

# INORGANIC CHEMISTRY DIVISION COMMITTEE OF IUPAC

## Minutes of Meeting at Istanbul 9 and 10 August 2013

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**INORGANIC CHEMISTRY DIVISION COMMITTEE OF IUPAC  
Meeting at Istanbul, Turkey August 9 -10, 2013**

**DRAFT MINUTES**

**Attendance:** Present were *President*, Robert Loss (Australia); *Vice President*, Jan Reedijk (Netherlands); *Secretary*, Markku Leskelä (Finland); *Titular Members*: Milan Drabik (Slovakia), Norman Holden (USA), Ken Sakai (Japan), and Lars Öhrström (Sweden); *Associate Members*: Javier Garcia-Martinez (Spain), Adam Kilic (Turkey), Daniel Rabinovich (USA), and *Secretary of Commission on Isotopic Abundances and Atomic Weights*, Juris Meija (Canada), *Newly elected observers (2014-15)*: Thomas Walczyk (TM, Singapore), and Ledda Meesuk (NR, Thailand), and *Young observers*: Robin Macaluso (USA), Brian Korgel (USA), Kemawadee Udomphan (Thailand) and Duangsamorn Morawang (Thailand)

**Apologies** were received from *Titular Members* Pavel Karen (Norway) and Edit Tsuva (Israel), *Associate member* Rose-Noelle Vannier (France) who could not attend.

**1 – Introductions and announcements (R. Loss)**

The meeting commenced at 9:15 a.m. on Friday, Aug. 9, 2013. Div. Pres. Loss welcomed the members who introduced themselves and described their professional affiliations and areas of expertise.

**2 – Presentation and discussion of the Agenda (Loss)**

The previously distributed Agenda was accepted by the meeting with the addition of some issues related to the naming of new elements.

**3 – Approval of Minutes from Division Meeting in Cologne (Leskelä) and status of the action items from the Cologne meeting (Loss)**

Minutes of the Cologne meeting had been distributed in draft form previously and amended according to corrections and comments received from the Division members and distributed by email to the Division members a few weeks before the present meeting. The final copy will also be available on the IUPAC Division II web page. The final version of the Minutes was approved without further change.

The action items from the Cologne meeting were included in the Minutes of that meeting as Appendix 1. All of these items had been addressed by the designated individuals. Öhrström agreed to note the Action Items for the current meeting, which are added in these Minutes as **Appendix 1**.

#### 4- Divisional Cross over meetings

R. Loss gave an overview of the backgrounds for these cross over meeting. In the schedule is first meeting with Div VIII, , and then with Div V. At the end of the day there will be a combined meeting with Divs I and V discussing the proposed new definition of mole.

Possible discussions on cross divisional projects – for example with Div VIII could be:

- The finished project of Öhrström on MOFs: 2009-012-2-200
- The ongoing project on naming of coordination polymers (with Div.IV): 2011-035-1-800
- A project that Div VIII has almost ready: A 4 page flyer on how to name inorganic compounds (2010-055-1-800)
- Update of the INCHI use in Inorganic Chemistry

With Div V:

- An update of the orange book
- Div V interest in our: Evaluation of Radiogenic Abundance Variations in Selected Elements
- Defining of time unit (for example year) in reporting of half-lives of isotopes. A project proposal was made 2012 which was approved but was not yet funded. This project is to be part funded by the International Geological Union and may need support from the Project committee.

The proposed redefinition of kg is to change from a physical one to a non-artifact. What is unclear is what would happen to the mole. This could be a topic of the interdivisional discussion.

#### 5 – Report of IUPAC Bureau and Executive actions (Loss)

The Bureau and Division Presidents met in Frankfurt on April 19, 2013 hosted by the GDCh (German Chemical Society). Loss reviewed the main items that were discussed at this meeting. Short description as follows:

PAC has a new publisher and the new agreement should be economically feasible.

Project money of the Division is close to being fully committed so any new proposals that come in before the end of the year will be forwarded to the project committee for additional funding.

Travel costs are the main item of expenditures and all measures should be taken to keep them as low as possible. Project and other meetings should be organized in connection to conferences and meetings where the participants are travelling anyway.

The IUPAC Web site has been a problem for a long time. Now the problems with servers have been solved and everything should run better. One new idea has been to create an IUPAC Network having links to other relevant organizations.

The Russian Chemical Society has requested that the IUPAC Periodic table be officially named by IUPAC as the D.M. Mendelejev Period Table. One issue is whether IUPAC is even in the business of naming anything and this is being discussed by the IUPAC executive. If IUPAC decides to proceed the IUPAC president is requesting that Div II investigate the matter. Division members favored the present form of the IUPAC Periodic table.

A copy of the Report on Division II that Div. President Loss will present for the 2013 General Assembly is attached to these Minutes as **Appendix 2**.

## **6 - Report from IUPAC Officers – (if present)**

IUPAC treasurer John Corish reviewed the economic situation of IUPAC. Both major income sources: publications and investments have decreased over the last few years. In publications alone the income of several hundred thousand USD is now starting to approach zero. Publishing of both PAC and CI has been outsourced to an experienced publishing company with a new contract guaranteeing an income of at least 100 000 €level which is less than a few years ago, but more than currently.

There is proposed to be a budget cut of about 12% to Divisional budgets for the coming biannual IUPAC budget. The treasurer agreed that he would respond favorably when a request would arrive to not reduce the Division travel for the 2014 meeting, and take more reduction from projects.

## **7- Reports from Other division representatives (CCE, Division VIII Garcia, Reedijk)**

Representatives of Committee for Chemical Education (CCE) (Mei-Hung Chiu, Jan Apotheker) presented the recent news and activities of the commission. Attention was paid to cartoon competition to which all divisions could join. Last year 900 cartoons were received from school student of different levels.

Javier Garcia also presented CCE activities. A 1.4 M\$ (USD) donation aimed for green chemistry (directed from UNESCO) is in progress. The donation has also an educational component. There have been also discussions on closer collaboration with UNESCO. A MoU has been signed.

Chemical Nomenclature and Structure Representation Division (VIII) has projects which may interest Div II:

- Revision and extension of the 1984 recommendations of (single-stranded) metal-based coordination polymers (common with Div IV)
- Basic Guidelines to the Nomenclature of Organic and Inorganic Chemistry
- Nomenclature for metallocycles containing transition metals

### **8- Report from the last elections, list of 2013 Division Members (Reedijk)**

The results from elections have already been announced in the Newsletter and will be confirmed by Council at the GA. We have 10 THs, 6 AMs and 10 NRs. The list of new division members (2014-2015) are listed in **Appendix 3**.

### **9 – Division newsletter status and planning (Reedijk)**

Jan Reedijk presented briefly the content of recent newsletter. It described recent and planned projects, duties of the division members, and memorial inscription from Professor Greenwood. Newsletter also contained short presentations and pictures of new members of Division. Information package content was discussed and the present content was considered useful and informative especially for new members. The next Newsletter will be composed/edited by Lars Öhrström.

### **10 - Review of Division budget allocations and expenditures (Loss)**

R. Loss presented the budget and expenditures of the Division.

Expenditure has successfully been held close to the recommended 30/70 ratio for Administration and Project work. The allocation of any remaining funds to specific projects was deferred to the end of this meeting.

He also explained the IUPAC Sponsored conference support for which conference organizers are required to present a detailed proposal which address specific criteria. The support provided is restricted to IUPAC invited speakers, and distribution of information. Evaluation of the conference proposals is made by division presidents.

### **11- Report from Commission on Isotopic Abundances and Atomic Weights (CIAAW) and its Subcommittees, incl. the relevant Project Reports (Meija, Holden, Loss)**

Juris Meija reported on the recent Commission meeting in Gebze in Turkey five days before the GA. 55 atomic weight related publications for the period 2011-2013 were reviewed during that time. Four elements were recommended to change the atomic weights: Mo, Cd, Se, Th. Commission also recommended the standard value for the natural terrestrial isotope ratio of  $^{238}\text{U}/^{235}\text{U}$ . Commission also resolved to declassify thorium as mononuclidic element based on the recent findings of  $^{230}\text{Th}$  isotope in deep seawaters.

Report of CIAAW is in **Appendix 4**

## **12-Report from the International Subcommittee on Materials Chemistry, ISMC (Leskelä)**

ISMC has been earlier dominated by the Div II people but now the Polymer chemistry division is also active and Chris Ober is the chairman. There are as yet no representatives from Div. III, VIII or industry.

Markku Leskelä highlighted the ISMC meeting held in Cologne and the recent activities. They include projects:

Nanomaterials (Ober/Jones)

Educational web-site (Ober)

In the e-mail discussions the general opinion is that more projects are needed and especially from the inorganic materials chemistry side. On the other hand, ISMC wants to take a more visible role in the WCC 2015 compared to its minimal role in Istanbul.

ISMC had a separate meeting on Aug. 10 and there discussions on the role of ISMC in IUPAC were continued to compile a list of needs and goals of the materials chemistry community, brainstorm possible projects to better meet the needs of this community, and provide recommendations for a plan going forward. The meeting was also attended by a high number of active young observers.

Division II participation in ISMC will change: Javier Garcia resigned, Sanjay Mathur will continue, Markku Leskelä is temporarily participating and Milan Drabik will join in 2014. Young Observer Brian Korgel has agreed act as liaison between Div II and ISMC.

Joint interests in materials chemistry for all material types are: a) nanomaterials; b) hybrid materials; c) interfaces/surfaces. These topics should form the basis for future projects.

## **13. Reports from other IUPAC bodies and Affiliated Organizations**

Markku Leskelä presented the activities of COCI. Since the off-year meeting of COCI held in Toronto, Canada in June 2012, before Div II in Cologne, the activities were reported already. COCI has still focus on regional meetings and new meetings are planned. The on-going projects deal with Life cycle analysis, Responsible care, Public appreciation science, and Feedback from International Year of Chemistry 2011. In Istanbul COCI will have the regular meeting on Sunday Aug. 11, Safety Training Seminar and Workshop on Monday Aug. 12. COCI has been active in organizing WLCM (World Chemistry Leadership Meeting) 2013 meeting the topic of which is Future of Chemistry – IUPAC's role. Members were encouraged to attend if available.

COCI secretary Colin Humphris visited the Division and highlighted also the COCI activities. According to him COCI wants to help IUPAC in working with chemical industry and transmit industry's interest to IUPAC, for example about regulation and safety issues. Chemical regulation worldwide is in COCI's interests. COCI is more like an NGO for UN and WHO.

Norman Holden gave the report on the Interdivisional Committee on Terminology Nomenclature and Symbols. The report is added in **Appendix 5**.

Norman Holden has also made a report to the ICTNS of the Inorganic Chemistry Division Committee which can be found in **Appendix 6**.

Holden reported also on his project collaboration with International Union of Geological Sciences IUGS .

The item on the Systeme International d'Unites, SI – redefinition of mole, was moved to Saturday afternoon to divisional cross over meeting.

#### **14 - Reports on recent and planned Division sponsored conferences (Loss)**

Bob Loss reported on the conditions of IUPAC for sponsoring conferences. IUPAC has clear rules to sponsor or label the conferences as “IUPAC”. IUPAC expects an IUPAC representative to be involved with the opening of the conference and act as an IUPAC lecturer. The financial support is not unspecified cash support towards the budget of the conference but ~20 % goes to support the lecturer and ~80 % to support participation of the young participants. Timeline for applications is generally around 2 years.

Div II has had in the past supported the conference series: High Temperature Materials Conference. This triennial Conference was last held in 2012 in Beijing, China. Unlike in the past, there are currently no Division members who are associated with this Conference. Plans for the next Conference in 2015 are unclear.

The last Workshop on Advanced Materials (WAM) was held in Stellenbosch, South Africa in 2005, and WAM IV was originally planned for 2008; however, these plans fell through and subsequent efforts to revive this series have thus far proved unsuccessful.

Milan Drabik told about IUPAC sponsored the 11<sup>th</sup> Solid State Chemistry conference (SSC 2014) to be held in Trenčianske Teplice, Slovakia, July 6-11, 2014. More information available from <http://www.ssc2014.sav.sk> and mail [ssc2014@savba.sk](mailto:ssc2014@savba.sk)

Brian Korgel told about the 4<sup>th</sup> International Solvothermal hydrothermal association conference to be held in France Oct. 2014. The organizers may ask IUPAC support.

Meeting ended 16.40

Division had a common dinner in Restaurant 360° close to Taksim.

**Saturday Aug. 10**

### **15 –Project-by-project review of project status (Rabinovich)**

R. Loss gave an overview of project numbers and types in all divisions. Rabinovich presented an overview of how the projects are formed and rules for projects as well as submission and approval process.

Consideration and review of project that generate an IUPAC technical report was discussed. The comprehensive procedure is as follows: 15 experts will review the recommendations, then they go to public web-site where everybody can comment them. After that final approval takes place.

Division II has 19 projects from which 8 have been recently completed. The project situation was reviewed. The completed projects are: 2006-16, 2007-29, 2007-31, 2007-38, 2009-012, 2009-025, 2009-029, 2012-47. There are ten on-going projects. Eight projects which are at pending state were discussed. Several projects were recommended for extension and tentatively \$ 12 k were allocated for them. See for details **Appendix 7**.

### **16-Ideas for possible new Projects:**

The following topics were discussed:

- Pedagogical materials for teachers to teach materials chemistry.
- Daniel Rabinovich and collaborators are working on a Periodic Table of Life project. A proposal will be finished during this year.
- Terminology of nanomaterials
- Follow up of the MOF project.
- Definition of valence.

Since the review process will require several months it was recommended that projects be submitted as soon as possible if they wish to be considered by the Project Committee for funding

### **17 – Review of Action items**

The review was made (Appendix 1)

### **18- Status of the next year Division off-year meeting**

Possible places for off-year meeting in order of priority from members at this meeting: ICCS 2014, Singapore, ECHEMS 2014 Istanbul, Gothenburg or Bratislava. Later an inquiry will be made to all TMs and AMs.

## 19. - Other Business

Professor N.N. Greenwood passed away November 2012. Norman Holden told briefly about his career and activity in IUPAC and as Chairman of the Atomic Weight Commission in particular. See **Appendix 8**.

The duties of all division members were reviewed. A representative to ICTNS to succeed Norman Holden was needed – Milan Drabik was proposed.

J. Reedijk thanked the division chair Loss for his great job in leading the Division the last years. He said: “Many thanks indeed for your hard work and leadership over the last 4 years, giving proper attention to the “3 blood groups” in the Division (Atoms, Molecules and Materials), for excellent and to the point communications, for your good discussions, and encouraging Division Members to take up activities, like projects for our Division. I am glad you will available some 2 more years in our Division as Past President, so that we can make use of your experiences and knowledge when needed.”

Loss thanked Norman Holden for his enormous contribution for such a long time service in IUPAC in many roles.

Naming of the elements 117, 118 was discussed in CI. The ending of the names could follow the endings of their Periodic Table groups –ine, -on, respectively.

R. Loss finished the general meeting at 12.45 and thanked the participants for an active meeting.

## 20. Cross over meeting Div II-Div VIII

Attendance: some 14 people (7 from each division):

Items discussed in some details and agreed were:

- a. Projects of interest for both divisions that are now running
- b. Projects in preparation
- c. Future projects

### For a:

1. MOF paper in PAC appeared this week; a subsequent study will follow, when we can use kappa terminology
2. TINCOPS: Ongoing (joint with Div IV)
3. Borane naming (meeting in Istanbul)
4. Metallacycle naming (meeting in Istanbul)
5. INCHI in Inorganic chemistry (the principle was explained briefly by an expert)
6. INCHI handling inorganic names
7. Kappa document (should be ready by end of 2013)
8. 4 page flyer how to name inorganic compounds: soon ready

### For b & c:

1. Central atom determination in Names

2. How to combine kappa and central atoms to make unique PINs
3. Red Book revised: 2019

Reedijk reported that a new Division representative would be needed succeeding him, to attend Div. VIII and maintaining the correspondence. This would imply to leave Div II General Assembly meetings a few times to attend parts of Div VIII meeting. The agenda for it would be adjusted.

### **21. Cross over meeting Div II-Div V**

No one from Div V showed up.

### **22. Meeting about mole**

Attendance: 30+ people from many different divisions and committees.

Discussions were lively, winding and long. In the end three Division chairs will formulate a plan for a project; not to redefine the mole, but rather to describe how IUPAC deals with proposed changes to fundamental definitions of quantities relevant to chemistry.

## Appendix 1

### **Action Items from IUPAC Inorganic Chemistry Division Committee Istanbul, Turkey August 9 - 10, 2013,**

Note on new project proposals for the current budget: Send by end of August to Fabienne Meyers (fabienne@iupac.org) and Daniel Rabinovich (drabinov@uncc.edu).

1. Newsletter items for Öhrström (ohrstrom@chalmers.se) in September 1. [all]
2. Update Information Packet for new Division members [Reedijk, Loss, Öhrström]
3. Contact Kaiser about status of project 2009-046-2-200 [Rabinovich]
4. Contact div. VIII to say that Div. II wants Rabinovich as task group member on *Nomenclature for polyhedral boranes and related compounds* (Beckett 2012-045-1-xxx). [Loss]
5. Contact div. VIII to say that Div. II wants Rabinovich as task group member on *Nomenclature for metallacycles containing transition metals* (Hutton). [Loss]
6. Div. II wants formal part of div. I project *Nomenclature of Crystal Engineering* (Metrangolo) and apologize for not taking action earlier. [Loss]
7. Budget update for projects [Loss, Rabinovich]
8. Off year meeting location and time [Reedijk]

## Appendix 2

### INORGANIC CHEMISTRY DIVISION (II) Report to 47GA Council, Istanbul – August 2013

#### Members (2012-2013)

**President:** R. D. Loss (Australia)

**Past President :** K. Tatsumi (Japan)

**Vice President:** J. Reedijk (The Netherlands)

**Secretary:** M. Leskela (Finland),

**Titular Memebers:** M. Drabik (Slovakia), N. Holden (USA), P. Karen (Norway), S. Mathur (Germany), L. Öhrström (Sweden), K. Sakai (Japan), E. Tshuva (Israel)

**Associate Memebers:** J. Buchweishaija (Tanzania), T. Ding (China), J. Garcia Martinez (Spain), A. Kiliç (Turkey), D. Rabinovick (USA), R-N. Vannier (France)

**National Representatives:** Y. Abdul Aziz (Malaysia), S. Ali (Pakistan), V Chandrsekhar (India) B. Prugovečki, Biserka (Croatia), H. Toma (Brazil) N. Trendafilova (Bulgaria), S. Youngme (Thailand).

\* Commission on Isotopic Abundances and Atomic Weights (II.1), Chairman: W. Brand

\* Subcommittee on Isotopic Abundance Measurements, Chairman: Ronny Schoenberg

\* Subcommittee on Stable Isotope Reference Material Assessment, Chairman: W.

Brand

\* Interdivisional Subcommittee on Materials Chemistry, Chairman: C. Ober,

#### I. Divisional High lights

The Division is currently involved with 20 ongoing projects, and while all have merit, the most significant achievements of the Division during the last biennium have been the outputs associated with four key projects.

The first of these is the *“Atomic weights of the elements 2011”* by Michael E. Wieser, Norman Holden, Tyler B. Coplen, John K. Böhlke, Michael Berglund, Willi A. Brand, Paul De Bièvre, Manfred Gröning, Robert D. Loss, Juris Meija, Takafumi Hirata, Thomas Prohaska, Ronny Schoenberg, Glenda O’Connor, Thomas Walczyk, Shige Yoneda and Xiang Kun Zhu. (IUPAC Technical Report) 2013, Vol. 85, Issue 5, pp. 1047-1078

This biennial review of atomic-weight determinations and other cognate data by the Commission on Isotopic Abundances and Atomic Weights (CIAAW) has resulted in changes for the standard atomic weights of five elements, Br, Ge, In, Mg and Hg. Two of the new atomic weights for elements Br and Mg were assigned new standard atomic weights using intervals reflecting the common occurrence of variations in the atomic weights of those elements in normal terrestrial materials. This brings to 12 the number of elements with atomic weights expressed as intervals. Work continues in this area in projects related to explaining the significance of, and how to work with these atomic weight intervals to the wider chemical community. A review and evaluation of atomic weight and isotopic abundance related literature by CIAAW for the 2012-13 biennium is scheduled prior to the 2013 General Assembly in Istanbul.

The second report is a provisional Technical Recommendation in the area of

Terminology of Metal-Organic Frameworks and Coordination Polymers. This report is the outcome of a project on Coordination polymers and metal organic frameworks: terminology and nomenclature guidelines (2009-012-2-200) led by Division II member Prof Lars Öhrström. The report has been through the rigorous IUAPC review procedure and has been accepted by PAC for publication. The report provides a set of terms, definitions and recommendations for use in the expanding area of classification of coordination polymers, networks and metal-organic frameworks. The outcomes of this project were presented at the "Past, Present and Future of Crystallography@Politecnico di Milano: From Small Molecules to Macromolecules and Supramolecular Structures". This meeting was held in Milan, June 6-7, 2012, as part of the celebrations for the 150th Anniversary of Politecnico di Milano and the 50th Anniversary of Nobel Prize to Giulio Natta.

The third major piece of work sponsored by the Division is the Technical Report from project 2008-040-1-200, titled "Toward Comprehensive Definition of Oxidation State", led by Division II member Prof Pavel Karen. The report is under review but the Division expects it to become a major enhancement on the current definition. The report introduces several novel approaches to oxidation state: Instead of definitory algorithms, there is one single generic definition based on ionic approximation of bonds. For the latter, the team has tested three alternative interpretations: bond polarity, average valence-orbital energy of the isolated atom, and the atom's contribution to the bonding MO. The report also provides a clear set of rules needed for determination of oxidation clearly illustrated with numerous examples.

The final project involves validation of the claims for, and naming of, new elements. Since the last GA the Division has published a 2012 IUPAC recommendation entitled; Names and symbols of the elements with atomic numbers 114 and 116 (Pure Appl. Chem., Vol. 84, No. 7, pp. 1669–1672, 2012; Robert D. Loss and John Corish). A joint IUPAC/IUPAP Working Party continues to consider claims for new elements with atomic numbers in the range 113 to 118 - see IUPAC project 2012-047-1-200. This project is expected to lead to clarification for claims to elements numbered 113, 115, 117 and 118. The joint IUPAC – IUPAP Joint Working Party is expected to report on its deliberations by the end of 2013. The Division would like to acknowledge to contribution of IUPAC Treasurer, Prof Sean Corish, for his assistance with this important work. Even though these new elements have little current applicability, the approval of the naming of new elements is a high visibility activity for IUPAC that attracts significant public attention to the Periodic Table of the Elements and IUPAC.

## **II. Operations : from the perspective of IUPACs long range term goals**

1. IUPAC will provide leadership as a worldwide scientific organization that objectively addresses global issues involving the chemical sciences.

The Division's operations are in the areas of Inorganic Chemistry covering the broad areas of Atoms, Molecules and Materials with the former being effectively subsets of the later. Atoms covers areas such as the names of new elements, and atomic weights and isotopes of the elements. Molecules cover that broad area of inorganic chemistry between atoms and materials chemistry, while Materials Chemistry deals with any inorganic material. In practice the boundary between organic and inorganic materials can be difficult to determine hence the

need for the interdivisional Subcommittee on Materials chemistry, which includes members of both Division II and Division v (Polymers). All three areas address global chemical community needs as will be demonstrated in the following sections.

2. IUPAC will facilitate the advancement of research in the chemical sciences through the tools that it provides for international standardization and scientific discussion.

The Division supports fundamental data evaluation projects that are vital to long term research in the chemical and other sciences. An ongoing major effort in this regard is the work done on Atomic Weights and increasingly on Isotopic Abundances which are fundamental data used by the entire chemical community. These data are also critical in international commerce and trade of chemicals and chemical products. An example of a project in which highly specific data evaluation is being performed is in project 2011-026-1 led by professor Michael Wieser on a "Full calibration of a new molybdenum isotopic reference material." In which a number of laboratories will analyse and assess the isotopic composition of a wide range of Mo samples. No financial support is provided for the costly analytical work but for the cross evaluation of the results from different laboratories to ultimately produce an international quality Mo isotopic standard. National standards laboratories have traditionally undertaken this type of work, but as this is no longer the case the Division believes that IUPAC has a role to play in this ever-increasing need from the chemical community. The danger of this not being taken up by an international organization like IUPAC is a burgeoning number of in house standards that as well as creating additional expense for the chemical community also reduces standardization and unnecessarily complicates communication and chemical understanding

3. IUPAC will assist chemistry-related industry in its contribution to sustainable development, wealth creation, and improvement in the quality of life.

The same fundamental data that the Division provides for international standardization is also used by commerce and industry. The most significant example of this are the latest atomic weights and isotope abundances. Isotopic abundances, which are becoming increasingly important in areas such as legal and provenance cases and in medicinal chemistry.

4. IUPAC will foster communication among individual chemists and scientific organizations, with special emphasis on the needs of chemists in developing countries.

The Division reviews relevant IUPAC sponsored international conferences on the chemical sciences. Through the IUPAC project system the Division strongly supports the inclusion of chemists from as wide a range of countries as possible on project task groups. The Division also publishes a biannual newsletter of its activities, which are distributed to all member country societies and are readily available on the IUPAC website at [http://www.iupac.org/nc/home/about/members-and-committees/db/division-committee.html?tx\\_wfqbe\\_pi1%5Btitle%5D=Inorganic%20Chemistry%20Division&tx\\_wfqbe\\_pi1%5Bpublicid%5D=200](http://www.iupac.org/nc/home/about/members-and-committees/db/division-committee.html?tx_wfqbe_pi1%5Btitle%5D=Inorganic%20Chemistry%20Division&tx_wfqbe_pi1%5Bpublicid%5D=200).

5. IUPAC will utilize its global perspective and network to contribute to the enhancement of chemistry education, the career development of young chemical scientists, and the public appreciation of chemistry.

The Division is working with CCE on the extension of a major project involving the Period Table of the Isotopes for the educational community. (Project number 2007-038-3-200) This project is building on the concept that most elements consist of more than one isotope and that the Atomic weight of some of these elements varies in nature outside that of analytical uncertainty. The project is exploring ways to present this critical chemical representation of real world chemistry and the resulting wealth of applications it provides to many areas of chemistry and related sciences. An example of the work done to promote this project was a recent paper presented by Division member Dr Norman Holden on Educational Outreach involving the Periodic Table of the Isotopes Project during the education session of the International Conference on Nuclear Data for Science and Technology at New York City March 4-8, 2013. This is the first year that this International Conference has included an educational session during its meeting and was a valuable opportunity for the Division to promote IUPAC work outside of its normal constituents.

Another example of divisional engagement is the recent paper by Divisional member and Council member, Prof Javier Garcia who wrote an article in CI about the important role of young scientists in the sustainability debate  
[http://www.iupac.org/publications/ci/2013/3501/1\\_sutherland.html](http://www.iupac.org/publications/ci/2013/3501/1_sutherland.html)

6. IUPAC will broaden its national membership base and will seek the maximum feasible diversity in membership of IUPAC bodies in terms of geography, gender, and age.

The Division actively pursues new members to participate in divisional elections based on merit and diversity, through existing membership and connections, young observer program, and through national adhering organizations. Divisional projects are also reviewed for general diversity of the project task group. This year the Division is for the first time hosting a social gathering of prospective members at the General Assembly.

### 3) State of Projects – as of July 2013

The Division currently has 18 projects (down from 20 in 2012) on its project list. One of these projects is effectively completed, leaving 17 active projects, 8 of which are over time.

In the past 12 months 3 new projects have been funded.

2011-040-1-200 Task group Chair: Willi A. Brand Using intervals instead of fixed values for atomic weights USD 7,400 The outcomes of this project will explain the rationale behind the expressions of intervals and how and when to use the intervals.

2012-047-1-200 Xiang Kun Zhu, Evaluation of published lead isotopic data (1950

– 2013) for a new standard atomic weight of lead. Being a substantial product of the decay of uranium and thorium isotopes, the isotopic composition of lead and its resulting atomic weight is varied in nature. The isotopic composition of lead has also been measured in natural materials many times because it can be used to help determine the ages of formation of minerals and rocks. This project will mine the wealth of isotopic literature available for this element to gain a better overall understanding of the atomic weight of this important element. A major outcome is expected to be a new atomic weight based on intervals. The literature for this element is so vast that its atomic weight could not hope to be reviewed during normal CIAAW operations.

2011-026-1-200 Task Group Chair: Michael Wieser. Full calibration of a new molybdenum isotopic reference material USD 10200. This project has been discussed in section II.2 above

Three proposed projects are in the pipeline and 1 is pending a final decision.

2009-024-1 Holden USD 2500

Reanalysis of uncertainty of atomic masses for the atomic weights of mono-nuclidic elements. The proposal has been reviewed as satisfactory and final approval will be discussed at the GA.

2009-028-1 Ding USD 6000

Compilation and evaluation of isotopic fractionation factors for environmental investigations. This project is still under review.

2009-030-1 Renne USD 4900 from IUPAC and 4900 from IUGS

Recommendations for Isotope Data in Geosciences (extension of project 2006-016-1-200). This project is being held up, awaiting completion of project 2006-016-1-200.

In addition there are 2 Projects co-funded with other divisions

With Division 8: 2012-046-2 Handling of Inorganic compounds for InChI V2.8 Taskgroup Chair Hinnerk Rey, Budget Requested in USD 10000 (Div II contribution is USD2000), Div II representative is Prof Sanjay Mathur

With Division 8: 2012-045-1-800 Nomenclature for Polyhedral Borane and related compounds. Taskgroup Chair Michael Beckett, Budget Requested in USD 7205 (Div II contribution is USD 1000)

Two projects are under review

2012-036-1 Recommendations for Isotope Data in the Geosciences-II Taskgroup. Chair: Igor M. Villa, Date submitted 27 Nov 2012, Budget Requested in USD 9000

2012-016-1 Extension 2007-038-3-200 - Development of an Isotopic Periodic Table for the Educational Community. Taskgroup Chair Norman Holden. Date submitted 11 April 2012, Budget Requested in USD 20650

## List of Current projects

2006-016-1-200:	Recommendations for isotope data in geosciences
2007-029-1-200:	Evaluation of isotopic abundance variations in selected heavier elements
2007-031-1-200:	Evaluated compilation of international reference materials for isotope abundance measurements
2007-038-3-200:	Development of an isotopic periodic table for the educational community
2008-040-1-200:	Towards a comprehensive definition of oxidation state
2009-012-2-200:	Coordination polymers and metal organic frameworks: terminology and nomenclature guidelines
2009-023-1-200:	Evaluation of Radiogenic Abundance Variations in Selected Elements
2009-025-1-200:	Technical Guidelines for Isotope Abundances and Atomic Weight Measurements
2009-026-2-200:	Online evaluated isotope ratio database for user communities (2011-2014)
2009-027-1-200:	Assessment of Stable Isotopic Reference and Inter-Comparison Materials
2009-029-1-200:	Evaluated Published Isotope Ratio Data (2010-2011)
2009-045-1-200:	Guidelines for Measurement of Luminescence Spectra and Quantum Yields of Inorganic Compounds, Metal Complexes and Materials
2009-046-2-200:	Terminology and definition of quantities related to the isotope distribution in elements with more than two stable isotopes
2011-026-1-200:	Full calibration of a new molybdenum isotopic reference material
2011-027-1-200	Evaluated Published Isotope Ratio Data (2012-2013)
2011-028-1-200:	Evaluation of published lead isotopic data (1950 - 2013) for a new standard atomic weight of lead
2011-035-1-800:	Terminology and Nomenclature of Inorganic and Coordination Polymer
2011-040-2-200:	Developing a procedure for using intervals instead of fixed values for atomic weights
2012-047-1-200:	Discovery of Elements with Atomic Numbers greater than 113

## 4) Other Additional Information

### *Passing of Professor Norman Greenwood*

The past biennium marks the passing of Professor Norman Greenwood who passed away on 14 November 2012. Norman was a highly distinguished member of the IUPAC Atomic Weights Commission and served as the Chairman in the 1960s and 1970s. Norman was a Fellow of the Royal Society and a Foreign Member of the French Academy of Sciences and played a key role in establishing the criteria for recognizing the discovery of new elements, which now form an integral part of the IUPAC protocols of the naming of new elements. An obituary from the University of Leeds can be consulted at:

[http://www.leeds.ac.uk/forstaff/news/article/3582/emeritus\\_professor\\_norman\\_greenwood](http://www.leeds.ac.uk/forstaff/news/article/3582/emeritus_professor_norman_greenwood)

#### *Divisional Election of 214-15 members*

The Division is pleased to report the completion of its election for membership for the 2014-15 biennium. I would like to especially thank VP Reedijk and the nomination panel for pushing the elections through in a most efficient and timely manner.

#### *General Divisional Operations*

At the 46<sup>th</sup> GA in Puerto Rico the Division reviewed its operations and based on the request of several newly elected members decided that all divisional member duties (TM and AM) would be more clearly defined and made available on a matrix/table. This was prepared and sent out to all members in late 2011. The Division also has generated a welcome package of information for the new members. This has been updated and distributed to all newly elected members (2012-2013). (Copies are still available for others from the divisional vice president). The response to the use of the duties table and welcome package have been very positive.

#### *Interdivisional Subcommittee on Materials Chemistry*

The Division has substantial representation on the Interdivisional Subcommittee on Materials Chemistry (Current chair is C. Ober, also PP of Polymer Division) which together with Divisions I and IV is exploring ways of expanding the significance of Materials Chemistry with IUPAC and increasing the interaction between IUPAC and the Materials Chemistry user communities. A meeting of this subcommittee was held in Koln following the Division II off year meet in September 2012. Several ideas for projects were developed including a project on development of a Materials Chemistry Education Website.

#### *Off year Meeting – University of Koln – September 2012*

The Division held an off year meeting at the Chemistry Department of the University of Koln. The primary aim of the meeting was to induct new Division members on the operations and projects undertaken by the Division. The meeting also reviewed the progress of all current projects and as well as advancing several prospective projects. The Division would like to thank Prof Sanjay Mathur for making available such excellent facilities and support for the meeting

## **5. Other Significant Issues**

#### *The urgent need for an IUPAC Isotope Sciences Terminology*

During the past two biennia there have been significant difficulties in having recommendations and publications, submitted to PAC by the members of the

Commission on Isotopic Abundances and Atomic Weights, published in a timely manner. The issues involved have recently led to an impasse on several other publications resulting primarily from ICTNS insisting on the use of terminology from the Green Book (Physical Chemistry terminology) . These issues were discussed at a meeting between Division II and ICTNS members in San Juan and led to Division II having additional representation at the Titular membership level with ICTNS. The Division would like to thank the Chair of ICTN, Prof Ron Weir, in helping to resolve this issue.

### Appendix 3

#### Membership of Inorganic Chemistry Division Committee 2014-2015

Name	Status	Term	NAO
Prof. Jan Reedijk	TM – President	2014-2017	Netherlands
Prof. Lars Öhrström	TM – Vice President	2014-2017	Sweden
Prof. Markku Leskelä	TM – Secretary	2012-2015	Finland
Prof. Robert D. Loss	TM – Past President	2014-2015	Australia
Prof. Tiping Ding	TM	2014-2015	China/Beijing
Dr. Milan Drábik	TM-2nd term	2014-2015	Slovakia
Prof. Daniel Rabinovich	TM	2014-2015	United States
Prof. Edit Y. Tshuva	TM-2nd term	2014-2015	Israel
Prof. Thomas R. Walczyk	TM	2014-2015	Singapore
Prof. Michael Wieser	TM	2014-2015	Canada
Dr. Javier García-Martínez	AM-2nd term	2014-2015	Spain
Prof. Pavel Karen	AM	2014-2015	Norway
Dr. Adem Kiliç	AM-2nd term	2014-2015	Turkey
Prof. Rose-Nöelle Vannier	AM-2nd term	2014-2015	France
Dr. Joseph Buchweishaija	AM-2nd term	2014-2015	Tanzania
Prof. Ken Sakai	AM	2014-2015	Japan
Prof. Lidia Armaleo	NR	2014-2015	Italy
Prof. Yang F. Abdul Aziz	NR-2nd term	2014-2015	Malaysia
Prof. Amin Badshah	NR	2014-2015	Pakistan
Prof. V. Chandrasekhar	NR-2nd term	2014-2015	India
Prof. João Galamba	NR	2014-2015	Portugal
Prof. Stepan N. Kalmykov	NR	2014-2015	Russia
Prof. Sanjay Mathur	NR	2014-2015	Germany
Prof. Ladda M. Meesuk	NR	2014-2015	Thailand
Prof. Biserka Prugovečki	NR-2nd term	2014-2015	Croatia
Prof. Natasha Trendafilova	NR-2nd term	2014-2015	Bulgaria

10 TMs, 6 AMs, 10 NRs

AM = Associate Member

NR = National Representative

TM = Titular Member

## Appendix 4

# Report for the IUPAC Inorganic Chemistry Division

## Commission on Isotope Abundances and Atomic Weights

### Report for 2012-2013

The Titular and Associate members, and Observers present at the Commission on Isotope Abundances and Atomic Weights Meeting in Gebze were: W. Brand (Chair, Germany), J. Meija (Secretary, Canada), M. Berglund (Belgium), M. Gröning (Austria), T. Prohaska (Austria), R. Loss (Australia), T. Walczyk (Singapore), N. Holden (USA), P. De Bièvre (Belgium), T.B. Coplen (USA), J. Irrgeher (Austria)

The Commission on Isotopic Abundances and Atomic Weights (CIAAW) met at the Hotel B-Suites in Gebze, Turkey from the 7<sup>th</sup> to the 8<sup>th</sup> of August 2013 under the chairmanship of Dr. Willi A. Brand. In addition, the Subcommittee on Isotopic Abundance Measurements (SIAM) met at the Scientific and Technological Research Council of Turkey from the 4<sup>th</sup> to the 5<sup>th</sup> of August 2013, and the Subcommittee on Natural Assessment of Fundamental Understanding of Isotopes (SNAFU) met on the August 3<sup>rd</sup>.

The increased activity in the isotopic abundance research community necessitated in the Subcommittee on Isotopic Abundance Measurements (SIAM) evaluating 55 peer-reviewed publications over the course of two days, including several publications in the journal *Science*. Of the 55 manuscripts, 15 were recommended for full detailed evaluation by the SIAM. Based on this work, the Commission changed the standard atomic weights of four elements (molybdenum, cadmium, selenium, and thorium) based on recent determinations of isotopic abundances. The case of selenium is of particular interest since the standard atomic weight of selenium has remained unchanged since 1934. The Commission also recommended the standard value for the natural terrestrial isotope ratio of  $^{238}\text{U}/^{235}\text{U}$  based on the recent reports in the scientific literature. The evaluation of recent literature also resulted in the recommendations for the “best measurements” of isotopic abundances for six elements (molybdenum, cadmium, uranium, selenium, thorium, chlorine). The Commission also revised the standard atomic weights of 15 mononuclidic elements based on the recent 2012 atomic mass evaluation by IUPAP. Last but not least, acting on the recommendation of the Subcommittee on Natural Assessment of Fundamental Understanding of Isotopes, the Commission resolved to declassify thorium as mononuclidic element based on the recent findings of  $^{230}\text{Th}$  isotope in deep seawaters. The new standard atomic weights are as follows:

molybdenum: from  $95.96 \pm 0.02$  to  $95.95 \pm 0.01$

cadmium: from  $112.411 \pm 0.008$  to  $112.414 \pm 0.004$

selenium: from  $78.96 \pm 0.03$  to  $78.971 \pm 0.008$

thorium: from  $232.038\ 06 \pm 0.000\ 02$  to  $232.0377 \pm 0.0004$

beryllium: from  $9.012\ 182 \pm 0.000\ 003$  to  $9.012\ 1831 \pm 0.000\ 0005$

fluorine: from  $18.998\ 4032 \pm 0.000\ 0005$  to  $18.998\ 403\ 163 \pm 0.000\ 000\ 006$

aluminium: from  $26.981\ 5386 \pm 0.000\ 0008$  to  $26.981\ 5385 \pm 0.000\ 0007$

phosphorus: from  $30.973\ 762 \pm 0.000\ 002$  to  $30.973\ 761\ 998 \pm 0.000\ 000\ 005$

scandium: from  $44.955\ 912 \pm 0.000\ 006$  to  $44.955\ 908 \pm 0.000\ 005$

manganese: from  $54.938\ 045 \pm 0.000\ 005$  to  $54.938\ 044 \pm 0.000\ 003$

cobalt: from  $58.933\ 195 \pm 0.000\ 005$  to  $58.933\ 194 \pm 0.000\ 004$   
 arsenic: from  $74.921\ 60 \pm 0.000\ 02$  to  $74.921\ 595 \pm 0.000\ 006$   
 yttrium: from  $88.905\ 85 \pm 0.000\ 02$  to  $88.905\ 84 \pm 0.000\ 02$   
 niobium: from  $92.906\ 38 \pm 0.000\ 02$  to  $92.906\ 37 \pm 0.000\ 02$   
 caesium: from  $132.905\ 4519 \pm 0.000\ 0002$  to  $132.905\ 451\ 96 \pm 0.000\ 000\ 06$   
 praseodymium: from  $140.907\ 65 \pm 0.000\ 02$  to  $140.907\ 66 \pm 0.000\ 02$   
 holmium: from  $164.930\ 32 \pm 0.000\ 02$  to  $164.930\ 33 \pm 0.000\ 02$   
 thulium: from  $168.934\ 21 \pm 0.000\ 02$  to  $168.934\ 22 \pm 0.000\ 02$   
 gold: from  $196.966\ 569 \pm 0.000\ 004$  to  $196.966\ 569 \pm 0.000\ 005$

The natural terrestrial isotope amount ratio  $N(^{238}\text{U})/N(^{235}\text{U}) = 137.8 \pm 0.1$

These changes in the atomic weights will be published in a new Table of Standard Atomic Weights 2013, which will be submitted for publication in Pure and Applied Chemistry by the end of 2013.

The Subcommittee for Natural Assessment of Fundamental Understanding (SNAFU) presented work being done to assist users in the use of the new atomic weight intervals and accompanying figures. The Commission recognized that education of the user community is essential for future understanding of the atomic weight intervals, which reflect the fact that atomic weights are not constants in Nature.

#### **Commission Members 2014 - 2015:**

##### (a) Titular Members

Dr. J. Meija (Chair)  
 Dr. T. Prohaska (Secretary)  
 Dr. W. A. Brand  
 Dr. M. Gröning  
 Dr. R. Schönberg  
 Dr. X.-K. Zhu

##### (b) Associate Members:

Dr. T. Hirata  
 Dr. J. Vogl  
 J. Irrgeher

##### (c) National representatives:

Dr. Tyler B. Coplen (USA)  
 Dr. Paul De Bièvre (Belgium)

##### (d) Membership of subcommittees:

###### *1. Subcommittee on Isotopic Abundance Measurements*

Dr. Robert D. Loss  
 Dr. John Karl Böhlke  
 Dr. Willi Brand  
 Dr. Tyler B. Coplen  
 Dr. Paul De Bièvre  
 Dr. Tipping Ding  
 Dr. Manfred Gröning (Secretary)  
 Dr. Takafumi Hirata

Dr. Norman E. Holden  
Dr. Juris Meija  
Dr. Thomas Prohaska  
Dr. Ronny Schönberg (Chair)  
Dr. Thomas Walczyk  
Dr. Michael Wieser  
Dr. Shigeku Yoneda  
Dr. Xiang Kun Zhu  
Dr. Jochen Vogl  
Johanna Irrgeher

*2. Subcommittee on Natural Assessment of Fundamental Understanding of Isotopes*

The purpose of this Subcommittee is to promote and provide educational materials on the significance and use of Isotope Abundances and Atomic Weights.

Dr. John Karl Böhlke  
Dr. Tyler B. Coplen  
Dr. Paul De Bièvre  
Dr. Norman E. Holden (Chair)  
Dr. Michael Wieser

*3. Subcommittee on Stable Isotope Reference Material Assessment*

Dr. John Karl Böhlke  
Dr. Willi Brand  
Dr. Tyler B. Coplen  
Dr. Tiping Ding  
Dr. Manfred Gröning (Chair)  
Dr. Thomas Prohaska  
Dr. Ronny Schönberg  
Dr. Jochen Vogl  
Dr. Robert Vocke  
Dr. Thomas Walczyk  
Dr. Lu Yang

Juris Meija

Secretary, IUPAC Commission on Isotopic Abundances and Atomic Weights

## Appendix 5

### ICTNS, Interdivisional Committee on Terminology, Nomenclature and Symbols Report

Norman E. Holden

ICTNS held an off-year meeting in Lisbon, Portugal on May 5, 6, 2012. Attendees were three members of Division VIII, representatives of BIPM, Commission I.1 and II.1 and the chairman.

The chairman commented on the President's report at the IUPAC Bureau meeting of April 13, 15, 2012. The President was concerned that IUPAC was rather disconnected to the ITC-2011 event and noted that each Division was required to report to the Bureau.

Division I report – the abridged version of the Green Book (GB) was to be published in 2012. The Commission I.1 chairman commented that 2013 was a more realistic date. The chairman commented that we want a system where people can access the latest GB version (on-line searchable PDF). There is no continuously updated on-line version. The latest version is always the latest printed version. Preparing a constantly updated version of the complete PDF would destroy the possibility that a publisher would agree to print a hard-copy version of the document.

There was a discussion of the old IUPAC webpage versus the new one. Many items on the old site are not found on the new site. Searching the GB on the internet, usually points to the 2<sup>nd</sup> edition, even though the third printing of the third edition (2007, 2009, 2011) is available.

Division V report – questions and objections on the new definition of the mole were raised by Division V. The current arguments about the mole are the following:

1. Keep the mole linked to carbon-12;
2. Link the mole to a fixed Avogadro constant and shift the uncertainty to the mass of carbon-12, which would now have an uncertainty.
3. Should the mole be a quantity with unit mol or should it just be a number.

Division VIII report – There was a lengthy discussion about preferred names. The CAS and IUPAC rules for naming are different. There is a need to contact legislative bodies to have IUPAC naming schemes accepted.

#### New Elements

A question was raised about the symbol, Fl, for flerovium, since Fl was used for fluorine in the nineteenth century. In 1979, the IUPAC recommendation stated that a name may not be "recycled". Should this recommendation apply to chemical symbols?

#### Gold Book - the IUPAC Compendium of Chemical Technology

Many glossaries appear as recommendations each year. The latest entries in the Gold Book are more than five years old. A task group should be installed to set up rules for changing, modifying and formatting entries and bringing recommendations up to date. This Task Group should define the process for dealing with current entries, the back-log of unpublished entries and the future process for making entries in the Gold Book.

On the subject of working on IUPAC Task Groups, it was noted that some Universities do not support voluntary work of their staff for IUPAC.

The Status of the International System of Units (SI) regarding the mole.

The chairman emphasized that the position of IUPAC is unchanged. If someone has a feeling that the decision was not good, there is a formal way to relaunch the process. The issue about the name “amount of substance” is still going on. It is IUPAC business and of no interest to BIPM or ISO. A statement was issued in Glasgow (2009 General Assembly) regarding the amount of substance, asking for detailed discussions of the subject within IUPAC bodies. (I do not remember any discussion at a Division II meeting in Glasgow or more recently). Public relation papers were to be published in 2012.

### VIM3

VIM3 is not a glossary but a self-consistent vocabulary. A supplement is being produced as a means of an easier document to use than VIM3 and to bridge the gap between the vocabulary and current usage in the community.

### IUPAC Website

IUPAC maintains 2 parallel websites. The IUPAC website does not present the ‘color books’. Non-IUPAC websites contain the color books. IUPAC needs a policy on future management of its electronic documents. Should a book be produced in purely electronic form and distributed freely? Authors want a printed version for their bibliography.

### Chemistry International (CI)

It was suggested that topics from the Green Book be contributed to CI. Topics of interest to Division II were suggested to be contributed by Commission II.1 secretary on naming of elements, atomic weights, isotopic composition and M/Z in mass spectra.

### Atomic Weights

Technical Reports are not distributed to all ICTNS members. For Recommendations, 15 members are needed for reviewing, after the public review period. All ICTNS members receive an invitation to review the Recommendations.

Technical Reports need a minimum of 3 reviews after Division approval and not all ICTNS members are asked but a limited number. Some ICTNS members would like to see the Technical Reports prior to publication. Juris Meija asked why the Atomic Weights and Isotopic Compositions reports are not recommendations. A report for 2014 is currently in preparation and it will be submitted as a Recommendation if II.1 so chooses and ICTNS accepts. The ICTNS chairman will check on the requirements. Are NRO representatives invited to review, in view of language issues, the spelling of sulfur (sulphur) and caesium (cesium) for example?

### VIM

How consistent is the terminology with the Green Book needs to be checked because VIM is to be adopted by IUPAC.

- a) Does it define terms that are used in the chemical measurement?
- b) Is the terminology consistent with IUPAC recommendations?

c) Can we readily implement necessary changes or are the changes too numerous and therefore require a major change?

d) What should be done in the future (IUPAC representative?) for further developments? Might a similar document like EURCHEM/CITAC be useful? VIM is on the way to become a vocabulary above any other used to define measurement in chemistry. If IUPAC does not agree with that, VIM should not be published under the name of IUPAC. The chairman will contact N. Moreau as to whom is representing IUPAC on WG2 (probably the ICTNS secretary) and take immediate action.

## Appendix 6

### Report to the ICTNS of the Inorganic Chemistry Division Committee

Norman E. Holden

An off-year meeting was held at Cologne, Germany on September 6-7, 2012. President Bob Loss reported on the spring 2012 IUPAC Bureau meeting. IUPAC is pleased with the high level of Division II activities. The problem of copyright clearance, when developing educational material was discussed for the Periodic Table of Isotopes Project. The Secretary General keeps the problems of the new IUPAC website as top priority. The past President called for more inter-Scientific Union involvement for IUPAC.

New members have been sent information packets with the latest issue of the Division II newsletter. New members are asked to provide photographs and a short text of their research interest to the Division Vice-President.

Elements 114 and 116, Fl and Lv, have been approved. Information for atomic number elements 113, 115, 117 and 118 has been received. The Division awaits a report from the joint working party.

Interdivisional Sub-committee on Materials Chemistry, ISMC, reported that project topics discussed included nomenclature, photoactive materials, metal-organic framework (MOF), teaching materials chemistry, measurement standards and references in H<sub>2</sub>O splitting and methodology aspects/ standardization. Numbering systems for nano-materials are badly needed. Project Proposals discussed included preparing a report on the various numbering system options and a nano-material definition Project.

The Commission on Isotopic Abundances and Atomic Weights and sub-committees reported on Project 2007-038-3-200, on the Periodic Table of the Isotopes. It is in the final stages of completion. The major problem for the past two years deals with copyright clearance for the photos and write-ups of applications of isotopes. The Table can not be placed in general release until author and journal publisher permissions have been obtained for each picture and diagram, which illustrates the application provided in the table for the isotopes of the 118 chemical elements. When all permissions have been obtained, this Project will be completed and available for general release to the scientific community.

The 2011 report of the Commission was published in *Pure Applied Chemistry* vol. 85, no. 5, pp 1047-1078 (2013). The recommended atomic weight values changed for germanium to 72.630 (8), indium to 114,818 (1) and mercury to 200.592 (3). For magnesium, an interval was recommended 24.3040 to 24.3061 and for bromine, 79.901 to 79.907.

Project 2006-016-1-200, Recommendations for Isotope Data in Geosciences has been finalized. On the issue of the definition of the year, discussions are ongoing with the Director of the Time Department of the International Bureau of Weights and Measures (BIPM), the chairman of the SUNAMCO Commission of IUPAP and the IAU, the International Astronomical Union. The decay constant/half-life evaluation of <sup>234</sup>U, <sup>235</sup>U and <sup>87</sup>Rb are partially complete and work on <sup>40</sup>K has begun. A proposal for another Project to continue this work has been approved by the Executive Board of the IUGS in February 2013. A request for similar financial support from IUPAC in 2012 was denied because of IUPAC budgetary problems. The proposal has been resubmitted to IUPAC again this year.

Project 2009-012-2-200, Coordination Polymers, Metal-Organic Frameworks and the Need for Terminology Guidelines, reported that a publication resulting from this project was selected as a CrystEngComm. Hot Article and was featured on the CrystEngComm blog at <http://blogs.rsc.org/ce/2012/02/06/iupac-update-coordination-polymer-mof-nomenclature/> and made freely available to the public for four weeks. The blog enables authors and readers to exchange ideas and information about Hot Articles.

Project 2008-040-1-200, Towards a Comprehensive Definition of Oxidation State, reported that there were three stages, anamnesis, case studies and write-up. There were several discussion documents about various aspects of the oxidation state and examples of approximately 100 oxidation state case studies, which included ambiguous or practically indeterminable oxidation states. An extensive technical report write-up will deal with the history, the present debate, suggested definition, suggested algorithms and examples of oxidation states in molecules, clusters and solids. The completed Technical Report will be open for discussion on the Inorganic Chemistry Forum of the IUPAC Discussion Board. A recommendation will be produced and prepared for the Gold Book website.

There were suggestions for future projects presented.

Develop a Periodic Table of Life – role of elements and inorganic compounds in biological systems.

Develop a definition of nano-materials.

Develop a definition of valence.

Develop a Periodic Table of allotropy of elements.

Search for errors in Wikipedia related to inorganic chemistry and nomenclature and submit corrections to Wikipedia.

**Appendix 7****Summary of projects of Division II**

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IUPAC Division II - Inorganic Chemistry  
Review of Projects

Dan Rabinovich

Department of Chemistry  
The University of North Carolina at Charlotte



Istanbul, Turkey  
10 August 2013

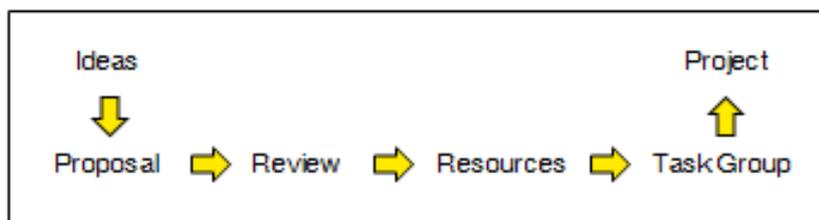
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## IUPAC Projects

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- IUPAC operates using a project-driven system that encourages participation by the worldwide chemistry community:



E.D. Becker *Chem. Internat.* **2001**, *23*, 12.

- Projects should address one of the goals listed in the *IUPAC Strategic Plan*:
  - Related to the needs of the chemists in the *world* (not a country or region).
  - Should be related to the role of chemistry for the needs of mankind.
  - Carried out by an international team of experts (*i.e.*, the Task Group).

## Project Submission and Approval Process

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- Anyone or any group may submit a project (4-6 people per Task Group).
- Length: 1-3 years.
- Total budget: \$5-10K.
- Use of funds: meetings of the task group (*i.e.*, travel), administrative costs, generation of products (publications, online resources, etc.).
- Submission form and guidelines are available online.
- Project proposal submitted by e-mail to the Secretariat.
- Forwarded to the appropriate Division for peer-reviewing (~4 months).
- Suitable topics:
  - International standardization of nomenclature and terminology
  - Publication of glossaries in particular fields
  - Setting standards for spectral and other data
  - Forging agreement on analytical methods
  - Compilation and evaluation of quantitative data (thermodynamics, kinetics, etc.).

## Project Submission Form

- Project title
- Task Group Chair (TGC)
- Task Group (TG) members
- Objective and rationale (< 100 words)
- Intended stakeholders
- Dissemination plan
- Intended publications (e.g., PAC)
- Project description (~250 words)
- Time frame
- Milestones
- Criteria for evaluation of outcomes
- Relevant IUPAC bodies
- Suggested referees



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**PROJECT SUBMISSION FORM** v. 10/09

Any individual or group can submit a project, with or without current affiliation with an IUPAC body. Projects can be submitted at any time. The detailed instructions, on the additional Guidelines for Completion of the Project Submission Form, Requested Subject Questions on Project Submission and Approval Process can be downloaded at the IUPAC web site at <http://www.iupac.org/projects/>.

This form should be completed with a brief proposal and returned to the IUPAC Secretariat (see below) as an e-mail attachment in .doc or .pdf format only. Please do not remove section headers and answer all questions. Indicate 'N/A' when a particular item does not apply to the proposal.

Administrative category	Submitter	W
Name		
Project Title		
Topic Title (if applicable)		
Task Group Chair	<input type="checkbox"/> IUPAC <input type="checkbox"/> Other	
Task Group Members	<input type="checkbox"/> IUPAC <input type="checkbox"/> Other	
Name of the person collecting the data of use for the proposed Task Group Chair	<input type="checkbox"/> IUPAC <input type="checkbox"/> Other	
Objective and Rationale This should summarize the proposed objective and rationale and be limited to 100 words.		100 words
Intended Stakeholders Give details of the intended stakeholders and their groups, and how the work would benefit them (Project/Department/Institution).		100 words
Dissemination Plan Describe how the results of the Project will be disseminated to target stakeholders (e.g. via IUPAC, the organization, from the Task Group and project stakeholders to the wider community).		
Intended Publications (please list names)	<input type="checkbox"/> IUPAC Recommendations <input type="checkbox"/> IUPAC Technical Report Other type of manuscript to be published in a journal other than Pure and Applied Chemistry	

## Completed projects September 2012-August 2013

- 2006-016-1-200
- TGC: Paul Renne (Berkeley Geochronology Center)
- TG: Bonardi, DeBievre, Fajgelj, Holden, Liu & Villa
- Recommendations for isotope data in geosciences
- Budget: USD 4,900; spent: USD 4,650; balance: USD 250.
- Div. II monitor: Holden
- Updates:

Mar 2007 - project announcement published in [Chem. Int. Mar-Apr 2007, p. 17](#)

Feb 2009 update - Geological and cosmochronological time is typically specified in orders of magnitude multiples of a year. Thus it becomes necessary to define a year in terms of the SI unit of time, the second, and accordingly the joint IUPAC-IUGS Task Group has defined the precise relationship between these units. (> provisional recommendation at [../provisional/abstract09/villa\\_300609.html](http://provisional/abstract09/villa_300609.html))

April 2011 update - recommendations titled 'IUPAC-IUGS common definition and convention on the use of the year as a derived unit of time (IUPAC Recommendations 2011)' published in *Pure Appl. Chem.* 2011, Vol. 83, No. 5, pp. 1159-1162 doi:[10.1351/PAC-REC-09-01-22](https://doi.org/10.1351/PAC-REC-09-01-22)

(cont...)

*May 2009 update* - The IUPAC/IUPAP Joint Working Party (JWP) on the priority of claims to the discovery of new elements has reviewed the relevant literature pertaining to several claims. In accordance with the criteria for the discovery of elements previously established by the 1992 IUPAC/IUPAP Transfermium Working Group, and reiterated by the 1999 and 2003 IUPAC/IUPAP JWPs, it was determined that the 1996 and 2002 claims by Hofmann et al. research collaborations for the discovery of the element with atomic number 112 at GSI share in the fulfillment of those criteria.

A synopsis of the relevant experiments and related efforts is presented in a technical report published online in *Pure and Applied Chemistry* on 25 May 2009. See [Pure Appl. Chem. 2009, Vol. 81, No. 7, pp. 1331-1343; doi:10.1351/PAC-REP-08-03-05](#)

This report was shortly after followed by the recommendations titled 'Name and symbol of the element with atomic number 112' (IUPAC Recommendations 2010), [Pure Appl. Chem. 82\(3\), 753-755, 2010 \[doi:10.1351/PAC-REC-09-08-20\]](#)

(cont...)

- After publication of the PAC paper, TG started work on  $^{234}\text{U}$ ,  $^{235}\text{U}$ ,  $^{238}\text{U}$ .
- Preliminary work presented at the 3<sup>rd</sup> International Nuclear Chemistry Congress (INCC) in Palermo, Sicily, Italy (18-23 September 2011).
- Update will be presented at the 8<sup>th</sup> International Conference of Nuclear and Radiochemistry in Como, Italy (16-21 September 2012).
- Paper to be published in *Geochimica et Cosmochimica Acta* (*in press*).
- Future submission to *Pure & Applied Chemistry* is planned.
- New project has been submitted: "Recommendation for Isotope Data in the Geosciences II" [possibly joint between the International Union of Geological Sciences (IUGS) and IUPAC].
- Final report to be submitted to *Chemistry International* in the near future.

Status: **completed.**

- **2006-046-1-200**
- TGC: Paul Karol (Dept. of Chemistry, Carnegie Mellon U.)
- TG: Barber, Nakahara, Vardaci & Vogt
- [Priority claims for the discovery of elements with atomic number greater than 111 \(Joint IUPAP/IUPAC Working Party\)](#)
- Budget: USD 7,290; spent: USD 7,290; **balance: USD 0.**
- **Div. II monitor: Corish**
- **Updates:**

Claims for the discovery of elements of atomic number greater than 111 have been invited and the scientists name below have submitted the following claims:

- Dr. Amnon Marinov, The Hebrew University, Jerusalem, Israel; for element 112
- Dr. Kosuke Morita, The Institute of Physical and Chemical Research, Riken, Japan; for element 112 (in part) and element 113
- Dr. Sergey Dimitriev, Joint Institute for Nuclear Research, Dubna, Russia; for elements 112, 113, 114, 115, 116, and 118
- Dr. Sigurd Hofmann, Gesellschaft für Schwerionenforschung mbH, Darmstadt, Germany; for element 112

> project announcement first published in [Chem. Int. Jan-Feb 2007](#)

[Z greater than 111](#) - submission invited to establish priorities for the discovery (posted 25 Jan 06)

(cont...)

*June 2011 update* - Priority for the discovery of the elements with atomic number 114 and 116 has been assigned, in accordance with the agreed criteria, to collaborative work between scientists from the Joint Institute for Nuclear Research in Dubna, Russia and from Lawrence Livermore, California, USA (the Dubna-Livermore collaborations). The discovery evidences were recently reviewed and recognized by a IUPAC/IUPAP joint working party. A full synopsis of the relevant experiments and related efforts is presented in a technical report published in *Pure and Applied Chemistry* 2011, Vol. 83, No. 7, pp. 1485-1498; doi:[10.1351/PAC-REP-10-05-01](#) (online on 1 June 2011)

With the priority for the discovery established, the scientists from the Dubna-Livermore collaborations are invited to propose a name for the two super-heavy elements, elements 114 and 116. The suggested names will then go through a review process before adoption by the IUPAC Council.

Last update: 24 June 2011

(cont...)

### June 2012 update

In accordance with IUPAC procedures, the discoverers proposed names as follows: flerovium with the symbol Fl for the element with  $Z = 114$  and livermorium with the symbol Lv for the element with  $Z = 116$ . The IUPAC Inorganic Chemistry Division recommended these proposals for acceptance, and they were adopted on 23 May 2012 by the IUPAC Bureau as delegated to act by the IUPAC Council meeting on 3-4 August 2011.

See: *Pure Appl. Chem.* **2012**, *84*, 1669-1672.

<http://dx.doi.org/10.1351/PAC-REC-11-12-03> (Published online 2012-06-26)

#### INORGANIC CHEMISTRY DIVISION

#### Names and symbols of the elements with atomic numbers 114 and 116 (IUPAC Recommendations 2012)

Robert D. Loss<sup>1</sup> and John Corish<sup>2\*</sup>

<sup>1</sup> Department of Applied Physics, Curtin University of Technology, GPO Box U 1987, Perth, WA 6845, Australia  
<sup>2</sup> School of Chemistry, Trinity College, University of Dublin, Dublin 2, Ireland

Status: **completed** [follow-up project: 2012-047-1-200]

- 2007-029-1-200
- TGC: Xiang-Kun Zhu (Chinese Academy of Geological Sciences)
- TG: Hirata, Loss, Schönberg, Walczyk, Wieser & Yoneda
- Evaluation of isotopic abundance variations in selected heavier elements
- Budget: USD 8,980; spent: USD 8,971; balance: USD 9.
- Div. II monitor: Loss
- Updates:

#### May 2013:

Atomic weights of the elements 2011 (IUPAC Technical Report) published in *Pure Appl. Chem.* **2013**, *85*, 1047-1078.

<http://dx.doi.org/10.1351/PAC-REP-13-03-02>

#### Atomic weights of the elements 2011 (IUPAC Technical Report)\*

Michael E. Wieser<sup>1,4</sup>, Norman Holden<sup>2</sup>, Tyler B. Coplen<sup>3</sup>,  
 John K. Böhlke<sup>3</sup>, Michael Berglund<sup>4</sup>, Willi A. Brand<sup>5</sup>,  
 Paul De Bièvre<sup>6</sup>, Manfred Gröning<sup>7</sup>, Robert D. Loss<sup>8</sup>, Juris Meija<sup>9</sup>,  
 Takafumi Hirata<sup>10</sup>, Thomas Prohaska<sup>11</sup>, Ronny Schoenberg<sup>12</sup>,  
 Glenda O'Connor<sup>13</sup>, Thomas Walczyk<sup>14</sup>, Shige Yoneda<sup>15</sup>, and  
 Xiang-Kun Zhu<sup>16</sup>

Status: **completed**.

- **2007-031-1-200**
- TGC: RonnySchönberg (Institute for Geosciences, U. of Tübingen)
- TG: Berglund,Brand,Fajgelj, Gonfiantini,Gröning,Hirata, Vocke & Walczyk
- **Evaluated compilation of international reference materials for isotope abundance measurements**
- Budget: USD 13,750; spent: USD 13,249; **balance: USD 501.**
- **Div. II monitor: Loss**
- **Updates:**

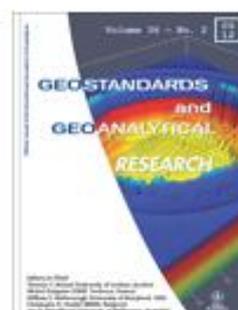
July 2011 - a manuscript entitled 'Calibration of the Certified Isotopic Reference Materials ERM-AE647 and IRMM-3702 - A new Reference Scale for Copper and Zinc Isotope Determinations' has been submitted to *Geostandards and Geoanalytical Research* (29 June 2011)

This manuscript includes two important points that were investigated within the scope of this project:

1. A compilation table showing the situation of isotopic reference materials for 'heavy' or non-traditional stable isotope systems.
2. Calibrating the newly available isotopic reference materials for Cu and Zn provided by IRMM against the previously used reference materials.

(cont...)

- Recent publication:  
K. Moeller, R. Schoenberg, R.-B. Pedersen, D. Weiss, S. Dong  
"Calibration of the New Certified Reference Materials ERM-AE633 and ERM-AE647 for Copper and IRMM-3702 for Zinc Isotope Amount Ratio Determinations"  
*Geostandards and Geoanalytical Research* **2012**, 36, 177-199.



Status: **completed.**

- **2007-038-3-200**
- TGC: Norman Holden (Brookhaven National Laboratory)
- TG: Böhlke, Coplen, de Laeter, Mahaffy, O' Connor, Roth, Tarbox, Tepper, Walczyk, Wieser & Yoneda
- [Development of an isotopic periodic table for the educational community](#)
- Budget: USD 11,000; spent: USD 11,000; **balance: USD 0.**
- **Div. II monitor: Holden**
- **Updates:**

July 2008 - project announcement published in [Chem. Int. July 2008](#)

March 2011 - relevant to this project is a feature titled 'Atomic Weights - No Longer Constants on Nature' published in [Chem Int March-April 2011](#), by Tyler B. Coplen and Norman E. Holden

Visit [www.ciaaw.org](http://www.ciaaw.org) for details and latest news.

July 2011 - Periodic Table of the Isotopes first release included as a supplement published in [Chem. Int. July-August](#); [see announcement, p. 20](#)

(cont...)

- Final technical and scientific review (400+ pages!) is in preparation.
- Copyright issue with 160 figures and drawings: request for an Extension has been made.
- An updated version of the Periodic Table of the Isotopes was prepared for the Virtual Colloquium (VC) in connection with the 22<sup>nd</sup> International Conference on Chemistry Education (ICCE) and the 11<sup>th</sup> European Conference on Research in Chemical Education in Rome, Italy, in July 2012.
- Future submission of a follow-up Project to develop digital learning objects (DLO) for students and teachers.

**May 2013:**

Atomic weights of the elements 2011 (IUPAC Technical Report) published in *Pure Appl. Chem.* **2013**, *85*, 1047-1078.  
<http://dx.doi.org/10.1351/PAC-REP-13-03-02>

**End date: 1 June 2013.**

**Status: completed.**

- **2009-012-2-200**
- TGC: Lars Öhrström (Chalmers University of Technology, Sweden)
- TG: Batten, Champness, Chen, García-Martínez, Kitagawa, O'Keefe, Reedijk & Suh
- [Coordination polymers and metal organic frameworks: terminology and nomenclature guidelines](#)
- Budget: USD 11,500; spent: USD 11,500; **balance: USD 0.**
- **Div. II monitor:** Öhrström
- **Updates:**

#### August 2009

The task group held its first meeting during the GA in Glasgow early August.

#### January 2010

Project announcement published in Chem. Int. Vol. 32 No. 1

#### March 2011

The task group invited the community to complete a questionnaire on CP/MOF terminology and provide comments directly to the TGC.

(cont...)

#### January 2012

The task group will have a final meeting on 24 May 2012 in Stockholm preceded by a one day symposium on 23 May on "Metal-organic frameworks, porous coordination polymers and zeolites" organized in collaboration with the "Trends in Inorganic Chemistry" symposium of the Swedish Chemical Society's Inorganic division. The symposium will feature talks by task group members Michael O'Keefe (Arizona State University, USA), Neil Champness (University of Nottingham, UK), Susumu Kitagawa (Kyoto University, Japan), Stuart Batten (Monash University, Australia), Javier García Martínez (University of Alicante, Spain), Xiao-Ming Chen (Sun Yat-Sen University, Beijing, China), and Myunghyun Paik Suh (Seoul National University, South Korea) as well as Tina Düren (University of Edinburgh, UK) and Unni Olsbye (University of Oslo, Norway). Proceedings from the meeting will be published in an open access special issue of *Zeitschrift für Kristallographie*, 2013. Further information on the symposium is available at [www.tinc.nu](http://www.tinc.nu).

#### February 2012

A brief account of the task force's work will be published in CrystEngComm as a highlight.



(cont...)

**August 2013**Final recommendations published in: *Pure Appl. Chem.* **2013**, *85*, 1715-1724.

*Pure Appl. Chem.*, Vol. 85, No. 8, pp. 1715–1724, 2013.  
<http://dx.doi.org/10.1351/PAC-REC-12-11-20>  
 © 2013 IUPAC, Publication date (Web): 29 July 2013

**Terminology of metal–organic frameworks and coordination polymers (IUPAC Recommendations 2013)\***

Stuart R. Batten<sup>1</sup>, Neil R. Champness<sup>2</sup>, Xiao-Ming Chen<sup>3</sup>,  
 Javier Garcia-Martinez<sup>4</sup>, Susumu Kitagawa<sup>5</sup>, Lars Öhrström<sup>6,†</sup>,  
 Michael O’Keeffe<sup>7</sup>, Myunghyun Paik Suh<sup>8</sup>, and Jan Reedijk<sup>9</sup>

<sup>1</sup>School of Chemistry, Monash University, Victoria 3800, Australia; <sup>2</sup>School of Chemistry, University of Nottingham, Nottingham NG7 2RD, UK; <sup>3</sup>School of Chemistry and Chemical Engineering, Sun Yat-Sen University, Guangzhou, PR China, 510275; <sup>4</sup>Universidad de Alicante, Departamento de Química Inorgánica, Carretera San Vicente del Raspeig s/n, E-03690 Alicante, Spain; <sup>5</sup>Department of Synthetic Chemistry and Biological Chemistry, Kyoto University, Katsura, Nishikyo-ku, Kyoto, 615-8510, Japan; <sup>6</sup>Department of Chemical and Biological Engineering, Physical Chemistry, Chalmers University of Technology, SE-412 96 Göteborg, Sweden; <sup>7</sup>Department of Chemistry and Biochemistry, Arizona State University, Tempe, AZ 85287, USA; <sup>8</sup>Department of Chemistry, Seoul National University, Seoul 151-747, South Korea; <sup>9</sup>Leiden Institute of Chemistry, Leiden University, P.O. Box 9502, 2300 RA Leiden, The Netherlands

End date: 31 December 2012.

Status: **completed**.

- **2009-025-1-200**
- TGC: Michael Wieser (U. of Calgary) & John de Laeter (dec.)
- TG: Berglund, Coplen, DeBievre & Meija
- [Technical Guidelines for Isotope Abundances and Atomic Weight Measurements](#)
- Budget: USD 2,500; spent: USD 2,500; **balance: USD 0.**
- **Div. II monitor: Loss**
- **Updates:**

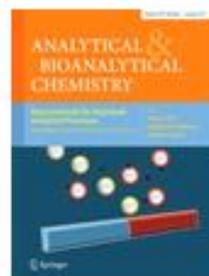
July 2010 - project announcement published in *Chem. Int.* Jul-Aug, p. 22

- Commission on Isotopic Abundances and Atomic Weights (CIAAW) met in Calgary (2012): “The question as to what constitutes a fully calibrated isotope amount ratio measurement still remains a topic of active research and debate. For years, the definitive calibration approach has been by means of synthetic mixtures of highly enriched isotopes with known chemical purity to give gravimetrically defined ratios.”
- An updated edition of the CIAAW’s Technical Booklet, currently in its 5th edition (1999), will be produced by the next Commission meeting (2013).

(cont...)

### September 2012

The Commission on Isotopic Abundances and Atomic Weights (CIAAW) met in Calgary (2012). The question as to what constitutes a fully calibrated isotope amount ratio measurement still remains a topic of active research and debate. For years, the definitive calibration approach has been by means of synthetic mixtures of highly enriched isotopes with known chemical purity to give gravimetrically defined ratios.



Paper published by Juris Meija: "Calibration of isotope amount ratios by analysis of isotope mixtures" *Anal. Bioanal. Chem.* **2012**, *403*, 2071-2076.

### May 2013

Atomic weights of the elements 2011 (IUPAC Technical Report) published in *Pure Appl. Chem.* **2013**, *85*, 1047-1078.

End date: 30 June 2012.

Status: **completed**.

- 2009-029-1-200
- TGC: Takafumi Hirata (Tokyo University)
- TG: Berglund, Böhlke, Brand, Coplen, de Laeter, DeBievre, Ding, Gonfiantini, Gröning, Holden, Loss, Schönberg, Vocke, Walczyk, Wieser, Yoneda & Zhu
- [Evaluated published isotope ratio data \(2010-2011\)](#)
- Budget: USD 13,200; spent: USD 12,201; **balance: USD 999**.
- [Div. II monitor: Loss](#)
- [Updates:](#)

### May 2013

Atomic weights of the elements 2011 (IUPAC Technical Report) published in *Pure Appl. Chem.* **2013**, *85*, 1047-1078. This biennial review of atomic weight determinations resulted in changes for the standard atomic weights of five elements. The atomic weight of bromine has changed from 79.904(1) to the interval [79.901, 79.907], germanium from 72.63(1) to 72.630(8), indium from 114.818(3) to 114.818(1), magnesium from 24.3050(6) to the interval [24.304, 24.307], and mercury from 200.59(2) to 200.592(3). For bromine and magnesium, assignment of intervals for the new standard atomic weights reflects the common occurrence of variations in the atomic weights of those elements in normal terrestrial materials.

Status: **completed** [7 June 2013]

## Status report on active projects

- **2008-040-1-200**
- TGC: Pavel Karen (University of Oslo)
- TG: McArdle, Takats & Tatsumi
- [Towards a comprehensive definition of oxidation state](#)
- Budget: USD 4,200; spent: USD 0; **balance: USD 4,200.**
- **Div. II monitor: Holden**
- **Updates:**

#### **September 2011**

The experimental part of the project is finished (the research, analysis, data gathering, calculations, and discussions of about 100 examples among 3 task group members). The write-up of the Technical Report (TR) is currently almost complete and being refined. Write-up of a Recommendation will be started soon. Write-up of a pedagogical summary for *Journal of Chemical Education* will be commenced soon.

#### **June 2013**

The intended new TR sections were written and the TR manuscript was published on April 24 at the IUPAC discussion forum. Some aspects were discussed with two division members and the Division 8 president R. Hartshorn. On May 31, the TR manuscript was submitted to PAC.

[Extension requested on 6 June 2013 \(expected end date: 1 March 2014\)](#)

- **2009-023-1-200**
- TGC: Michael Wieser (U. of Calgary)
- TG: de Laeter, Hirata & Schönberg
- [Evaluation of radiogenic abundance variations in selected elements](#)
- Budget: USD 8,500; spent: USD 3,340; **balance: USD 5,160.**
- **Div. II monitor: Loss**
- **Updates:**

#### **September 8, 2012:**

The isotopic abundance variations of the radiogenic elements Re, Os, Rb, Sr, K, Nd, Sm, Hf, Lu, and Ar are being evaluated to determine the variability of the atomic weight. These data will be incorporated in the Commission's Technical Report of the Table of Standard Atomic Weights. The evaluation of Ar is complete and was approved by the Commission at the Calgary meeting in 2011 for incorporation in the Table of Standard Atomic Weights 2011, to be published this year. The reports on the remaining elements are still in progress and will be presented to the Commission for approval at the upcoming Commission meeting in 2013.

[Planned end date: 31 December 2013](#)

- **2009-026-2-200**
- TGC: Michael Berglund (European Commission – DG Joint Research Centre)
- TG: Böhlke, Gröning, Kessel, Loss & Wieser
- [Online evaluated isotope ratio database for user communities \(2011-2014\)](#)
- Budget: USD 6,000; spent: USD 0; **balance: USD 6,000.**
- **Div. II monitor: Loss**
- **Updates:**

**August 2013 (Bob Loss):**

The TGC and a TG member are no longer involved in the project; alternative contributors are currently being sought and will hopefully allow completion of the project in a timely fashion.

**Planned end date: 1-Apr-2014**

- **2009-027-1-200**
- TGC: Willi Brand (Max Planck Institute for Biogeochemistry)
- TG: Böhlke, Coplen, Brand, Gonfiantini, Gröning, Qi & Vocke
- [Assessment of stable isotopic reference and inter-comparison materials](#)
- Budget: USD 9,600; spent: USD 6,149; **balance: USD 3,451.**
- **Div. II monitor: Holden**
- **Updates:**

September 2010 - project announcement published in *Chem. Int. Sep-Oct*, p. 23

**8 August 2013 (Juris Meija):**

Draft manuscript was circulated to all members of the Subcommittee in July 2013. Task group members met during the CIAAW meeting in Aug. 2013 and made considerable progress towards the completion of the project. Completion of the project and publication in PAC is expected shortly.

**Planned end date: 31 December 2012**

- **2009-045-1-200**
- TGC: Hitoshi Ishida (Kitasato University)
- TG: Beeby, Bunzli, Campagna, De Cola, Ford, Gordon, Hasegawa, Hasegawa, Katoh, Keene, McCusker, Nozaki, Sakai, Tobita, Vlack & Yam
- [Guidelines for measurement of luminescence spectra and quantum yields of inorganic compounds, metal complexes and materials](#)
- Budget: USD 8,000; spent: USD 0; **balance: USD 8,000.**
- **Div. II monitor:** Sakai
- **Updates:**

July 2010 - project announcement published in *Chem. Int. Jul-Aug, p. 21*

- A draft of the report has not been prepared yet but hopefully will within the next 2 months (Beeby, Bunzli & Ishida).
- Workshop at an international photochemistry conference such as the International Symposium on the Photochemistry and Photophysics of Coordination Compounds (ISPPCC) is being planned.

(cont...)

- **Updates:**

**Ishida e-mail message (9 August 2013):**

**Re: IUPAC Div II project 2009-045-1-200**

ishida@sci.kitasato-u.ac.jp

To: Rabinovich, Dan  
Cc: ishida@sci.kitasato-u.ac.jp

Dear Don:

I am so sorry that I have not sent any report and updated information. We actually had stopped the project work, but we have recently discussed on the work and we again recognize it as an important work for the inorganic chemists who measure the emission spectra and quantum yields of inorganic compounds. Actually, I was consulted by such inorganic chemists in the USA, and I and my coworker measured their samples.

I hope we will continue the project, or restart it in near future. Anyway, I will report the update informational.

Best regards,  
Hitoshi

**Planned end date: 31 December 2011**

- **2009-046-2-200**
- TGC: Jan Kaiser (University of East Anglia)
- TG: Angert, Berquist, Brand, Ono, Röckmann & Savarino
- [Terminology and definition of quantities related to the isotope distribution in elements with more than two stable isotopes](#)
- Budget: USD 6,000; spent: USD 188; **balance: USD 5,812.**
- **Div. II monitor:** Rabinovich
- **Updates:**

September 2010 - project announcement published in [Chem. Int. Sep-Oct](#), p. 23

- Poster presented at the General Assembly of the European Geosciences Union in Vienna (April 2012).
- Talk on the project presented to a meeting of Ph.D. students and supervisors at the Marie Curie Initial Training Network (INTRMIF).

[Planned end date:](#) 30-Jun-2014

- **2011-026-1-200**
- TGC: Michael Wieser (U. of Calgary)
- TG: Schönberg, Zhu, Gröning & Meija
- [Full calibration of a new molybdenum isotopic reference material](#)
- Requested budget: USD 10,200; spent: USD 0; **balance: USD 10,200.**
- **Div. II monitor:** Loss
- **Updates:**

*No updates to report*

[Start date:](#) 1 December 2012  
[Planned end date:](#) 30 April 2014

- **2011-027-1-200**
- TGC: Ronny Schönberg (Institute for Geosciences, U. of Tübingen)
- TG: Böhlke, Brand, Berglund, Coplen, De Bievre, Ding, Gröning, Hirata, Holden, Loss, Meija, Prohaska, Singleton, Walczyk, Wieser, Yoneda & Zhu
- [Evaluated published isotope ratio data \(2011-2013\)](#)
- Budget: USD 19,400 (USD 6,695 from Division II; USD 12,705 from Project Committee); spent: USD 0; **balance: USD 19,400.**
- **Div. II monitor: Holden**
- **Updates:**

**8 August 2013** (*Juris Meija*):

The Subcommittee on Isotopic Abundance Measurements (SIAM) met in Gebze, Turkey, on August 4-5, and evaluated published isotope ratio data. SIAM made the recommendations to the CIAAW, which were accepted during the 2013 CIAAW meeting. The IUPAC Table of Isotopic Composition of the Elements 2013 will be published in *Pure and Applied Chemistry* in 2014.

Approved: 3-Jan-2012

Planned end date: 31-Dec-2013

- **2011-028-1-200**
- TGC: Xiang Kun Zhu (Chinese Academy of Geological Sciences)
- TG: Holden, Hirata & Prohaska
- [Evaluation of published lead isotopic data \(1950-2013\) for a new standard atomic weight of lead](#)
- Budget: USD 6,400; spent: USD 0; **balance: USD 6,400.**
- **Div. II monitor: Ding**
- **Updates:**

**8 August 2013** (*Juris Meija*):

The task group chairman presented the draft report to the CIAAW members during the 2011 Calgary meeting. Significant progress has been made in this project and the follow-up progress report was expected during the 2013 CIAAW meeting, however, the task group Chairman was unable to attend the meeting due to visa problems.

Approved: March 2012

Planned end date: 1-Mar-2014

- **2011-040-2-200**
- TGC: Willi A. Brand (Max Planck Institute for Biogeochemistry)
- TG: Meija, Milton & Wieser
- [Development a procedure for using intervals instead of fixed values for atomic weights; an educational exercise](#)
- Budget: USD 7,400; spent: USD 1,300; **balance: USD 6,100.**
- **Div. II monitor: Holden**
- **Updates:**

**8 August 2013 (Juris Meija):**

The task group members have been working to solicit the wider opinion of the scientific community, in particular, the opinion of several ISO Technical Committees, and that of the JCGM WG-1 (BIPM). Position paper will be formulated after careful consideration of the presented advice and opinions.

Approved: 22-Mar-2012

Planned end date: 1-Mar-2014

- **2012-044-1-100**
- TGC: Pierangelo Metrangolo & Giuseppe Resnati (NFMLab, Milano)
- TG: Aakeröy, Gao, Barbour, Nangia, Ogawa, Öhrström, Guru Row, Rogers, Zaworotko, Bernstein, Hosseini, Seddon, Desiraju, Bacchi, Rissanen & Reutzel-Edens
- [Basic Terminology of Crystal Engineering](#)
- **Div. II monitor: Öhrström**
- **Updates:**
  - Original proposal submitted to Div. II, III & VIII
  - Approved and funded by Div. I (USD 10,000)

Submitted: 1 November 2012

Approved: xx-yyyy-zzzz

Planned end date: 31 December 2014

- **2012-045-1-800**
- TGC: Michael A. Beckett (Bangor University, UK)
- TG: Breilochs, Chizhevsky, Damhus, Kennedy, Venas & Yerin
- [Nomenclature for Polyhedral Boranes and Related Compounds](#)
- Budget: USD 7,205; spent: USD 240; **balance: USD 6,965.**
- **Div. II monitor: Rabinovich**
- **Updates:**
  - Original proposal submitted to Div. VIII (Chemical Nomenclature and Structure Representation)
  - USD 1,000 contribution from Div. II *[31 January 2013]*
  - Funded by **Project Committee**
  - Dan Rabinovich (USA) representative from Div. II and TG member
  - Potential contribution of USD 1,500 from Div. II (?)

Submitted: 5 November 2012

Approved: xx-yyyy-zzzz

Planned end date: 31 December 2015

- **2012-046-2-800**
- TGC: Hinnerk Rey (Elsevier Information Systems GmbH, Frankfurt am Main, Germany)
- TG: Druckenbrodt, Hartshorn, Damhus, Schenk & Sitzmann
- [Handling of Inorganic compounds for InChI V2](#)
- Requested budget: USD 10,000
- **Div. II monitor: Mathur**
- **Updates:**
  - Original proposal submitted to Div. VIII (Chemical Nomenclature and Structure Representation)
  - Currently under consideration by **Project Committee**
  - Sanjay Mathur (Köln) representative from Div. II and TG member
  - Proposed \$1,500 co-funding (?)

Approved: xx-yyyy-zzzz

Planned end date: 30 June 2015

**Update on Pending Proposals: Peer-Reviewed (Awaiting Funding)**

- **2013-030-1-xxx**
- TGC: Alan Hutton (U. of Cape Town)
- TG: Constable, Laitinen, Nordlander & Powell
- [Nomenclature for metallacycles containing transition metals](#)
- Requested budget: USD 14,200
- **Div. II monitor: Rabinovich**
- Updates:
  - Original proposal submitted to Div. VIII (Chemical Nomenclature and Structure Representation)
  - Initial reviews (Div. VIII) very favorable [25 June 2013]
  - Interest/support from Div. II pending [favorable opinion from JGM]
  - Currently under consideration by **Project Committee**
  - Dan Rabinovich (USA) representative from Div. II and TG member
  - Potential contribution of USD 1,500 from Div. II (?)

*Funding Pending*

Submitted: 5 June 2013

Approved: xx-yyyy-zzzz

Planned end date: ???

- **2013-032-1-xxx**
- TGC: Adriaan van der Veen (VSL = Dutch Metrology Institute)
- TG: Possolo, Meija & Hibbert
- [Guidelines for the Derivation of Values and Uncertainties from Standard Atomic Weight Intervals](#)
- Requested budget: USD 5,000
- **Div. II monitor: ???**
- Updates:
  - Original proposal submitted to **Div. II**
  - Complementary to 2011-040-2-200 (TGC = W. A. Brand)
  - Interest from Commission I.1 [Kaoru Yamanouchi]
  - 4 favorable reviews [Rev1, V, VIII, Rev2] & 1 unfavorable review [Rev3]
  - No interest from CCE [Mustafa Sözbilir, 8 July 2013]

*Project Approval Pending*

Submitted: 1 July 2013

Approved: xx-yyyy-zzzz

Planned end date: ???

**Update on Pending Proposals: Undergoing Peer-Review**

- **2012-036-2-xxx**
- TGC: Igor M. Villa (Institut für Geologie, Bern, Switzerland)
- TG: De Bievre, Holden & Renne
- [Recommendations for Isotope Data in the Geosciences II](#)
- Focus on four nuclides used in geochronology:  $^{40}\text{K}$ ,  $^{87}\text{Rb}$ ,  $^{176}\text{Lu}$  and  $^{187}\text{Re}$ .
- Requested budget: USD 9,000 (USD \$2,000 from Div. II?)
- **Div. II monitor: ???**
- **Updates:**
  - Currently under evaluation by Div. II and external reviewers

*Revised proposal under review*

Submitted: 12 July 2013  
 Approved: xx-yyyy-zzzz  
 Planned end date: ???

- **2013-037-1-xxx**
- TGC: Christopher Ober (Cornell University, Ithaca, New York, USA)
- TG: García-Martínez, Jones, Mathur, Wilson & Zharov
- [Creating Educational Website for Materials Chemistry](#)
- Requested budget: USD 6,000 (\$1,000 from Div. II)
- **Div. II monitor: Mathur**
- **Updates:**
  - Original proposal submitted to Div. I, II & IV
  - Very good internal reviews.
  - External reviews needed/required?

*Proposal under review*

Submitted: 22 July 2013  
 Approved: xx-yyyy-zzzz  
 Planned end date: ???

- **2013-xxx-1-xxx**
- TGC: Norman Holden (Brookhaven National Laboratory)
- TG: Coplen, de Bièvre & Wieser
- [Assessment of Fundamental Understanding of Isotopic Abundances and Atomic Weights of the Chemical Elements \(2014—2015\)](#)
- Requested budget: USD 5,000
- Div. II monitor: ???
- Updates:
  - Proposal in preparation, to be submitted to Div. II

*Proposal in preparation*

Submitted: xx yyyy 2013  
 Approved: xx yyyy zzzz  
 Planned end date: ???

- **2013-xxx-1-xxx**
- TGC: Norman Holden (Brookhaven National Laboratory) & Peter Mahaffy (The King's University College)
- TG: Coplen, Walczyk, Wieser, Martin, Apotheker, Hoffman & Tarbox
- [Development and Global Dissemination of an IUPAC Interactive Electronic Isotopic Periodic Table and Supporting Resources for the Education Community](#)
- Requested budget: USD 27,840 (\$1,500 from Div. II)
- Div. II monitor: ???
- Updates:
  - Proposal in preparation, to be submitted to Div. II & CCE

*Proposal in preparation*

Submitted: xx yyyy 2013  
 Approved: xx yyyy zzzz  
 Planned end date: ???

## Summary: Project Expense vs. Budget

Through 8 July 2013	Actual	Budget	Over/ (Under) Budget	% of Budget	Planned End Date
<b>200-Inorganic</b>					
2006-016-1-200 Renne	4,650	4,900	(250)	95%	30-Jun-2012
2006-046-1-200C Karol	7,290	-	7,290	100%	Completed
2007-029-1-200C Zhu	8,971	8,980	(9)	100%	Completed
2007-031-1-200 Schönberg	13,249	13,750	(501)	96%	31-Dec-2011
2007-038-3-200 Holden	11,000	11,000	-	100%	31-Dec-2011
2008-040-1-200 Karen	-	4,200	(4,200)	-	1-Sep-2013
2009-012-2-200 Ohlstrom	11,500	11,500	-	100%	31-Dec-2012
2009-023-1-200 Wieser	3,340	8,500	(5,160)	39%	31-Dec-2013
2009-025-1-200 Wieser	2,500	2,500	-	100%	30-Jun-2012
2009-026-2-200 Berglund	-	6,000	(6,000)	-	1-Apr-2014
2009-027-1-200 Brand	6,149	9,600	(3,451)	64%	31-Dec-2012
2009-029-1-200C Hirata	12,201	13,200	(999)	92%	Completed
2009-045-1-200 Ishida	-	8,000	(8,000)	-	31-Dec-2011
2009-046-2-200 Kaiser	188	6,000	(5,812)	3%	30-Jun-2014
2011-026-1-200 Wieser	-	10,200	(10,200)	-	31-Dec-2015
2011-027-1-200 Schonberg	-	19,400	(19,400)	-	31-Dec-2013
2011-028-1-200 Zhu	-	6,400	(6,400)	-	1-Mar-2014
2011-040-2-200 Brand	1,300	7,400	(6,100)	18%	1-Mar-2014
2012-047-1-200 Karol	-	-	-	-	1-Jul-2014

Completed projects (9/2012–8/2013): 8

Active projects: 10

## 2012-13 Funding Commitments

(as of 9 August 2013)

Project Number	Chairman	Title	Commitment	Total Commitment
<b>Division II</b>				
2011-040-1-200	Willi A. Brand	Using intervals instead of fixed values for atomic weights	7,400	7,400
2011-028-1-200	Xiang Kun Zhu	Evaluation of published lead isotopic data (1950 – 2013) for a new standard atomic weight of lead	6,400	6,400
2012-047-1-200	Paul Karol	Priority claims for the discovery of elements with atomic number greater than 117	-	-
2011-026-1-200	Michael Wieser	Full calibration of a new molybdenum isotopic reference material	10,200	10,200
2012-045-1-800	Michael A. Beckett	Nomenclature for polyhedral boranes and related compounds	1,000	7,205
<b>Total Commitments (DC II)</b>			<u>25,000</u>	

## Appendix 8

### Professor Norman N. Greenwood

Norman Greenwood was born in 1925 in Australia. After education at the University of Melbourne, he came to Cambridge University for his PhD studies on an Exhibition of 1851 Fellowship in 1948. He was a Harwell Research Fellow before he began teaching at the University of Nottingham, the University of Newcastle upon Tyne and the University of Leeds. At Newcastle, he became the first chairman of Inorganic Chemistry in England. He was a Fellow of the Royal Society of Chemistry and a foreign member of the French Academy of Science.

His IUPAC experience began in 1963, when he was elected to the Atomic Weights Commission. He attended his first meeting in Paris in 1965. In 1969, he was elected as the Commission chairman and he served three terms. During his tenure on the Commission, the Commission's 1969 biennial report introduced for the first time, atomic weight uncertainties for all elements, footnotes and annotations to the Atomic Weights Table, a Table of radioactive nuclides with half-life values, a Table of atomic masses of selected nuclides and a number of definitions of terms.

The definition of atomic weight generated an inter-divisional fight with terminologists from many IUPAC Divisions that lasted a decade until the Davos, Switzerland General Assembly in 1979. To mollify educators who argued for a change of the name of the quantity 'atomic weight' to one that included the term "mass", it was pointed out that the quantity atomic weight is not a mass but a dimensionless ratio.

Other significant issues during Norman's chairmanship included the creation of a Working Party and subsequently a sub-committee on isotopic abundance measurements to assist the Commission by reviewing and evaluating the measurements in the literature and the impact of the French discovery of the two billion year old nuclear reactors at the uranium mines in Oklo, Gabon, on atomic-weight values. As a lasting legacy to the Commission, Norman prepared the first technical policy document to provide continuity for decisions that would be made by future Commission members. He stated that atomic weights are consensus values, enunciated by uniquely qualified experts, and as such, are not subject to statistical concepts.

In addition to his Commission work, Norman also served IUPAC as President of the Inorganic Chemistry Division Committee and as one of the two chemist members of the joint IUPAC-IUPAP Trans-fermium Working Party to resolve priority in discovery (synthesis) of chemical elements with nuclear charge number  $> 100$ .

Norman Greenwood died on November 14, 2012.