. The upcoming division president Lidia Armelao is the second woman to be DP, the first was the recently deceased Mary L. Good (1931-2019, DP 1981-1985, the first woman to be IUPAC DP). Number of countries represented is up from 22 in this biennium to 23 in the coming. The geographic diversity is good with members from western (8), central and eastern (1) Europe, USA (2), Canada (1), Latin America (1), Africa (2), Middle East (3), South East Asia (3), China (2), Japan (2) and Australia (1).

- The DP is still working on capitalizing from the 2018 division off-year meeting in Gaborone, Botswana, one of only two such meetings held outside high-income countries in 2018. A report was published in 2019 (L. Öhrström & I. Masesane, Bringing IUPAC to Southern Africa, *Chemistry International* 2019, 41 (2), 38-40).

2.5 Enhance interdivisional interaction and collaboration

- We work since long with Div VIII (i.e. Nomenclature for metallacycles containing transition metals) and CCE (i.e. Periodic table of isotopes, Periodic table challenge) with many successful projects. Many projects touches upon multiple divisions as the Inorganic and coordination polymers (2011-035-1-800) with Div IV and Div VIII. Recently the division has also provided expertise to the Div VI Project 2014-031-3-600, The environmental and health challenges of e-waste and its management: an emerging 21st century global concern.

2.6 Emphasize multidisciplinary projects addressing critical global issues

- The above mentioned e-waste project.

2.7 Support chemistry education, particularly in developing countries

- The IUPAC Periodic Table Challenge 2.0 (Project No.: 2020-004-1-050)

IV. Tabular material. *This should include a list of publications since 2019 relevant to the IUPAC Division/Committee.*

- Zhu, X., Benefield, J., Coplen, T. B., Gao, Z., & Holden, N. E. (2020). Variation of lead isotopic composition and atomic weight in terrestrial materials (IUPAC Technical Report), *Pure and Applied Chemistry* (AOP 1 Oct 2020); <https://doi.org/10.1515/pac-2018-0916>
- Adriaan van der Veen et al, “Interpretation and use of standard atomic weights (IUPAC Technical Report)” *Pure and Applied Chemistry*, (AOP 26 Apr 2021); <https://doi.org/10.1515/pac-2017-1002>
Pure Appl Chem
- Hofmann et al. “On the discovery of new elements” *Pure and Applied Chemistry*, 2020, 92(9), 1387-1446 <https://doi.org/10.1515/pac-2020-2926>
- ‘Purchase, D., Abbasi, G., et al. Global occurrence, chemical properties, and ecological impacts of e-wastes (IUPAC Technical Report)’, by *Pure Appl. Chem.* (2020); <https://doi.org/10.1515/pac-2019-0502>
- Öhrström and Masesane, "Bringing IUPAC to Southern Africa" *Chemistry International*, 2019, 41(2), pp. 38-40. <https://doi.org/10.1515/ci-2019-0215>
- Öhrström ed. special issue “Elements of X” *Chemistry International*, 2019 41(4), <https://www.degruyter.com/journal/key/CI/41/4/html>
- Scerri “Provisional Report on Discussions on Group 3 of The Periodic Table” *Chemistry International*, 2021, 43(1), pp. 31-34. (<https://doi.org/10.1515/ci-2021-0115>; [PDF](#))

Among endorsed conferences we can mention 7th Asian Conference on Coordination Chemistry, 15-18th October 2019 at Putra World Trade Centre (PWTC), Kuala Lumpur, <https://iupac.org/event/7th-asian-coordination-chemistry-conference-acc7/>

Running projects

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|--------------------------------|---|
| 2020-022-1-200 | Gold Book Update of Terms for Inorganic Chemistry |
| 2020-016-3-020 | The Gender Gap in Chemistry – Building on the ISC Gender Gap Project |
| 2020-013-1-200 | Assessment of absolute isotope ratios for the international isotope delta measurement standards |
| 2020-004-1-050 | IUPAC Periodic Table Challenge 2.0 |
| 2019-020-2-024 | Machine-Accessible Periodic Table |
| 2019-024-1-200 | Statistical Models and Data Reductions to Estimate Standard Atomic Weights and Isotopic Ratios for the Elements, and to Evaluate the Associated Uncertainties |
| 2019-016-3-800 | Nomenclature and Associated Terminology for Inorganic Nanoscale Particles |

[2018-030-2-200](#) [Toward a comprehensive definition of valence](#)

[2017-023-2-200](#) [Collection, compilation and evaluation of elemental and isotopic data of calcium carbonate and hydroxyapatite materials](#)

[2017-039-2-800](#) [Graphical Representation of Polymer Structures](#)

[2017-036-2-800](#) [Graphical Representation Standards for Chemical Reaction Diagrams](#)

[2017-030-2-041](#) [Metrics for Green Syntheses](#)

[2017-017-2-200](#) [Evaluated Published Isotope Ratio Data \(2013-2018\)](#)

[2015-053-1-200](#) [Survey of Definitions and Use of Common Solid-State Chemistry Terminology](#)

[2015-039-2-200](#) [The constitution of group 3 of the periodic table](#)

[2015-030-2-200](#) [Assessment of fundamental understanding of isotopic abundances and atomic weights of the chemical elements \(2016-2017\)](#)

[2015-037-2-200](#) [IUPAC Molecular Weight Calculator](#)

[2014-016-2-200](#) [Compilation of the variation of the isotopic composition of the elements via crowdsourcing](#)

[2014-002-1-200](#) [Assessment of Stable Isotopic Reference Materials](#)

[2014-001-2-200](#) [Terminology guidelines and database issues for topology representations in coordination networks, metal-organic frameworks and other crystalline materials](#)

[2013-037-1-200](#) [Creating Educational Website for Materials Chemistry](#)

[2012-036-2-200](#) [Recommendations for Isotope Data in the Geosciences-II](#)

[2011-035-1-800](#) [Terminology and Nomenclature of Inorganic and Coordination Polymer](#)

[2009-046-2-200](#) [Terminology and definition of quantities related to the isotope distribution in elements with more than two stable isotopes](#)