MINUTES OF THE INORGANIC CHEMISTRY DIVISION COMMITTEE OF IUPAC
Meeting at Helsinki 11th and 12th August 2008

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INORGANIC CHEMISTRY DIVISION COMMITTEE OF IUPAC

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Attendance: Present were *President*, Kazuyuki Tatsumi (Japan); *Vice President,* Robert Loss (Australia); *Past President*, Anthony West (U.K.), *Secretary*, Leonard Interrante (U.S.A.); *Titular Members*: Tyler Coplen (U.S.A.), Tiping Ding (China/Bejing), Javier Garcia-Martinez (Spain), Marku Leskela (Finland), Jan Reedijk (Netherlands), and Myunghyun Pik Suh (Korea); *Associate Members*, Sanjay Mathur (Germany), Ken Sakai (Japan), and Joe Takats (Canada); *National Representatives*, Pavel Karen (Norway), Ling-Kang Liu (China/Taiwan), Lars Öhrström (Sweden), and Peter Day (U.K.) (Division Project Leader).
Apologies were received from Titular Member Luis Oro and Associate Members, Alan Chadwick, Milan Drabik, and Norman Holden, who could not attend. A current list of Division members and their terms of office, obtained from the Secretariat in August 2008, is attached to these Minutes as **Appendix 1**.

1 – Greetings and Announcements from the meeting host (M. Leskela)

The meeting commenced at ca. 9:40 a.m. on Monday, August 11, 2008 in the offices of the Finnish Chemical Society in Helsinki. TM Leskela, the host of our meeting, welcomed the members and went over the arrangements for lunches and dinners.

2 – Introductions and Announcements, Amendments to the Agenda

Each of the attendees introduced themselves and described their professional affiliations and areas of expertise. The previously distributed Agenda was accepted by President Tatsumi with the addition of a report at the end, under Other Business, by TM Reedijk on a recent meeting that he had attended of the Nomenclature Division (VIII).

3 – Minutes from Division Meeting in Torino

Copies of a draft of these minutes were previously distributed by email and are now available on the IUPAC Division II web page. These Minutes had been distributed in draft form previously and amended according to corrections and comments received from the Division members. The resulting final version of the Minutes were approved without further change.

4 – Report on the status of the action items from the Torino meeting; appointment of a Division member to record a list of action items for this and the next Division meeting (Interrante, Tatsumi)

The action items from the Torino meeting were included in the Minutes to that meeting as Appendix 9. These Action items were presented by Interrante and it appears that all of them have been addressed by the designated individual. Coplen agreed to take over the responsibility for noting the Action Items for the current meeting, which are included in these Minutes as **Appendix 2**.

5 – Reports of IUPAC Bureau and Executive Actions (Tatsumi + excerpts from the Draft Minutes of the Bureau Meeting in Istanbul of particular interest to the Division)

The Bureau met in Istanbul in March 2008**.** At this meeting Secretary General Black reported on the progress of the Task Group charged with revising the IUPAC Statutes and Guidelines. At

their meeting in February the TG prepared a draft of the revised guidelines which was approved at the Bureau meeting and is being circulated to the NAOs so that any comments from the NAOs can be considered in time to revise the Statutes and Bylaws and circulate them ten months before the Council meeting.

CCE President Mahaffy reported that the Ethiopian Chemical Society has worked with their UNESCO delegation to place a recommendation for the United Nations to proclaim 2011 as an International Year of Chemistry on the agenda for the April 2008 UNESCO 179th Executive Board Meeting. Several other countries will also co-sponsor the recommendation. If approved by the Executive Board, this recommendation will go to the UNESCO General Meeting and then to the UN General Assembly in 2009 for final approval. It was agreed that if the UN did not approve designation, IUPAC would proceed with a World Year of Chemistry in 2011 in any case.

The 2009 G.A. and World Chemistry Congress will be held in Glasgow, Scotland, with the Official opening of the Congress on August 2nd. **The Division Committee meetings will be held on Friday and Saturday, July 31 and August 1, with the Standing Committee meetings on August 2nd and 3rd.** The 46th G.A. and 43rd W.C.G. will be held in San Juan Puerto Rico on July 30 – August 7, 2011. A web site for this Congress has already been set up http://www.iupac2011.org/. Secr. Gen. Black noted that the time needed for advance planning of a Congress was in some cases more than the four years allowed by the IUPAC approval process. He proposed that in 2009 bids should be solicited for the 2013 and 2015 Congresses and General Assemblies. In subsequent years, this would mean that a site for the Congress and General Assembly would be approved six years in advance. The Bureau approved this proposal.

Treasurer Corish noted that while the Union's reserves are adequate for the near to mid term, there are possible long term financial issues that could arise due to the decline in the income realized from the Union's journal, *Pure and Applied Chemistry*. He also noted a number of other developments, including the introduction of a Strategic Opportunities Fund and the success of the project system in promoting the work of IUPAC. He also commented on the success of the concept of calculating National Subscriptions in national currencies in reducing exchange rate-related payment problems for NAOs.

Prof. Bull introduced his report on *PAC* by noting he did not view *PAC* as being in decline but in transition. His report summarized the trends in the content and the impact of *PAC* since the decision made to appoint a Scientific Editor and to actively control the content rather than relying on the individual conference editors. The impact factor of the journal has increased from 1.257 in 2000 to 1.920 in 2006 and its rank in the General Chemistry category is now 35th out of 124 journals as measured by Impact Factor and 16th as measured by Total Cites. He noted that many of the articles in *PAC* have a long citation life, that is, the number of citations for articles more than five years old continues to increase each year. He observed that the journal now publishes the articles from most conferences in the calendar year following the conference, in many cases
twelve months or less after the date of the conference. The online journal was now available from volume 21, 1970, and the remaining archival volumes were expected to be online by the end of 2008. Prof. Bull summarized by saying that the quality and impact of *PAC* were both increasing and the expectation was that this improvement could be continued in the future.

As part of a discussion on project commitments and expense, IUPAC President Jin urged the

Division Presidents and Standing Committee Chairs to examine carefully those projects that are overdue with no expenditures. Prof. Henry commented on the need for the Secretariat to begin sending letters to Divisions and Standing Committees asking them to either justify the continuation of such projects or terminate them.

Discovery And Naming Of New Elements

Prof. Black reported that the Joint Working Party had decided to divide its work into two parts; they will first consider the evidence regarding the element of atomic number 112 and then claims regarding elements of higher atomic number. This will enable the naming process for 112 to proceed while the claims for elements 113 et seq. are resolved. The report on the element of atomic number 112 has been written and has been circulated to the laboratories concerned. After their comments have been taken into account, the Executive Committees of IUPAC and IUPAP will review the report. If both Unions approve the report, it will be reviewed by ICTNS prior to publication in *PAC* as a Technical Report. After approval of the report for publication, the Inorganic Chemistry Division will request the group named as the discoverer of element 112 to suggest a name and symbol for the element. A Recommendation will be made available for Public Comment and will then be brought to the Bureau or Council, whichever meets at the appropriate time, for approval. The Recommendation will then be published in *PAC*. The Council previously approved a motion to delegate to the Bureau the approval of a name for element 112 if there is no controversy regarding the assignment of priority of discovery or regarding the proposed name after the public comment period.

IUPAC Web Site And Other Publicity About The Union

Dr. Jost noted that the major event regarding the web site is the conversion of the existing site to one based on XML technology. The implications of this change in the short term are that significant functionality has been lost and it will be some time, perhaps months, before most aspects of the site are fully functional. While this transition period will last for at least the early part of 2008, the web developers felt it was better to make the new site public rather than continuing to work on a test site. Their judgment is that development of the test site had reached the point that only by placing the site in use could further progress be made. Dr. Meyers reported that this decision meant that information regarding new projects had not been incorporated into the new site and that it was not clear when the site would become current with respect to projects. Her prognosis was that it would be some time before she would be in a position to provide the same rapid response using the new site as had been possible on the old. There were a number of comments regarding the favorable impression given by the new site. Dr. Meyers pointed out that the change in the underlying infrastructure of the site did not yet address the concerns regarding ease of navigation and the need to address the requirements of both IUPAC members and the public. These concerns would be addressed, to some extent, by work that is currently being done to design a new main page as well as improvements in the internal navigation of the site. Dr. Jost reported that Discussion Boards for Divisions and Standing Committees are being set up on the IUPAC web site with the help of FIZ Chemie staff. This addresses a long-standing request of Divisions and Standing Committees. New Discussion Boards would replace the existing Google Groups for the Bureau, EC, and DPs/STCCs.

6 – Reports from Other Division Representatives (CCE: Garcia; COCI: Leskela)

Garcia attended the CCE meeting in Torino and also the one that was held in Philadelphia at the Chemical Heritige Foundation in January 2008. He noted that the CCE is a very active

organization with lots of projects and activities and a strongly committed membership. Over 30 people attended the meeting in Torino, which included workshops on various topics for the attendees. The 20th Intl. Conference on Chemical Education was held in Mauritius on 3-8 August '08 with the title: "Chemistry in the Information & Communications Technologies Age", and was attended by over 500 people. The CCE will play a large role in the IUPAC recognition of the IYOC in 2011 and is just beginning to explore potential programs and sources of funding in the member countries. IUPAC and UNESCO has provided a limited amount of seed funds and the ACS and RSC has offered to help. When we think about projects for our Division, we should always consider the educational aspects and possible joint efforts with the CCE.

Reedijk agreed to serve as the Inorganic Division representative on Division VIII (Nomenclature) and will report on a recent meeting of this Committee at the end of this meeting.

Leskela reported that COCI (Committee on Chemistry and Industry) held their annual meeting in Marl, Germany on April 26-27. He was unable to attend on that date due to other commitments; however, he was able to obtain a report of this meeting from the Finnish industrial representative who did attend. COCI will be active for the IYOC and will try to find sponsors. The various active Projects sponsored by COCI were described and among the Project proposals under development was one entitled "Nanotechnology and Human Health". A full report on COCI was received from Leskela and is attached to these Minutes as **Appendix 3**.

7 – The Status of the Information Packet for New Division Members

Loss indicated that a draft table of contents for the Information Packet was sent out to the members in September. He received only two replies, but he will progress this to some kind of draft to send to the members for comments and additions, with the goal of having something ready for the new group of new members in time for our next meeting at the Glascow G.A.

This Information Pack is intended to provide information for new/prospective Division members to be better prepared to participate effectively in Divisional meetings or assist them in deciding on becoming Divisional members. A draft table of contents of some 10 items is under development and will be the subject of informal discussion during the remainder of this Divisional meeting. It is anticipated that a draft pack will be available for Divisional members before the end of 2008.

8 – Report on the use of Wolfram as an Alternative Name for Tungsten

As requested when this topic came up for discussion at our meeting in Torino, N. Holden agreed to look up the history of the naming of this element and to prepare a report for our information at the current meeting. This report is attached to these Minutes as **Appendix 4**. Interrante agreed to send a message to Holden, thanking him for this report (**ACTION ITEM**). At our Torino meeting, Oro pointed out that wolfram had been removed as an allowed alternative name for element number 74 from the last edition of the "red book". This has caused some concern/frustration among the Spanish community, homeland of the discovers of this element, as recently described in Goya, P.; Román. P. Wolfram vs. Tungsten. *Chemistry International* 2005, 27 (4), 26–27. After some discussion, it was suggested that we revisit the question at our next Division meeting after seeking advice from experts in Division VIII. Prior to the meeting, Jeff Leigh also provided some background regarding the sequence of events that followed the original discovery of element #74 and the subsequent history of the two names, wolfram and tungsten, that have been used to refer to this element.

After considerable discussion, which included a presentation by Garcia in support of retaining wolfram as an alternative name, a vote was taken on the following motion: "Division II recommends that Division VIII consider going back to the designation tungsten (wolfram) for element #74, that was used in the 1990 edition of the Red Book". This motion was passed by a majority of the Division members present and Secretary Interrante was charged (**ACTION ITEM**) with preparing a letter (or message) to Division VIII to inform them of our recommendation and to ask them to include a discussion on this topic on the agenda of their next meeting. In support of this recommendation, Garcia will present new evidence on the tungsten/wolfram naming issue of element 74 to Division VIII (**ACTION ITEM**).

9 – Report on the Status of the New Elements

Sean Corish provided a written report on this subject, which was read by the Division Secretary and is attached to these Minutes as **Appendix 5**. (see also Item 5 of these Minutes, which contains a section on this subject taken from a draft of the Minutes of the Torino Bureau Meeting received by Interrante). Progress was made by the IUPAC/IUPAP Joint Working Group in completing a report for publication in PAC on an element with Atomic Number 112. This report has been reviewed by referees and the claimant laboratories and all changes will be incorporated in a revised manuscript for submission. They also reviewed the claims for the discoveries of elements with Atomic Numbers 113, 114, 115, 116, and 118; however, it was not found to be possible to identify and/find unambiguous references for all of the events claimed and the relevant laboratories have been asked to clarify their data. Corish agreed to continue to oversee the work of the JWG and to report back to the Division at our next meeting.

10 – Report on the 2009 IUPAC WCC

Reedijk reported that the planning for the 2009 IUPAC World Chemistry Cngress was proceeding well and that a list of plenary lecturers have been developed and the following seven Themes have been established for the Congress: Chemistry for Health, Analysis & Detection, Materials (including MC9), Communication & Education, Industry & Innovation, Energy & Environment and Synthesis & Mechanisms. The 9th in a continuing series of Materials Chemistry Conferences (MC9) will run as part of this Congress. The Congress website will be open in August, 2008.

11 – Review of Division budget allocations and expenditures

(see item 15, Review of current Project Status).

12 – Report of the Materials Chemistry Subcommittee (West)

Division Past President A. West, who agreed to serve as the Subcommittee Chair after the previous Chair, Sean Corish became IUPAC Treasurer, reported on the proceedings of the Subcommittee meeting, which was held prior to this meeting, on the afternoon of August 10, 2008. Attending this meeting was President Tatsumi, TMs West, Garcia, Interrante, Leskela, AM Mathur and Project Leader P. Day. The status of two long-standing Division sponsored, materials-related, conferences and workshops was summarized. The next High Temperature Materials Chemistry (HTMC) conference is set for 2009 in Davis, Calif. with A. Navrotsky as Chairperson. The Workshops on Advanced Materials (WAM) series is currently in hiatus while an alternative site and organizers for WAM IV are being evaluated. China/Taiwan has been suggested and S.M. Mathur will contact the prospective organizers to evaluate this possibility. The several Projects that fall under the responsibility of this Subcommittee were reviewed and

Day and Garcia/Mathur presented, at both the Subcommittee meeting and at this Division meeting, reports on their respective projects (see item 15 for an overall summary of the Division Projects). A possible new project on the teaching of nanoscience and technology was in the formative stages and was discussed briefly by Garcia.

13 – Report on the Division Newsletter

R. Loss reported that he had received input from five Division members and one former Divisional member and took information from the IUPAC website and other sources in preparing the first (ever) edition of the Inorganic Division Newsletter, which was produced and distributed in May 2008 (see **Appendix 6**). In addition to the members of Division II, this Newsletter was sent to all of the IUPAC Division Presidents and the Executive Committee. He received six congratulatory emails regarding this Newsletter, including one from President Henry. In the future, he would like to receive input regarding news from outside, as well as inside, IUPAC from the Division members and including brief summaries of Projects, information regarding upcoming meetings, etc., preferably accompanied by photos. He would also like to expand the distribution of this Newsletter, outside of IUPAC and asked the members to circulate copies within their own chemical societies. He indicated that, "in terms of the next newsletter what I would really like to do is to feature:

- some research success and and brief stories about Divisional members

- brief stories of project completions - these shouldn't be a copy of the reports but be redrafted for a newsletter style with photos."

The members congratulated Bob for the outstanding job that he had done with this first Newsletter and gave him a round of applause for his efforts in putting this together.

14 – Report from Commission on Isotopic Abundances and Atomic Weights and the Sub-committee on the Natural Assessment of Fundamental Understanding

Loss gave a brief report on the Commission, which last met in Pisa, Italy in advance of the Torino G.A. Outside of project work there has been limited CIAAW activity since the Pisa meetings and workshops. The secretary, Dr Michael Weiser, has produced a comprehensive set of updated minutes from the PISA workshop and meetings, and the 2007 TSAW PAC publication (minor edits is almost ready to upload for publication). The rate of publications that need consideration and evaluation by the commission and related projects continues to expand. In terms of up coming meetings and workshop there is advanced planning to hold the next round of meetings and workshops at the Vienna IAEA on 24 - 30 July 2009 using workshops across several current projects and the main CIAAW meeting.

Prior to this Meeting, Division AM Holden had submitted to the Secretary a written report on the activities of the Subcommittee on the Natural Assessment of Fundamental Understanding (SNAFU), which is attached to these Minutes as **Appendix 7.** He recommended that the Inorganic Chemistry Division Committee (**ACTION ITEM**) and IUPAC extend the deadline for this Task Group (Project 2006-025-1-200) to December 31, 2009 (at no additional cost to IUPAC) to allow time for the Task Group to complete their discussions and recommendations to CIAAW on the above topics.

15 – Review of Current Projects Status

Project Coordinator Coplen reported that the Division currently has 15 funded projects, 7 of which have extended past their planned ending date. In comparison, at our Torino meeting, we had 13 funded projects, only two of which were extended past their planned ending dates (second best among the Divisions in this category). We are currently in the middle of the pack among the Divisions in terms of overdue projects, but it is better than it appears, as several of these projects have completed their work and submitted reports, but are awaiting their publication in PAC to be considered "officially" complete.

2000-024-1-200: Teaching High Temperature Materials Chemistry; Project Leader, Balducci; Division Monitor, G. Rosenblatt; $4,800 allocated, $4,508 spent; Planned completetion date: 31-Dec-2007

As was reported at our Torino meeting by Balducci, this project was effectively completed and a report was written and circulated to the Task Group members and other colleagues for their advice and corrections. However, this is still listed as incomplete by the Secretariat. West agreed to follow up on this with Balducci **(ACTION ITEM).** (After this meeting, it was learned that a report had been submitted to PAC for publication and was accepted with minor revisions. These revisions were subsequently completed and the report is now scheduled for publication).

2001-015-1-100: Standard Potentials of Radicals; Project Leader, Stanbury; Division Monitor, G. Rosenblatt; $21,000 allocated (with Division I as primary sponsor), $20,525 spent; Planned completion date: June 2008

The following report was submitted to the Secretary by Stanbury by email:

"I sent an update on my Radical Potentials in aqueous solution project to Chris Brett on April 16, 2008. Since then we have completed an evaluation of 2,6-dimethylbenzoquinone, which is essential in defining the standard potential of superoxide. The progress described in my update sent to Chris Brett follows: "The inorganic radicals are nearing completion, with recent (since July '07) evaluations having been made for hydroxylamine and nitrogen dioxide. Superoxide is the last "important" radical to be evaluated, but it isn't finished yet. The problem with superoxide is that we have a very good idea of what the approximate redox potential is, but we are having trouble deciding on a recommended value with a meaningful uncertainty. The superoxide potential is dependent on equilibria with various organic radicals, and so we are in the thick of trying to decide on recommendations for those organic radicals. Specifically, duroquinone, indigodisulfonate, naphthoquinonesulfonate, and dimethylquinone are receiving close scrutiny. Among the organic radicals, we have made recent (since July '07) evaluations for trimethyxybenzene, t-butylquinone, sesamol, 3,5-dimethylphenol, 3,4-dimethylphenol, and 2,6-dimethylphenol. On the prompting of the editor of JPCRD we are now giving serious consideration to publishing our work in installments. The first would be the inorganic radicals. Once we finish superoxide we can anticipate submitting a manuscript on the inorganic radicals later this year ('08)." David Stanbury

2001-019-1-200: Guidelines for mass spectrometric isotope ratio measurements; Project Leader, Walczyk, Division Monitor, Coplen; $2,000 allocated, $2,000 spent; Planned Ending Date: 31-Dec-2007

This project is also effectively completed and the publication of two reports that were submitted to PAC is awaited. A combined final report that covers this and 3 other Commission projects

entitled: Atomic Weights of the Elements 2007, is now in final revision. This is the final report for: 2001-019-1-200, Walczyk; 2003-033-1-200, Wieser; 2003-031-1-200, Berglund; and 2005-027-1-200, Berglund.

2003-031-1-200: Isotopic Compositions of Selected Elements; Project Leader, Berglund, Division Monitor, Loss; $12,000 allocated, $13,026 spent; Planned Ending Date: 31-Dec-2007

This project is also completed with the revision of the final report nearly complete (see 2001-019-1-200 above).

2003-033-1-200: Determination of Atomic Weights Using New Analytical Techniques; Project Leader, Wieser, Division Monitor, Loss; $14,800 allocated, $14,800 spent; Planned Ending Date: 1-May-2008

Project effectively completed; publication of final report awaited (see 2001-019-1-200 above).

2003-034-1-200: Classification, Terminology and Nomenclature of Borophosphates, Kniep, Division Monitor, West; $16,000 allocated (with Division VIII), spent $0; Planned Ending Date: 31-Dec-2008

This project, whose objective was to provide terminology, classification and naming of novel borophosphate compounds depending on structure and linking principles, was started in 2003 by Prof. Meral Kizilyalli. The planned ending date was initially set for 31-December 2006. After her untimely death in 2004, Prof. Kniep took over the project and the planned ending date was extended to 31-Dec-2008. He subsequently published a review entitled, "Structural Chemistry of Borophosphates, Metalloborophosphates, and Related Compounds", *Z. Anorg. Allg. Chem.* 2007, 633, 1517-1540. Prof. Jing-Tai Zhao, a Task Group member agreed to organize a meeting in China in conjunction with the Beijing GA to review the latest progress and formulate a report based on the aforementioned review paper by Bastian Ewald, Ya-Xi Huang, and Rüdiger Kniep. Prof. Zhao's report on the task group meeting is attached to these Minutes as **Appendix 8**. With this report, the Task Group has concluded their work on this project by deciding that the objectives could not be achieved due to the inherent complexity of the problem and that it should be considered abandoned. A paragraph, noting the abandonment of this project is needed to officially delete it from our list of current projects. The Division Monitor, West, agreed to prepare and submit this paragraph to the Secretariat (**ACTION ITEM**).

2005-001-1-200: Towards Defining Materials Chemistry, Project Leader, Day, Division Monitor, West; $8,000 allocated, spent $2,290; Planned Ending Date: 31-Dec-2007

In his presentation to the Division (see item 12), P. Day described the background and objectives of this project, which seeks to: "assemble, collate and disseminate information about the scope of the newly-emerging discipline of materials chemistry, leading to an authoritative definition of the subject within the family of chemical sciences." During the course of this project, three meetings were held in which three of the Task Group (Day, Interrante and West) met, along with, at the first meeting, ca. 50 other scientists who are working in this area and, at the second, with the Subcommittee on Materials Chemistry at the Subcommittee meeting in Torino. The first meeting was held as part of an international Workshop in London, England in 2005, at the offices of the Royal Society of Chemistry and the last one, which involved just the above three TG members, was held on Sunday morning (Aug. 10) immediately preceding the current Division meeting in Helsinki. At this last meeting agreement was reached on a suggested

definition of materials chemistry as: "*Materials chemistry comprises the application of chemistry to the design, synthesis, characterisation, processing, understanding and utilization of materials*, *particularly those with useful, or potentially useful, physical properties*". This proposed definition draws upon the existing definitions for the terms "chemistry" and "materials", while acknowledging that the "materials" that have been (and are likely to be in the future) of particular interest to the practitioners of materials chemistry are generally those that have certain properties, e.g., mechanical, electrical, magnetic, optical, catalytic, biological that make them useful, or potentially useful, in a functional sense. Thus the keywords "useful" and "properties" were added to further define the "materials" that are most likely to be the subject of investigation in this field as well as the fact that functionality, or the prospect of functionality, is a major driver for research and development in the field.

A preliminary report relating to this project has been submitted by Day to PAC for publication and a final report, which may take the form of a recommendation was near completion at the time of this Division meeting. This will be circulated to the other Task Group members for changes and additions and then submitted to PAC. In addition to recommending a definition of materials chemistry, this report also notes that the ubiquity and importance of this subject both for science and industry, merit a more prominent status for it in the IUPAC structure than the current Subdivision arrangement. Indeed, although the Subcommittee on Materials Chemistry was intended from the outset to function as an interdisciplinary committee, with members from Divisions other than Division II, it has proven difficult under the current structure to attract to its meetings (especially off-year meetings) a sufficiently broad representation from other Divisions.

The Project WG recommends that IUPAC address the present deficiency by establishing a cross-divisional Committee that would work with all of the current IUPAC Divisions to develop and co-sponsor new projects, in the area of chemical education, nomenclature, terminology, health and safety, etc., that will increase the recognition of the current and future importance of this field to the international chemistry community. West agreed to pursue this with the IUPAC Executive Committee and to seek to have an item placed on the agenda of the next Council meeting to consider this recommendation (**ACTION ITEM**).

2005-022-1-200: Calibration of Organic and Inorganic Oxygen-bearing Isotopic Reference Materials, Project Leaders, Brand/Coplen, Division Monitor, Coplen; $12,000 allocated, spent $10,546; Planned Ending Date: 31-Dec-2007

The Goal: Measurement of the same homogeneous sample by any laboratory worldwide should yield the same isotopic composition within analytical uncertainty. The fraction of ^{18}O in many naturally occurring substances can be used to infer origin, source, or history of the substance. Forensic and environmental applications. Aim is to calibrate 3 waters, 3 sulfates, 3 nitrates, and 3 organic O-bearing isotopic reference materials. Far more difficult analytically than anticipated; 5300 measurements by six laboratories. Final report in preparation.

2005-027-1-200: Evaluated Published Isotope Ratio Data (2005-2007); Project Leader, Berglund, Division Monitor, Loss; $9,800 allocated, $8,700 spent; Planned Ending Date: 31-Dec-2007

This project has been completed and a final report covering this and 3 other Division projects (see 2003-033-1-200 above) is near being submitted for publication to PAC.

2005-043-1-400: Terminology for self-assembly and aggregation of polymers; Project Leader, Ober, Division Monitor, Chadwick, Allocated: $6,000 (2k from Div II), Spent: 5,198; Planned Ending Date: 1-Apr-2009

The following report was received from C. Ober regarding this, and his other, project (see 2006-28-1-400 below):

We have made substantial progress on both activities.

1) Terminology for self-assembly and aggregation of polymers

Task group: T. Chang, M. Hess, P. Hodge, J. I. Jin, P. Kratochvil, G. Moad, M. Vert

Start Date: 2006

Objective: define terminology for self-assembling, organized non-crystalline polymer materials

We have a draft document that is being circulated. The document has numerous terms that have been compared to the Gold book and Blue book. Additional terms are now being added. It is conceivable the document will be nearly finished by Glasgow WCC.

2006-016-1-200: Recommendations for Isotope Data in Geosciences, Project Leader, Renne, Division Monitor, Holden, $4,900 allocated, $0 spent; Planned Ending Date: 1-Oct-2008

The object is to update and harmonize recommendations on half-lives and isotopic compositions

Progress: Bilateral meetings in Beijing, Berkeley, & Upton (NY). Issues Identified:

Standard and symbol used for the measurement of the half-lives of long-lived radionuclides used for age determinations. A standard unit of time is needed.

Year is not a defined quantity in SI; instead the second is. Year decreases by 0.530 s per century.

For the symbol of time unit, year, the IUPAP's SUN (Symbols, Units and Nomenclature) and IUPAC's "Green Book" recommend "a" for annum. Problem: Others don't.

Uncertainty: For a publication on a half-life measurement for which no specification is given for the standard unit of the year, the uncertainty could be as large as +0.07% for a non-leap year measurement, while the uncertainty could be as large as – 0.21% for a leap year measurement merely due to the uncertainty in the standard. The quoted half-life value would have an inherent "type B" uncertainty of 0.21% (see the International Organization for Standardization, ISO, Guide to the Expression of Uncertainty in Measurement, GUM), independent of any other type A or type B uncertainties. This could limit the accuracy of age determinations to no better than 0.2%, depending on the half-life measurement used.

Results: A publication was submitted to Pure and Applied Chemistry and comments from the editor of PAC are being resolved now.

Future Plans: Due to the problems associated with the standard unit, year, an effort to reevaluate the major publications on half-lives being used for age determinations will begin to assess the type A and type B uncertainties in these publications.

Recommendations (ACTION ITEM): It is recommended that Division II and IUPAC extend the deadline (by 15 months) for this Task Group to December 31, 2009 (at no additional cost to IUGS or IUPAC) to allow time for the reevaluation of the half-life publications.

A similar request is being made to the IUGS Executive Committee to extend their funding period for this Task Group to December 31, 2009 also. A written report on this project was submitted by Holden and is attached to these Minutes as **Appendix 9**.

2006-025-1-200: Assessment of fundamental understanding of isotopic abundances and atomic weights of the chemical elements (SNAFU for short); Project Leader, Holden, Division Monitor, Holden, Allocated: $9,800, Spent: $6,861; Planned Ending Date: 1-Oct-2008

Status: Met in Sevres, France in July 2007 at BIPM. Reported on recommendations to Commission on Isotopic Abundances and Atomic Weights (CIIAW) in July 2007. CIAAW accepted 24 of 27 recommendations. The Task Group is reviewing the remaining three recommendations and other items. A subgroup of members of the Task Group and the CIAAW Secretary presented a poster at the 2008 Conference on Geochemistry (Vancouver, B. C., Canada). The paper dealt with the introduction of ranges of values for the presentation of Standard Atomic Weights, in lieu of presenting values and uncertainties (the present method), where some of these stated uncertainties might be asymmetric in nature (see Appendix 6 for a full report on this project).

Topics for Discussion

- With the introduction of ranges of values as a possible method of expressing atomic weight uncertainty limits, discuss and make recommendations to CIAAW on whether ranges are a better method for uncertainty treatment, which could incorporate asymmetric uncertainties.
- Determine the best method to incorporate both uncertainty and isotopic variation within a single parameter.
- Provide input to the CIAAW on the question "is our reported uncertainty interval associated with Standard Atomic Weight values published in the Table of Standard Atomic Weights (TSAW) a "standard" uncertainty, a "combined" uncertainty, an "expanded" uncertainty or some other type of uncertainty?"
  - IUPAC is an international scientific union professing to follow the International Organization on Standardization (ISO) Guide to the Expression of Uncertainty in Measurement (GUM). Does CIAAW in fact follow these regulations?
- Review the concept of rectangular distributions and Gaussian distributions.
- Decide what type of distribution CIAAW should use in their evaluations and justify the decision.
- Clarify what is meant by a calibrated measurement system before recommending that the scientific community's data should be based on such a calibrated measurement system.
- Clarify the use of a reference material that is available to other laboratories for experimenters to base their measurements on.
- Discuss and recommend a consistent publication cycle time for the published reports on the recommended Table of Isotopic Composition Evaluations (TICE).

- Develop a comprehensive system to avoid missing published papers for consideration by the subcommittee on isotopic abundance measurements (SIAM) and CIAAW to be used as new best measurements and for isotopic abundance variations.
- Determine whether the definition of the atomic weight requires a revision.
- Review the usage and the wording of footnotes and annotations for the Table of Standard Atomic Weights (TSAW) as published by CIAAW. Perform this review in the case of presenting values and uncertainties, as well as for the case of the use of recommended ranges in the published Tables.

Future Plans and Recommendations

- Due to the numerous problems that have been referred to the Task Group by CIAAW, further work must be carried out by SNAFU prior to the next CIAAW meeting in Vienna, Austria during the summer of 2009.
- It is recommended that the Inorganic Chemistry Division Committee and IUPAC extend the deadline for this Task Group to December 31, 2009 (at no additional cost to IUPAC) to allow time for the Task Group to complete their discussions and recommendations to CIAAW on the above topics **(ACTION ITEM)**. See Appendix 7 for a full report on this project.

2006-28-1-400: Terminology for conducting, electroactive and field-responsive polymers; Project Leader, Ober, Division Monitor, Chadwick; Allocated: $6,000 total (with Div IV), Spent: $4,431; Planned Ending Date: 1-Sept-2009

Comment: With recent advances in the realm of organic electronics for displays, solar cells, and other applications, the entire field of electroactive polymers is of growing importance. This project is aimed at proposing a list of terms and definitions to be accepted and respected by chemists and others working as materials scientists within academia and industry.

2) Terminology for conducting, electroactive and field-responsive polymers

Leaders: F. Schué, J. Vohlidal

Task group: M. Hess, R Hiorn, J.-I. Jin, R. Jones, C. K. Ober, M. Nowakowska, F. Schué, J. Stejskal

Start date: 2007

Objective: identify terminology for conducting, conjugated polymers to unify language between chemistry, physics and materials communities.

The document has made enormous progress. Terms have been vetted for the Gold book and at the last Division meeting, work was parcelled out to refine definitions. This document is very near completion.

Chris Ober

2006-046-1-200: Priority claims for the discovery of elements with atomic number greater than 111; Project Leader, Karol, Division Monitor, Corish; Allocated, $10,200, Spent: $7,290, Planned Ending Date: 1-Aug-2009

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 fur Schwerionenforschung mbH, Darmstadt, Germany; for element 112

See items 5 and 9, and Appendix 5 for further details regarding this project.

2007-028-1-200: Evaluated Published Isotope Ratio Data (2007-2009); Project Leader, Berglund, Division Monitor, Ding, Allocated, $12,800, Spent: $0; Planned Ending Date: 31-Dec-09

A meeting is planned as part of the next CIAAW meeting in Vienna, Austria (2009). This project involves data evaluation required for the updating of the Table of Isotopic Compositions of the Elements (TICE) and the Table of Standard Atomic Weights of the Elements (TSAW).

2007-031-1-200: Evaluated Compilation of International Reference Materials for Isotope Abundance Measurements, Project Leader, Schönberg, Division Monitor, Loss; Allocated, $13,750, spent $0; Planned Ending Date: 31-Dec-2010

Comment: recently funded

2007-038-3-200: Development of an Isotopic Periodic Table for the Educational Community, Project Leader, Holden, Division Monitor, Garcia, Allocated, $11,000, spent $0; Planned Ending Date: 31-Dec-2010

Comment: Recently funded; with Committee on Chemical Education (CCE)

- This project originally had three aspects:
    - A scientific part
    - An educational aspect
    - An information technology (IT) portion.
- The project was recommended by SNAFU to Commission II.1 (CIAAW) in Pisa, Italy in July 2007.
- After a series of lengthy negotiations with the IUPAC Projects Committee (PC), it was approved and funded (15-Apr-08) for a considerably lower budget and without the IT component.
- After the completion of this reduced project, it is hoped that a follow-on project including the IT component will be submitted to and funded by the PC.

- This project was planned to begin during summer of 2008.

Objectives

- Clarify the role of isotopes in chemistry and other sciences.
- This project along with the follow-on project will develop, with the help of CCE, learner oriented materials on an interactive periodic table emphasizing isotopes.
- The web-site version of the periodic table will be addressed in the subsequent project proposal.

Results: The Task Group is just beginning to organize and to examine the materials that will be needed in terms of both basic and applied usage of isotopes in science.

Future plans: The initial effort will be done via e-mail communications.

When sufficient material has been collected across the periodic table of elements, a meeting will be planned for the summer of 2009, prior to the CIAAW meeting, which is planned at the IAEA in Vienna, Austria in late July 2009 (see **Appendix 10** for a full report on this Project).

2007-040-2-200: Analysis of the Usage of NanoScience and Technology in Chemistry Project Leader: Martinez, Division Monitor, Interrante, Allocated $4,000, spent $0; Planned Ending Date: 31-Dec-2009

A presentation on this project was made by Garcia and Mathur as part of the Materials Chemistry Subcommittee report presented earlier and a written preliminary report (50 pages, including a series of keyword correlation maps generated by using Bibexcel bibliometric freeware developed by Prof O. Persson (Umeå University)) was submitted to the Secretary at the meeting and is available to interested Division members upon request. Despite the short time since it was officially started, considerable progress has been made, while no funds have been expended as yet.

The overall objectives of this project are:

"To map and critically study the use of the prefix *nano* in various fields of Chemistry. For this purpose, we will use the different search engines available in the web to compare the usage of nano-containing terms. We will also evaluate the evolution of different terms containing nano- and their acceptance and relevance to identify the most popular terminology. We will map the evolution and usage of nano-containing descriptive terms according to different criteria, and critically analyze their validity in scientific (chemical) language. This project represents the first step towards analyzing the impact of nano- in Chemistry terminology."

"The scope of this project is to study the use of nano- terminology in Chemistry, analyzing its evolution with time, by country, its penetration among the various chemical disciplines, and to determine what are the most popular nanowords."

"The methodology proposed is the following. In a first step, we will use widely popular Chemistry search engines, such as Sci Finder, and the ones provided by the CAS and RSC.

We will plot the hits on nano* from every search engine *vs* time to analyze its time evolution. In a second step, we will repeat the process by restricting the search to some of the most highly cited journals of each chemistry discipline, to learn if nano- terminology has impacted all the areas of Chemistry, and if so, to what extent and at what rate.

Following this, we will extend our search to patents, as a step further toward R&D and commercialization. Again, search engines will be used to determine the number of patents related to nanotechnology issued by year and country.

In parallel to our own research, we will look at various reports published on nanotechnology, to get more information on funding by countries, impact on the national GPD, etc… Also, we will determine what Chemistry subjects are taught in the books on nanotechnology and the terminology used.

Finally, we will determine the most popular chemical terminology related to nanotechnology. To get this information we will use words in titles and as keywords in Chemistry journals from search engines like Scifinder, CAS and RSC. The meaning and implication of these words will be critically analyzed."

The following preliminary findings and observations were made as part of an assessment keywords found in 16 chemistry journals that were selected as the most highly cited journals of each chemistry discipline.

Findings and Observations

Nanotechnology Share of Papers in Leading Chemistry Journals

- The share of nanotechnology papers in chemistry journals has more than doubled over the past ten years from 12% in 1996-7 to 26% in 2006-7.
- While there is an overall trend towards a growing share of nanotechnology papers in almost all chemistry journals, there is considerable variation.
    - Nanotechnology papers account for more than 50% of all articles and reviews in a journal, such as *Chemistry of Materials,* 40% or more in journals, such as *Macromolecules* and *Journal of Physical Chemistry*.
    - General journals have a 'balanced' number of nanotechnology related papers close to the average value of above 20% (in 2006).
    - Journals in the inorganic and analytical chemistry cover nanotechnology ton a similar extent.
    - Organic chemistry, environmental and medicinal chemistry related journals have experienced a growth in nano-papers while the percentage of nanotechnology papers still remains at around 10%
- This difference in 'nanotechnology intensity' of certain subfields of chemistry becomes visible when one compares the share of nanotechnology papers in a given journal to the average.
    - Chemical engineering seems to be apart from the abovementioned fields a specialty to which nanotechnology is not as frequently mentioned as in other cases.
    - Education in chemistry is another, perhaps not very suprising area of low nanotechnology coverage.

Current Division II Budget

- Total biennial allocation: USD 53,200
- Expenditures (as of 1-Aug-08): USD 25,920
  - 2007-031-1-200, Schönberg, USD 5,750
  - 2007-038-3-200, Holden, USD 1,000
  - 2007-040-2-200, Garcia Martinez, USD 4,000
  - Travel to this meeting, USD 15,170

  (further travel costs were anticipated after the conclusion of this meeting)

At this point, the meeting was concluded for the day at 5:15pm. It was called to order by the President again at 9:40am on Tuesday, August 12.

16 – Report of Nominating Committee for the 2009 Division election (Loss)

Vice-President Loss, the Nominations Committee Chair, reviewed the current status of the Division TMs and noted whose terms were ending and who would be eligible for renomination (see Appendix 1 for a list of the current TMs and their terms of office). The terms of TMs Coplen, Leskela, Reedijk and Suh are ending in 2009 and, according to the IUPAC Rules, none are eligible for renomination as TM. The terms of none of the current Division Officers, except for Past President West, who is unavailable for re-election, are ending in 2009, thus there will be no new positions open for Division Officers. Therefore, four new TMs will be elected in the 2009 election, but no officers. The Nominations Committee, which includes three members from outside IUPAC, as well as Loss and Interrante from Division II, will now solicit nominations from the Division members. Interrante was charged with asking for these nominations, which are due in by mid-September to the Nominations Committee Chair (**ACTION ITEM**).

The remainder of the meeting (most of this day) was devoted to the discussion of potential projects.

17 – Review of Project Application Form and Application Procedure (Reedijk)

Reedijk gave a PowerPoint presentation which included a section on proposal submission. This presentation, which provided some very useful information for those Division members who are new to IUPAC project proposal submission, is reprinted in its entirety below:

Who are entitled to submit projects?

Any individual or group can submit a project, with or without current affiliation with an IUPAC body. Projects can be submitted at any time.

For detailed information, see: *Guidelines for Completion of the Project Submission Form*. Frequently Asked Questions on *Project Submission and Approval Process* are also available via the Union's web site at http://www.iupac.org/projects

Protocol and procedures for project proposal submission and evaluation:

- There is no set schedule for the evaluation process, but it *usually* will not take more than four months.

- Decisions will be taken during the course of the year as projects are submitted and the required information has been gathered.

Frequently Asked Questions on *Project Submission and Approval Process* are available on the above web site.

Guidelines for Projects

- Short descriptive title of project. If applicable, specify *Series Title*
- *Task Group Chairman*

  Name and affiliation of person(s) who will be coordinator for the project.
- *Task Group Members*

  Names and affiliation of the task group members who have committed themselves and agreed to work on the project.
- *Objective*

  Describe the objective of the project in one or two sentences (<50 words). The objective should explain the value of the project to the field of chemistry involved.
- *Description*
  - The description should be brief (250 words) and should enable readers to understand the purpose and methods used in the project. Make clear why the project should be carried out under the auspices of IUPAC.
  - Include a clear statement of previous or concurrent work done on the proposed project, including conferences or workshops + any previous, concurrent or planned interactions outside IUPAC relevant to the project.
  - When needed to provide additional information and supporting documentation for proper evaluation of the proposal, this should be given on a separate sheet. To decide what information to include, consult the "*Advice for Project Reviewers*" at http://www.iupac.org/projects .
- *Expected outcome*
  - Is the final product of the project a recommendation or report to be published in Pure and Applied Chemistry, in another journal or a book, as a workshop or conference proceeding, a set of instructional materials, a web page?
  - What plans have been made to promote international consensus, particularly if the project results in nomenclature recommendations (including terminology, symbols, and units)?
  - If a book is planned, has a publisher been approached?

  See also Appendix III of IUPAC Handbook "Procedures for publications of IUPAC technical reports and recommendations", available online as http://www.iupac.org/reports/provisional/procedure.html.
- *Dissemination plan*
  - Identify the intended audience/stakeholders.

- Explain how will the results of this project be disseminated to the affected community. How will nomenclature recommendations, for instance, be made known to practitioners or to the intended audience? This is a vital part of the project.
- *Mention Relevant IUPAC Body*
- Suggested name of the Division(s) and/or Standing Committee(s) that should review and supervise this project.

- *Budget and External Funding*
  - The budget should justify all planned expenditures (all sources) over the lifetime of the project. Costs for dissemination of the results should be included (including holding a workshop or special symposium at a Conference to publicize the results of the project).
  - Travel expenses include total costs for attending meetings of the task group, according to the rules governing IUPAC expenses. Because funds are limited, every effort should be made to utilize electronic communications in lieu of meetings of the task group. In view of the modern means of electronic communication, overhead expenses are expected to be minimal. However, in some cases, costs for meeting facilities, software development, technical assistance might be accepted.
  - Please note that IUPAC projects are not intended to be original research projects and the cost of new research work should not be a part of the project costs.
- *Other Sponsors*
  - When the proposer has already received funding by other organizations and is approaching IUPAC for additional funding, this should be mentioned under the previous section *Budget.*
  - The proposer may also suggest in this proposal that IUPAC apply for external funding for the project, either to replace or to augment IUPAC money. This can then be considered after the review process has been completed.
- *Time Frame, Milestones*
  - Indicate planned start and completion dates of the project. The expected duration of IUPAC projects is 2-3 years. Longer term projects should be broken into phases. Each phase should have an interim report.. That is, a project can begin at any time in one biennium and end in another.
  - Major milestones, such as completion of first drafts of a report, dates of task group meetings should be given in the proposal.
  - Upon acceptance its milestones will be reviewed and a specific timeline for progress reports will be agreed on with the responsible Division or Standing Committee.
- *Impact is important*
  - *The anticipated Impact should be addressed*

    How will the results of the project affect practitioners?
  - *Criteria for Retrospective Evaluation*

How should the success of the project be measured; when? E.g. have recommendations been adopted by journals as part of their instructions for authors? Should the project impact be evaluated in one year or three after completion?

- *Suggested Referees:* Please suggest the names (and provide address, affiliation and e-mail) of at least 3 external referees (but better 6, from whom one can choose to ask to evaluate the project). Referees should be experts in the field, and in general be chosen so as to avoid the appearance of conflict of interest.

18 – Presentations by Division TMs on Prospective Projects

Reedijk also presented some ideas for projects in the areas of molecular and bioinorganic chemistry, where he felt that there was a need for standardization in terminology and definitions. In particular, he suggested the following areas as particularly relevant for our Division (for molecular inorganic chemistry):

- Terminology items dealing with metals and the like (e.g. bioinorganic terminology update to bioorganometallic)
- Items from the Gold Book that would need an update (oxidation matters: see memo from McArdle): e,g, extended to inorganic solids and nano-metallic clusters
- Terminology: Metal organic frameworks? (coordination polymers)

In particular, in the area of bioorganometallic chemistry:

- Bioorganometallic chemistry is rapidly appearing, and is using terminology developed "on the spot", or from e.g. organometallic, coordination, bioinorganic chemistry; scientists in this area are about to start an international association that coordinates their conferences
- A small Div. 2 project group, joint with Div. 8, might be useful to clear up ambiguities, and update a joint terminology in this area and applications, like biomonitoring, MRI (to follow up on the old 1997 report, which was dealing with bioinorganic terminology only)

A possible candidate:

- Bioorganometallic terminology: with J. Reedijk and possibly either Roger Alberto (Zürich) and/or Nils Metzler-Nolte (Bochum) as Project Leader(s). Other members could be: Michael Heyneke (Seattle), Toshikazu Hirao (Osaka), and Edward Rosenberg (Missoula, MT)

Another possible project is in the area of Metal-Organic Frameworks (MOFs) (Coordination Polymers). Prof. M.P. Suh has indicated interest in preparing a proposal in this area and she spoke briefly about the need for the standardization of terminology relating to the structure and properties of this class of solids.

These are typically hybrid materials that result from the reaction between organic and inorganic species in order to build up three-dimensional open (or potentially open) frameworks whose skeleton contains both organic and inorganic moieties only linked by strong bonds, at variance to supramolecular chemistry;

1. Hybrid open frameworks

- coordination polymers: where the inorganic part contains either isolated polyhedra or small clusters,
- inorganic parts with a larger dimensionality, giving rise to chains (1D), layers (2D) and even inorganic frameworks (3D)

2. Porous Metal-Organic Frameworks (IRMOFs) (for IsoReticular MOFs), MMOFs (for microporous MOFs
   - Metal-organic coordination frameworks

3. PCPs (for porous coordination polymers)…

4. Porous Coordination Networks

The terminology for these structures varies in the published literature with many different groups employing their own invented terminology. There is a clear need for standardization of this terminology and for international agreement on the accepted terms for the different types of compounds an structures that are being discovered. Moreover, the terminology relation to the porosity in these systems is also at variance within the field, e.g., proved by gas adsorption?

Garcia pointed out that IUPAC has established clear guidelines and recommendations relating to porosity and porous materials. These established guidelines should be made clear to the authors, and Editors, of publications in this field.

Suh indicated that she might be able to come up with a proposal in this area by the time of our Glascow meeting. This was encouraged by the meeting participants and both Garcia and Öhrström indicated their interest in becoming involved with this project.

Proposed Project Leader: M.P. Suh; with Omar Yaghi (UCLA), *OR*: Michael O'Keeffe (UCLA),

Jeffrey Long (Berkeley), Patrick Gamez (Leiden), Javier Garcia (Spain), Lars Öhrström, and Susumu Kitagawa (Kyoto) on Task Group.

Reedijk continued with a suggestion for a small project to update the Gold Book in the area of oxidation definitions. He suggested L. Oro as a potential Project Leader with P. Karen and K. Tatsumi in the Task Group.

Next, Ken Sakai gave a Power Point presentation relating to a proposed project in the area of inorganic photochemistry (or photochemistry in general). In this presentation he noted the increasing importance of photochemistry recently in connection with solar energy conversion and storage, as well as in Light Emitting Diodes, where molecular inorganic compounds, such as tris-bipyridyl Ru and Ir complexes, for example, have attracted particular attention as photosensitizers for water splitting processes or as highly luminescent materials. One idea for a project was to put together a handbook of photochemistry experiments. Another, perhaps more pressing, need was to develop guidelines for quantum yield determination in luminescence and in photoconversion processes. The following specific example was noted:

Determination of Critical/Accurate Values for the Luminescence Quantum Yields of some Important Standard Luminescence Materials, such as $Ru(bpy)_3^{2+}$, $Ir(ppy)_3^{3+}$, and their derivatives, because most of recent works use indirect methods, e.g., using a reported value for $Ru(bpy)_3^{2+}$ (F_{em}=0.042, in water, in degassed, r.t.), which has now turned out to be incorrect.

He went on to give some background in this area, including the definition for quantum yield and the experimental methods for its determination. An indirect method is commonly used, where a standard luminescent compound with a known value of $F_{emission}$ is measured under the same conditions, and the emission band areas are used to estimate the relative luminescence intensity of the standard and the sample of interest. However, there has been uncertainty in the reported values, partly due to the relatively lower accuracy for earlier reported data, or due to the lack of computer-based integration of areas. Perhaps a better handbook with suggested procedures is needed and could be developed as a IUPAC project. A better method for determining quantum yield involves accurately measuring both the amount of photons absorbed and the amount of photons emitted. Such an apparatus is now commercially a available, e.g., from Hamamatsu Photonics (*Photons are perfectly collected using an integration sphere*). He asked "can we determine the best recommended values of $F_{emission}$ for some commonly and widely employed standard materials, such as $Ru(bpy)_3^{2+}$, etc., as part of an activity of the IUPAC Inorganic Chemistry Division?"

Proposed Activities

- Organize meetings to discuss this issues and to select experts who actually determined the values.
- Organize meetings to exchange the outcomes to establish the best recommended values.
- Report the values as outputs of this project.

Summary of a Possible Project.

- 10 or 20 Inorganic Photochemists can be selected to be involved in this activity.
- A few persons from this Division could be added to this body.
- A non-inorganic photochemist within IUPAC who is familiar with this field can be invited to join under the support of their Division.
- The outcomes of this activity must be finally reported as the best recommended values as the international standards.
- Proposed budget: USD 5,000 from the Inorganic Division.

In the discussion of this proposed project, it was noted by Loss that it was important to tightly define the focus of projects and that the current scope and objectives of this project seemed rather broad. Perhaps a more tightly defined initial project proposal could be developed that would be more effective in achieving results within a 2-3 year time period.

Coplen volunteered to work with Sakai after this meeting to help refine his project proposal. He also indicated his willingness to act as a consultant to Division members in preparing their project proposals and encouraged us to send him their drafts for advice prior to their actual submission.

Garcia presented some preliminary ideas for extension of his (and Mathur's) current project on nanotechnology terminology, including the need to address the current deficiency of materials relating to nanotechnology in education. After some discussion, he indicated that he would be giving this more thought and would discuss this further at a future Division meeting.

Interrante then presented his idea for a project entitled: "Toward the Development of International Standards for Authors and Reviewers of Chemical Publications". The objectives of this project would be to: *Assess current practices/ethical standards for authors and reviewers of scientific publications, in general, (and chemical publications in particular) worldwide* and to *formulate, propose and advance a set of author/reviewer ethical guidelines based on this assessment*.

As justification for this project he noted that:

The last 15-20 years has seen an enormous growth in the numbers of scientific papers appearing in journals worldwide - this is particularly reflected in the various journals that relate to chemistry

This growth in papers has resulted in an increasing frequency of ethical violations, ranging from self-plagiarism to fraudulent reports, that have threatened the integrity of scientific publications

After giving examples of the types of ethical violations (plagiarism – including self-plagiarism, duplicate submission or publication, unrevealed conflicts of interest, misrepresentation of research findings - use of selective or fraudulent data to support a hypothesis or claim, etc.) he indicated that:

- Scientific societies, such as the ACS and RSC, have developed their own guidelines for authors and reviewers; however, there is currently no single set of internationally accepted guidelines of this type available for use by the chemistry profession
- Excerpt from IUPAC Mission statement: "IUPAC promotes the norms, values, standards, and ethics of science ..." (if not IUPAC than who?)

The following tasks were proposed for this project:

- During the initial phase of the Project, the TG members will collect information from publishers, societies, governmental agencies and the literature relating to author/reviewer ethical standards
- The TG members will review this information and formulate a set of proposed guidelines
- A report will be published in PAC on the findings and proposed guidelines; the key findings and preliminary recommendations will be disseminated through society publications and newsletters

The task group members of this project would consist of representatives of chemistry journals and scientific societies worldwide and that every effort would be made to achieve a balanced and representative group who could provide an international consensus regarding the proposed guidelines.

Finally, it was noted that the scope of this proposed project goes well beyond that of the Inorganic Division and sponsorship would be sought from several other Divisions and Standing Committees, or directly from the Project Committee of IUPAC.

In the discussion of this proposed project, which received good support from the members, it was suggested by Reedijk that the scope of the proposed guidelines be expanded to include Editors, as well as Authors and Reviewers. This suggestion was accepted by Interrante, who was planning on developing this project proposal for submission in early-to-mid 2009.

19 – Report on Division II related activities of the Nomenclature Division (Reedijk)

Reedijk gave a report on the inorganic-related activies of the Nomenclature Division (Division VIII), whose off-year meeting he had recently attended.

An ongoing project of Division 8 deals with a follow-up of the Red Book 2005 and its use. Major changes in RB-2005 are still being advertised. Am important one deals with the proper use of additive nomenclature: all anionic ligands have a simple –o replacing the –e. *No trivial names are recommended anymore.*

The gradual adoption of InChI as standard for drawing by more institutions, including Elsevier/Beilstein and the EBI, and possibly the European Union, was noted. Questions remain as to how further development is to be funded. Also, one is encouraged to use IUPAC Web boards to publicise new drafts etc. The EU is preparing their own list of chemical names, to be based upon IUPAC precedents. The publication of an "inorganic" Technical Report on the representation of coordination polyhedra (PAC 79(10), 1779-1799, 2007) was mentioned.

- A major project is the development of Preferred Inorganic Names (PIN), in analogy with organic preferred names. The users should be able to choose THE PREFERRED NAME.
    - Progress on the inorganic PINS project in 2008.
    - Now at least two levels of PIN will be needed to accord with different levels of detail. For example, industrial organisations do not necessarily wish to check every detail of a structure if the identification of the material is unequivocal.

  He showed the example of "copper acetate dihydrate", a ligand-bridged, bicyclic, dimeric Cu compound:

    - This can be named at a number of levels (all can be possible PINs), depending on how much information might be available to the person needing a PIN:
      - copper diacetate hydrate, or copper diacetate monohydrate (empirical formula, ePIN)
      - dicopper tetraacetate dihydrate (molecular formula, mPIN)
      - tetrakis(μ-acetato-1κ*O*,2κ*O'*)diaqua-1κ*O*,2κ*O*-dicopper (structural formula, PIN)
      - (*SPY*-5-21)(*SPY*-5-21)-tetrakis(μ-acetato-1κ*O*,2κ*O'*)diaqua-1κ*O*,2κ*O*-dicopper (structural formula with configuration specified, PIN*)
    - Key problem: if a name like copper diacetate monohydrate is interpreted as a plain PIN, and if not indicated as an ePIN, deciphering the name into a structure would produce a monocopper compound of some kind.

- Differences in inorganic vs organic nomenclature; Additive versus Substitutive naming. So users should be able to see whether $SiCl_4$, $SiCl_3(CH_3)$, $Pb(OAc)_4$, $Pb(Me)_4$ are organic or inorganic compounds!
    - Since 2005 all anionic ligands now end with the letter -o, so that the last –e of the anion is changed into –o, when used in a name.

- So in names: acetato, chlorido, methoxido, oxido, azido, hydroxido, azido, phenoxido, sulfido, benzoato, bromido, fluorido, hexafluoridophosphato, tetrafluoridoborato, tetraoxidoperchlorato (or perchlorato), etc.
- Compare: tetrachloromethane (organic substitutive) and tetrachloridocarbon (inorganic additive); or tetrabromostannane, vs. tetrabromidotin for $SnBr_4$; memo available

- For the moment: solid state structures, zeolites, polymers are left out. The first stage is molecular inorganic compounds where a central element can be defined.

Under other items, he indicated:

- The progress on the Principles II project (leading to a small book) was noted. It is hoped to finalise the manuscript by the middle of 2009.
- It was agreed that IUPAC should not promulgate a IUPAC-approved Periodic Table, and should discourage the submission of new forms for approval. However, the recommendation of 1-18 group numbering would not be open for reconsideration at present.
- No discussion was made on W and using wolfram as an allowed alternative (they are waiting for Division 2, to whom this was sent back in 2007).

20 – Action Items for this meeting (Coplen)

Coplen presented the list of Action Items that he had noted during this meeting. It was suggested to add one on Interrante to send out a call for nominations to all of the Division members for this next TM election. With this addition, the final list of Action Items is attached to these Minutes as **Appendix 2**.

21 – Status of pending project proposals (Coplen)

Coplen then presented the two currently active project proposals that had been submitted for Division support and reviewed by IUPAC— both received "very suitable" reviews by IUPAC:

- 2007-029-1 Zhu, Evaluation of Isotopic Abundance Variations in Selected Heavier Elements USD 8,980
- 2007-030-1 Holden, Evaluation of Radiogenic Abundance Variations in Selected Elements USD 8,500 TOTAL USD 17,480

If both are funded, this would leave $9,800 for additional administrative and project expenses for 2008 and 2009.

He indicated that, in order to be revised, submitted and reviewed by IUPAC in time for consideration for Division II funding in the current biennium, he would have to receive the drafts of any project proposals by October 31, 2008. Interrante moved that we agree to fund the first proposal (2007-029-1 by Zhu) for $9,890 now and hold the one submitted by Holden until January 1, 2009, to be reconsidered in the context of any other proposals that were available for consideration at that time. This motion was approved by a vote of the members present.

The meeting was adjourned at 2pm on August 12, 2008.

Leonard V. Interrante, Secretary, Division II

Appendix 1

Division II Membership 2008-2009

Name	Status	Term	NAO	Potential Status
Prof. Anthony R. West	TM - Past President	2008-2009	United Kingdom	
Prof. Kazuyuki Tatsumi	TM - President	2008-2011	Japan	Ongoing
Prof. Leonard V. Interrante	TM - Secretary	2008-2011	United States	Ongoing
Prof. Robert D. Loss	TM - Vice President	2008-2011	Australia	Ongoing
Prof. Tiping Ding	TM	2008-2011	China/ Beijing	Ongoing
Dr. Tyler B. Coplen	TM	2006-2009	US	
Prof. Markku Leskelä	TM	2006-2009	Finland	
Prof. J. García-Martínez	TM	2008-2011	Spain	Ongoing
Prof. Luis A. Oro	TM	2008-2011	Spain	Ongoing
Prof. Jan Reedijk	TM	2006-2009	Netherlands	
Prof. M. Paik Suh	TM	2006-2009	Korea	
Prof. Josef Takats	AM	2008-2009	Canada	
Dr. Milan Drabik	AM	2008-2009	Slovakia	
Dr. Norman E. Holden	AM	2008-2009	US	
Prof. Sanjay Mathur	AM	2008-2009	Germany	
Prof. Alan Chadwick	AM	2008-2009	UK	
Prof. K. Sakai	AM	2008-2009	Japan	
Prof. Ling-Kang Liu	NR	2008-2009	China/Taiwan	
Dr. R. Gonfiantini	NR	2008-2009	Italy	
Prof. Pavel Karen	NR	2008-2009	Norway	
Dr. Tamara V. Basova	NR	2008-2009	Russia	
Prof. Lars R. Öhrström	NR	2008-2009	Sweden	
Prof. Aldo Bologna Alles	NR	2008-2009	Uruguay	
	11 TMs, 6 AMs, 7 NRs			

AM = Associate Member

NR = National Representative

TM = Titular Member

Appendix 2

ACTION ITEMS HELSINKI August 2008

1. Len Interrante will send email to Norman Holden thanking him for his educational report on the names tungsten/wolfram for element 74.
2. The Secretary will send a letter to Division VIII to ask if they will consider adding wolfram as a non-preferred name to element 74 as it was in the "Red Book" of 1990.
3. Javier Garcia-Martinez will present new evidence on the tungsten/wolfram naming issue of element 74 to Division VIII.
4. Tony West will contact G. Balducci to find out the state of project 2000-024-2-200 and will prepare a paragraph or two for the IUPAC website.

   See http://iupac.org/web/ins/2000-024-2-200
5. Jan Reedijk will email Tony West information about reference of publication for IUPAC project 2003-034-1-200 on Classification, terminology and nomenclature of borophosphates by R. Kniep.

   Progress

   June 2007 - The task group met on 6-7 August 2007 in China to review the latest progress and formulate a report based on a recent review by Bastian Ewald, Ya-Xi Huang, and Rüdiger Kniep titled "Structural Chemistry of Borophosphates, Metalloborophosphates, and Related Compounds", *Z. Anorg. Allg. Chem*. 2007, 633, 1517-1540 [doi: 10.1002/zaac.200700232]
6. Tony West will write paragraph or two for the Secretariat telling them that there is not need to perform additional work on this project because current naming methods and the publication above is satisfactory. The project should be marked as completed satisfactorily or project plan was evaluated and work is no longer needed.
7. Tony West will pursue with the Executive Board suggestions that resulted from the Day project concerning the future of materials chemistry within IUPAC.
8. Bob Loss will contact the Secretariat and inform them that project 2006-016-1-200 Renne (Recommendations for Isotope Data in Geosciences) is progressing well and needs an additional 15 months at no additional cost to IUGS or IUPAC (to December 31, 2009) to allow time for the reevaluation of the half-life publications.
9. Bob Loss will contact the Secretariat and inform them that project 2006-025-1-200 Holden (Assessment of fundamental understanding of isotopic abundances and atomic weights of the chemical elements) is progressing well and needs an additional 15 months at no additional cost to IUGS or IUPAC (to December 31, 2009) to allow time for the Task Group to complete their discussions and recommendations to CIAAW on the above topics.
10. Len Interrante will ask the Division members for nominations for the 2009 election of TMs for the Division.

Appendix 3

Recent activities in COCI (Committee on Chemistry and Industry)

COCI had their off-year meeting in Marl, Germany, April 26-27, 2008. The meeting dealt with regular issues, topics like: functioning of COCI., budget, reports from Bureau and Executive Committee, report from the on-going projects, and possible new projects.

COCI will be active for IYOC (international year of chemistry) and try to find sponsors. This will be an important action for the coming three years. COCI has the following on-going projects:

- Chemistry in a changing world - new perspectives concerning the IUPAC family (2006 -)
- Responsible Application of Chemistry -- An Introduction to Responsible Care (2006 -)
- IUPAC-UNESCO-UNIDO Safety Training Program Workshop, Turin, Italy (2007 -)
- Future Energy: Improved, sustainable and clean options for our planet (2007 -)
- Options for IUPAC engagement in SAICM implementation (2008 -) (SAICM = Strategic Approach to International Chemicals Management) (Intergovernmental Forum on Chemical Safety.

The Safety Training Program (STP) is an important action in COCI. In that chemists from developing countries are visiting and practicing in American and European chemical companies. The main focus in the training is in safe working. New companies are needed for this program.

The following new project ideas were discussed in the Marl meeting:

- Nanotechnology and Human Health. Preparation is on-going.
- Biomonitoring. The topic was discussed with Analytical division but they were not interested in. Next discussions with division VI.
- Biofuels. Discussions will continue with CHEMRAWN.
- STP (Safety Training Program) Internet Modules. This has been done first in Uruguay and will be distributed in industry in South America. English version is still missing. Further collaboration will be made with CCE.
- IUPAC Industrial Chemistry Prize. The prize should be for innovation that had developmental capabilities to piloting and commercial exploitation. The award would be presented to a maximum of three persons with the same value as the Richter prize. The first award would be presented in Glasgow in 2009. Needs sponsors and acceptance of IUPAC.

Next, the status of the programs in COCI was discussed. The programs are:

- Public Appreciation of Chemistry Program. A new PAC-related Web-site in collaboration with CCE will be developed.
- NGO/IGO/Trade Associations Program. NGO status of IUPAC in UNESCO, CEFIC etc. should be strengthened.
- Division/Standing Committee Collaborations Program. Only a few divisions were present in Marl. In Glasgow the divisions get 15 min for presentations.
- NAO/CA Program. In connection to this program an European regional workshop was held in Marl before COCI meeting ("Workshop in a changing world – new perspectives concerning the IUPAC family"). NAOs, CEFIC, RSC were present. In that meeting one message was: new company members are needed in COCI: Asia is developing well, Europe is setting back, companies in developing countires are not interested in IUPAC. Many other topics interesting industry were discussed.
- Health, Safety and Environment Program. This is still the most important program. New ideas for further development are needed.

Appendix 4

Prepared for the IUPAC
Inorganic Chemistry Division
Committee Meeting in
Helsinki, Finland on
August 11-12, 2008

BNL-81324-2008-CP

Element 74, the Wolfram Versus Tungsten Controversy

Norman E. Holden

Abstract

Two and a quarter centuries ago, a heavy mineral ore was found which was thought to contain a new chemical element called heavy stone (or tung-sten in Swedish). A few years later, the metal was separated from its oxide and the new element (Z=74) was called wolfram. Over the years since that time, both the names wolfram and tungsten were attached to this element in various countries. Sixty years ago, IUPAC chose wolfram as the official name for the element. A few years later, under pressure from the press in the USA, the alternative name tungsten was also allowed by IUPAC. Now the original, official name "wolfram" has been deleted by IUPAC as one of the two alternate names for the element. The history of this controversy is described here.

Introduction

Pilar Goya and Pascual Roman had expressed a concern[1] about the revision of the Red Book[2] (Nomenclature of Inorganic Chemistry - IUPAC Recommendations 2005), in which wolfram was deleted as an alternative name for tungsten (element 74). They argued that the case of wolfram, which was recommended by IUPAC with the alternative name of tungsten allowed in the English speaking world, was significantly different from that of other elements where the listed second name referred to the Latin root of that element and which explained the chemical symbol associated with that element.

Luis Oro and Javier Garcia brought up this issue of the deletion of the name wolfram again at the meeting of the Inorganic Chemistry Division Committee during the 44th IUPAC General Assembly in Torino, Italy in August 2007, where Oro and Garcia are Division Committee Titular Members. Following a few initial brief comments on this issue, it was decided to postpone a detailed discussion of this matter until the upcoming "off-year" meeting of the Division II Committee in Helsinki, Finland, which is scheduled for August 2008. This paper addresses some of the basic issues that were involved in the previous history of these disputed names for element 74. Since most of these discussions were held fifty to sixty years ago, many (if not most) of the participants in this present discussion may be completely unaware of the existence of, or any of the details of the earlier decision about the naming controversy and the origin of the use of the two names by IUPAC.

Early History

The early history of element 74 is well established. During the sixteenth century, the mineral wolframite [(Fe, Mn) WO_4] was noted in the literature. The origin of the name wolframite comes from the fact that the mineral interfered with the reduction of the principal ore of tin, cassiterite, (SnO_2). The mineral was said to devour the tin like a wolf devours a sheep.

Some two centuries later, the Swedish chemist and mineralogist, Axel Fredrik Cronstedt discovered a heavy mineral that he called heavy stone (or "tung-sten" in Swedish). He thought that this mineral contained a new element. Carl Wilhelm Scheele, who worked as a pharmacist and private tutor in Uppsala, isolated the tri-oxide of the element in 1781. He did not isolate the pure element. This tungsten mineral was later called scheelite, $CaWO_4$.

Torbern Bergman at Uppsala predicted that the acid isolated by Scheele contained a new metal. He thought that it should be possible to prepare the metal by charcoal reduction. During 1782, a Spanish nobleman named Juan Jose de Elhuyar, studied under Bergman at the University of Uppsala. Returning to Spain in 1783, Juan Jose and his brother Fausto de Elhuyar were the first to prepare this metal by reduction with carbon, as suggested by Bergman. They named this element wolfram. The name wolfram was established in Germany and Scandinavia, while the Anglo-Saxon countries preferred Cronstedt's name of tungsten.

The IUPAC Connection

The original International Commission on Atomic Weights preceded the formation of the International Association of Chemical Societies (IACS), in 1911, by more than a decade and the formation of the International Union of Pure and Applied Chemistry (IUPAC), in 1919, by about two decades. The Atomic Weights Commission, which had been part of the IACS, joined IUPAC at its inception. At the first Conference, there did not exist a Commission on Nomenclature within IUPAC, but one was created at the next IUPAC Conference.

The Atomic Weights Commission was reorganized in 1923 within a Commission on the Chemical Elements of IUPAC. In 1930, this Chemical Elements Commission was divided into a number of separate Commissions including one on the Atomic Weights and a Commission on Atoms that was formed to cover the areas of isotopes, atomic structure, physical methods for masses and nuclear chemistry.

The desirability of fixing element names, which could be used with little adaptation in different languages and of facilitating the adoption of universal element symbols in a chemical formula was of concern to IUPAC. During the first half of the Twentieth Century, there was a particular issue regarding the long-standing controversy over the two chemical names, beryllium and glucinium (with chemical symbols Be and Gl), for element number 4, which were currently used in different groups of countries.

There was no IUPAC Conference (General Assembly) between the years 1938 (the 13th Conference) and 1947 (the 14th Conference) because of World War II. During the 1947 IUPAC Conference in London, the problem of approving a name for a number of new chemical elements that had been discovered in the previous decade, as well as resolving the controversy of the disputed names for other elements was initially referred to the Atoms Commission. Unfortunately, the Atoms Commission was involved in the process of dissolving itself during this 14th IUPAC Conference[3]. As a result, the matter of these element names was referred to two other IUPAC Commissions, the Commission on Nomenclature of Inorganic Chemistry (CNIC)

and the Atomic Weights Commission. A joint meeting of these Commissions was planned to take place during the 15th IUPC Conference in Amsterdam, the Netherlands in 1949.

The IUPAC Authority for the Names of the Chemical Elements

At that particular period in time (1947-1949), the situation facing the Commission on Atomic Weights was the following. Most of the Commission members had either died or had withdrawn after the 1947 meeting because of their professional retirement. During early 1949, Edward Wichers (US National Bureau of Standards) was asked by the Union's Executive Committee to serve as chairman and to reorganize the Commission. To acquaint himself with the Commission's past procedures, Wichers wrote to Professor Gregory Baxter (Harvard University), who had been the previous Commission President from 1930 to 1947. In the correspondence, Wichers mentioned the problem of the element names. He noted that the 1947 atomic weight table in French listed "Tu" as a second choice symbol for tungsten.

Baxter replied to Wichers that his procedure in the past was to write and then circulate each report (in English) on the Atomic Weights to Commission members for suggestions or additions. He noted that there was never even a discussion about these disputed names. The procedure in place was that the Commission members would approve the table with all of the chemical names, as they were used in English in this English text of the report. The various members would use the element names favored in their own country, when they translated this table into other languages. Since there had previously never been an occasion for IUPAC to insist on a single name in all languages for each element, Baxter concluded his reply by suggesting to Wichers that he leave the matter of the element names to the Nomenclature Committee and would avoid any possible international trouble[4].

From the above discussion, it can be seen that the Atomic Weights Commission never made an official decision on the names of the elements. However, the names listed in the Table in a particular country corresponded to those, which were commonly used and accepted for the element in that country and to this extent, the appearance of an element in the Atomic Weights Table was an implicit acknowledgment that IUPAC accepted that particular element. The Commission avoided the potential problem of an initially false discovery of an element in the following manner. No element would be listed in the Atomic Weights Table until a measurable amount of that element had been separated and a value measured for its atomic weight. This process usually took a considerable number of years, by which time any potential problems or controversies with the discovery of the element were usually apparent in the scientific literature.

It will be seen that in 1949, the Atomic Weights Commission ceded the responsibility for the names of the chemical elements to the CNIC, where it remained until 2001 when IUPAC was reorganized and when IUPAC terminated the CNIC and almost all of the other IUPAC Commissions. The previous responsibility for the names of the chemical elements was transferred to the Inorganic Chemistry Division Committee (Division II). All of the previous nomenclature and terminology work that was being done in IUPAC was consolidated within a new Division of Chemical Nomenclature and Structure Representation (Division VIII).

The 15th IUPAC Conference

During the 1949 Conference, there was a joint meeting of the two Commissions, CNIC and Atomic Weights, to deal with element names. In addition to the beryllium/glucinium controversy, there were other elements for which two separate names were being used

internationally. The other elements included niobium/columbium, cassiopeium/lutetium, celtium/hafnium and tungsten/wolfram. The discussion led to a general recommendation (which was subsequently incorporated into the 1957 Rules of the CNIC) that the old custom of allowing the right of naming of a new element to rest with the first discoverer should be abandoned, since it had resulted in many useless controversies and a principle of general acceptability should be used. Some examples of the problems that resulted from this practice of allowing the discoverer to name a new element can be seen from a review of the History of the Chemical Elements[5]. For general acceptability, the issues that were considered in the meeting included which name had the more widespread use in science, the priority of discovery and the number of languages in which the disputed names were used.

One outcome from this meeting was that in the future, the Atomic Weights Commission would withdraw from any further discussion about the names of the chemical elements. A second outcome of the meeting was that names would be recommended for the more recently discovered elements, technetium, promethium, astatine, francium, neptunium, plutonium, americium and curium. In additional, the names of beryllium, niobium, lutetium, hafnium, and wolfram were recommended for the cases of the disputed names, where two or more names were current. For element 91, the name protactinium was recommended to replace the previous name of protoactinium. Finally, the name lutetium from the Latin name of Paris, Lutetia, had been preferred to lutecium, from the French equivalent name of Paris, Lutece.

The Specific Case of Wolfram/Tungsten

During the course of the 1949 discussion, the subject of wolfram versus tungsten was raised, although this case was quite different from that for which the new principle had been enunciated. In this instance, the problem arose because in Scandinavian languages the word tungsten (or local variations) signifies “heavy stone” and this name seemed to be inappropriate for designating an element. Against this statement, it was argued that wolfram had long been accepted as the name of a particular mineral.

It was eventually suggested that the name wolfram should be recommended as the scientific name for the element, while the name tungsten could be retained, where desired, for commercial use, in analogy with the word “steel” for many commercial forms of “iron”. These suggestions from the 1949 meeting were followed by considerable correspondence from many parts of the world, which did not reveal any clear consensus.

These issues were reconsidered again by the CNIC at the 1951 IUPAC Congress. After studying the correspondence, Commission members agreed to leave the suggestions as they stood, with the name wolfram for element 74, in the hope that merit of uniformity in chemical nomenclature would gain recognition when the underlying reasons for the proposed change became generally understood.

Unfortunately, the 1951 Commission meeting of the CNIC was held in conjunction with the American Chemical Society’s (ACS) Centennial celebrations and unlike previous Commission meetings, it received much more attention from the press. Before the CNIC sessions were completed and long before the Commission’s report had been prepared for the IUPAC Council’s approval and its subsequent publication, a report appeared in the press suggesting that the Commission had decreed the abolition of the name tungsten. This report was completely in error, but it provoked a storm of protest from all over the world. Although efforts were made to correct the error, much harm was done to the standing of the Nomenclature Commission. The CNIC

decided to recognize both names. At the 1953 meeting of the CNIC, it was decided to let the whole matter drop until a fresh review of the matter could be made under calmer conditions.

Since 1953, the CNIC Commission has been very fully occupied in dealing with the many nomenclature problems brought about by the rapid and extensive developments in inorganic chemistry and it has not been possible to undertake a fresh look at the wolfram-tungsten question[6]. It could be seen from the 1970 edition of the Nomenclature rules that both forms, wolfram and tungsten, were provided for in the rules as alternative names for the element.

Although the responsibility for the names of the chemical elements in IUPAC passed from the CNIC to the Inorganic Chemistry Division Committee, Division II, the recent change in the element name was made by Division VIII, without notifying or consulting the sole IUPAC authority responsible for the names, the Division II Committee.

Side Note on a Spanish Member of the Atomic Weights Commission

I might note that Enrique Moles, who was a Professor at Madrid University and had been an IUPAC Vice-President during the period of the 1930s, was invited to attend the 1949 reorganization meeting of the Atomic Weight Commission because of his known interest in atomic weights. Professor Moles was elected to the Commission at the meeting and he was chosen as the Secretary-Reporter. At the meeting, Moles proposed a table, which included the element, tungsten, with the symbol W and without any mention of wolfram, since the table for the report was prepared in English. In November 1949, when Wichers sent the final version of the report on atomic weights to the IUPAC Council, it included the element name, wolfram, with the symbol W and a reference to the IUPAC Nomenclature Commission making the change. In the 1949 Report of the Atomic Weight values in the USA[7], the names and symbols adopted by IUPAC were used but as a concession to the fact that the new names were unfamiliar in the United States (and may not find acceptance there), the old names of columbium and tungsten were also given for the elements 41 and 74, respectively. In the 1951 Report of the Atomic Weight values in the USA[8], the name wolfram, as the preferred name of the element more commonly known as tungsten in the English speaking countries has been dropped from the table because it failed to gain acceptance in the United States (see the above note on the uproar in the USA press over the elimination of tungsten). It was noted in the report that IUPAC now recognized both names of tungsten and wolfram.

I might note that some forty years after the decision had been made by the CNIC on the preferred element names, metallurgists in the USA were writing to ask me why the name columbium, which was used by metallurgists throughout the USA, was not listed in the Atomic Weights Table in English.

Conclusions

From the above history of the wolfram-tungsten affair, it can be seen that a special set of circumstances was involved in the resolution of the disputed names for element 74 some sixty years ago. Under these circumstances of bowing to the public pressure of the press in the USA, the 1970 edition of the Nomenclature rules allowed the use of both of the names, wolfram and tungsten. As the nomenclature rules change with time, the choice of using either name for element 74 as a compromise has now been withdrawn by IUPAC. However, a half-century after the controversy, probably much of this history has been lost and is now forgotten by the people who were involved in making this recent decision.

On the other hand, the thinking involved has also evolved during this period. As Ture Damhus has noted[9], the recommended chemical names are now those names as used in English, which is the one official language of IUPAC[10]. Damhus also noted that there is still the option of using other names in various other national nomenclatures (at least for the time being). Whether this option will remain as rules continue to evolve in the future is not clear.

As a final note, I would also mention that if these present rules had been in place in 1949, the name for element 41 would probably now be columbium and not niobium. However, nomenclature rules evolve over time and one should not try to impose rules from one time era to decisions that were made during another time era. Whether the origin of the dispute over wolfram and tungsten would justify the retention of wolfram as an alternate name for element 74, only time will tell.

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Appendix 5

Report to the Inorganic Chemistry Division Committee meeting at Helsinki

August 2008 on the IUPAC/IUPAP Joint Working Group to assign

Priority for the Discovery of New Elements

The JWG has made good progress since the last report made to the Division Committee at Torino. Its first Report, on an element with Atomic Number 112, was submitted for publication to PAC. In addition to the peer refereeing process the claimant laboratories were sent the Report who were asked to comment on its technical accuracy. The comments and suggestions received were sent to the JWG in May last for their consideration before publication.

The JWG held their first meeting ever, with funding provided to the project from the Strategic Opportunities Fund, at TRIUMF in Vancouver May 20th to 24th 2008. At that meeting the members considered in detail the communication from the Editor in Chief of PAC in respect of the referees' comments and the responses of the laboratories on their Report of the discovery of element 112. Agreement was reached on responses to all of the points raised and all changes will be incorporated in a revised Ms for submission with a covering letter to the Editor.

The group then discussed in detail the submissions received and which they had already reviewed on the discoveries of elements with Atomic Numbers 113, 114, 115, 116, and 118. Despite a very painstaking process that involved looking in detail at each and every isotope reported it was not found to be possible to identify and/find unambiguous references for all of the events claimed. The Group therefore decided that it should request the relevant laboratories to clarify their data by providing a clear statement of all of the events with the original reference for each. A time limit of July 31st was set for this response and all the laboratories were informed that this new extended deadline had been set and asked to submit any new documentation relating to elements with A > 112. All of the laboratories have acknowledged this request and will comply. The JWG is writing its second Report on elements with Z > 112, which will incorporate the information and clarifications received, and this will be submitted for publication in PAC in the near future.. The meeting of the JWG, which greatly assisted in advancing their work, was judged to be very well worthwhile by the JWG members.

John Corish

Trinity College Dublin,
July 20th 2008

Appendix 6

IUPAC
International Union of Pure and Applied Chemistry

Inorganic Chemistry Division (II) Newsletter 2008

Editors Note:

After some delays and procrastination I am pleased to present you with the first of the Division II newsletter for this biennium. This edition features snippets of news from members and in particular from the newly emerging IUPAC website and I hope you find these useful and/or interesting. Many thanks to those who have provided some of the interesting leads, photos and news items. If you have an item or images about any of the Division members or associated activites, please forward these to me, preferable via email. (r.loss@curtin.edu.au). All the best from Bob Loss.

Division II People

President: Tatsumi, Kazuyuki, **Vice President:** Loss, Robert D., **Secretary:** Interrante, Leonard V.
Past President: West, Anthony R.
Titular members: Coplen, Tyler B., Ding, Tiping, Garcia-Martinez, Javier, Leskelä, Markku, Oro, Luis A., Reedijk, Jan, Suh, Myunghyun Paik
Associate members: Chadwick, Alan V., Drabik, Milan, Holden, Norman E., Mathur, Sanjay, Sakai, Ken, Takats, Josef
National representatives: Basova, Tamara V., Bologna Alles, Aldo, Gonfiantini, Roberto Karen, Pavel, Liu, Ling-Kang, Öhrström, Lars R.

Division II Subcommittees and Commissions
Subcommittee on Isotopic Abundance Measurements
Subcommittee on Characterization of Carbonaceous Materials and New Carbons
Interdivisional Subcommittee on Materials Chemistry
Commission on Isotopic Abundance and Atomic Weights

News Snippets

New IUPAC Treasurer

For those of that have still not heard, past - past Divisional II president, John Corish, has been elected as the General Treasurer to IUPAC for 2008 – 9. Congratulations from all of us.

IUPAC leadership for 2008–2009 (from left): Secretary General David StC. Black, Past President Bryan Henry, Vice President Nicole Moreau, President Jung-Il Jin, and Treasurer John Corish

PAC online

Pure and Applied Chemistry, the Official Journal of IUPAC, is all new online, (http://iupac.org/publications/pac/index.html) with better navigation, improved indexes, and searchable archives.

Meetings and conferences

IUPAC – CHF : Chemical Education meetings - Report

Division Titular member Javier Garcia-Martinez attended a series of meetings in January 2008 of the IUPAC Committee for Chemical Education (CCE) and the Chemical Heritage Foundation (CHF) to foster collaboration between the two organizations, and in particular planning for the 2011 International Year of Chemistry.

The following common priority areas in Chemical Education were identified:

1. A more learner-centred chemistry curriculum,

2. Initiatives that highlight the relationship between chemistry and sustainable development..

3. Support for initiatives that highlight ethical concerns in chemistry.

4. Increasing the public understanding of chemistry. One measure of success will be for Public Understanding of Chemistry to be seen as every chemists responsibility, tied into all IUPAC projects and activities in appropriate ways.

5. Improved integration between International Conference on Chemical Education (ICCE) activities into the work of CCE through building chemistry education networks, using the multicultural competence within CCE.

7. Articulate clear directions for the Chemistry Education for Development subcommittee, and include the Flying Chemist Program as an integral part of the work of that subcommittee.

CCE and CHF meeting participants: Javier Garcia Martinez, Peter Mahaffy, Eva Akesson, John Theibault (standing), Mort Hoffman, John Malin, Fabienne Meyers

Off year Divisional Meeting 2008

11 – 12 August 2008 Helsinki.

The Division off year meeting will be held on Monday and Tuesday Aug. 11-12 2008 in Helsinki, preceded by a Materials Chemistry subcommittee on Sunday August 10.

The Venue for the Materials Chemistry subcommittee is the office of Finnish Chemical Society, while the venue for Divisional meeting will be the House of Learned Societies.

Further information can be obtained from Titular member, Prof. Markku Leskelä, <leskela@mappi.helsinki.fi>
p. + 358 9 191 50195

IUPAC 45th General Assembly

Commences August 1 2009 Glasgow UK

Titular Member Award

Luis Oro, Divisional member and EuCheMS President Elelct was awarded the Spanish research prize for science and chemical technology "Enrique Moles" for his exceptional contributions to the field of metallorganic chemistry and homogeneous catalysis. Luis recived the prize from HRH Juan Carlos on 15 Jan in Madrid. Luis is Head of the Instituto Universitario de Catálisis Homogénea and full professor of Inorganic Chemistry in Zaragoza.

13th International IUPAC Conference on High Temperature Materials Chemistry

HTMC-XIII will be the 13th meeting in a series of conferences that are held every three years, the last occurring in Vienna, Austria. The conference will be held September 14-18 at the University of California, Davis.

The meeting will be jointly organized by the Nanomaterials in the Environment, Agriculture, and Technology Organized Research Unit, and the Peter A. Rock Thermochemistry Laboratory of UC-Davis.

Further details available at
http://neat.ucdavis.edu/HTMC%2D13/

To be added to the HTMC-13 mailing list, please send your name and EMail address to Professor Navrotsky's executive assistant at navea@ucdavis.edu

Project News

The Development of an Isotopic Periodic Table for the Educational Community (2007-038-3-200)

This is a new joint Project approved in April between Division II and the Committee on Chemical Education (CCE) to develop information for a self-learning guide for students at the primary, secondary and tertiary levels about the existence and the importance of isotopes in the various chemical elements. Long serving IUPAC and Division II member Dr Norman Holden is the project leader. The long-range goal of this joint effort is the display of this information for each chemical element on an interactive website, where users can manipulate popup windows to expose the detailed information on both basic data as well as applied uses of isotopes of these elements.

The Project has been divided into two parts, where this first project will involve the determination of the various types of data required, the effort to collect all of these data and the development of educational strategies on the proper methods to help the students to utilize the data and the periodic table.

In addition, this first project will require the determination of the types of various printed materials and the strategies that will need to be provided for use by educational facilities in those countries where an adequate web access may not be presently available. We have been asked to then pilot test these printed materials in various countries and examine the feedback to help fine-tune the final information.

A second Project will be initiated after the successful completion of the first Project. This second project will involve the development of the interactive Periodic Table itself and the design of the supporting web site reflecting how isotope and this affects the Atomic weight of many of these elements

Teaching high-temperature materials chemistry at university

(Report from G. Balducci and G. M. Rosenblatt)

Over the last four to five decades high temperature materials chemistry (HTMC) has flourished and expanded as a challenging area of scientific and applied research, spurred by a growing demand for new inorganic materials (neoceramics, intermetallics, superalloys) able to withstand extreme thermal and chemical environments. Such high temperature environments are ubiquitous in combustion, nuclear energy, and space technologies and are also encountered in new, more efficient processes for the synthesis, recycling and refining of materials. The advancement of HTMC has seen a synergic interchange between basic and applied research, with the application of thermodynamics, kinetics and a variety of physical, chemical and modelling techniques. This fertile field of interdisciplinary research has its origins in modern high temperature chemistry which led to an understanding of the fundamental ways in which chemical properties and behaviour differ at high temperatures from those encountered at more moderate temperatures.

As systematic knowledge of the chemical and physical behaviour of materials at HT accumulated, accompanying progress in the production, control and measurement of temperature up to 3000 K and beyond, and by the extension of the high temperature regime to most measurement and diagnostic techniques, the unusual high temperature behaviour of materials' properties and reactivity emerged, often dramatically different from those expected near to room temperature. Accepted generalizations in chemical behaviour at ordinary temperatures are no longer valid at high temperature: the high temperature reactivity of materials is ruled by thermodynamic properties rather than kinetics; condensed phase-gas phase processes become increasingly important both in the number and complexity of chemical species; reactions tend to be entropy, rather than enthalpy, controlled with increasing temperature; unusual new compounds and molecular species appear with unfamiliar oxidation states stabilized by the high temperature conditions. Also, stoichiometric solids extend their range of homogeneity and often unstable, non stoichiometric phases are stabilized in the high temperature domain. This chemical behaviour influences the physical properties of a material and causes predictions based on extrapolation from room temperature properties to be invalid.

Despite the important role played by HTMC in modern advanced technology and the considerable progress by research in the field, HTMC topics are rarely addressed in chemistry and materials science programs at university, and no textbook exists specifically devoted to HTMC topics. It is therefore important to make efforts to fill this educational gap, and to introduce students of chemistry and materials science to the concepts underlying the behaviour of materials and chemical bonding at high temperatures. IUPAC Project 2000-024-2-200 (Teaching High-Temperature Materials Chemistry at University) under the auspices of the IUPAC Inorganic Chemistry Division aimed to fulfil this function. The final report of the project task group is a resource book on the properties and behaviour of high-temperature materials for those teaching

materials science or physical or inorganic chemistry at various levels. The report includes an introduction and seven sections covering historical background, chemical behaviour of condensed phase-gas phase systems at high temperature, basic concepts of materials thermodynamics, experimental techniques, use of thermodynamic data and modelling, vaporization and decomposition processes, and gas-solid reactions. The ninth section covers more specific topics, mostly concerning applications of high temperature materials and processes. Each recommended topic is accompanied by a bibliography of helpful references, a short introduction or explanation including the areas of application, and some relevant teaching suggestions. An extensive annotated resource bibliography is in an Appendix to the report.

Recent and ongoing Divisional projects

The Development of an Isotopic Periodic Table for the Educational Community (2007-038-3-200)
Analysis of the usage of nanoscience and technology in chemistry (2007-040-2-200)
Evaluated published isotope ratio data (2007-2009) (2007-028-1-200)
Evaluated compilation of int. reference materials for isotope abundance measurements (2007-031-1-200)
Recommendations for isotope data in geosciences (2006-016-1-200)
Assessment of fundamental understanding of isotopic abundances and atomic weights of the chemical elements (2006-025-1-200)
Terminology for conducting, electroactive and field-responsive polymers (2006-028-1-400)
Terminology for self-assembly and aggregation of polymers (2005-043-2-400)
Priority claims for the discovery of elements with atomic number greater than 111 (2006-046-1-200)
Evaluated published isotope ratio data (2005-2007) (2005-027-1-200)
Calibration of organic and inorganic oxygen-bearing isotopic reference materials (2005-022-1-200)
Towards defining materials chemistry (2005-001-1-200)

Spain celebrates a Year of Science in 2007

Divisional titular member, Javier Garcia-Martinez with Mendeleev actual size cardboard model and some participants of the Science Week at Murcia, Spain, during the presentation of the stamp "Tabla Periódica de elementos de Mendeleev" on November 2007, part of the Spanish Celebration of the Year of Science in 2007

Appendix 7

Annual Report on the SNAFU Task Group 2007-2008
Project #2006-025-1-200

Norman E. Holden, Division II Monitor

Membership:

J.K. Bohlke, USGS, Reston, Virginia, USA
T.B. Coplen, USGS, Reston, Virginia, USA
P. DeBievre, Royal Academies of Belgium, Bruxelles, Belgium
J.R. deLaeter, Curtin University, Perth, Western Australia, Australia
E. Roth, Sevres, France
Chairman, N.E. Holden, Brookhaven National Laboratory, Upton, New York, USA

Status:

In the last report to the Division in August 2007, it was mentioned that the Task Group met at the BIPM in Sevres, France and made recommendations to the Commission on Isotopic Abundance and Atomic Weights (CIAAW) at their meeting in Pisa, Italy. The CIAAW accepted twenty-four of SNAFU's total of twenty-seven recommendations. SNAFU was asked to review the three remaining rejected recommendations. In addition, other issues have since been raised by CIAAW and referred to SNAFU for discussion and recommendations.

A subgroup of members of the SNAFU Task Group and the CIAAW Secretary presented a paper in July 2008 at the Goldschmidt 2008 Conference on Geochemistry held in Vancouver, British Columbia, Canada. The paper dealt with the introduction of ranges of values for the presentation of Standard Atomic Weights, in lieu of presenting values and uncertainties (the present method), where some of these stated uncertainties might be asymmetric in nature.

The topics for discussion by SNAFU include the following:

1. With the introduction of ranges of values as a possible method of expressing atomic weight uncertainty limits, discuss and make recommendations to CIAAW on whether ranges are a better method for uncertainty treatment, which could incorporate asymmetric uncertainties.
2. Determine the best method to incorporate both uncertainty and isotopic variation within a single parameter.
3. Provide input to the CIAAW on the question "is our reported uncertainty interval associated with the Standard Atomic Weight values published in the Table of Standard Atomic Weights (TSAW) a "standard" uncertainty, a "combined" uncertainty, an "expanded" uncertainty or some other type of uncertainty. IUPAC is an international scientific union professing to follow the International Organization on Standardization (ISO) Guide to the Expression of Uncertainty in Measurement (GUM). Does CIAAW in fact follow these regulations?

4. Review the concept of rectangular distributions and Gaussian distributions. Decide what type of distribution CIAAW should use in their evaluations and justify the decision.
5. Clarify what is meant by a calibrated measurement system before recommending that the scientific community's data should be based on such a calibrated measurement system.
6. Clarify the use of a reference material that is available to other laboratories for experimenters to base their measurements on.
7. Discuss and recommend a consistent publication cycle time for the published reports on the recommended Table of Isotopic Composition Evaluations (TICE).
8. Develop a comprehensive system to avoid missing published papers for consideration by the subcommittee on isotopic abundance measurements (SIAM) and CIAAW to be used as new best measurements and for isotopic abundance variations.
9. Determine whether the definition of the atomic weight requires a revision.
10. Review the usage and the wording of footnotes and annotations for the Table of Standard Atomic Weights (TSAW) as published by CIAAW. Perform this review in the case of presenting values and uncertainties, as well as for the case of the use of recommended ranges in the published Tables.

Results:

CIAAW approved twenty-four of SNAFU's recommendations and have implemented the majority of these recommendations. A few of these recommendations have not yet been approved and funded by the Division Committee and/or IUPAC at the present time.

Future Plans:

Due to the numerous problems that have been referred to the Task Group by CIAAW, further work must be carried out by SNAFU prior to the next CIAAW meeting in Vienna, Austria during the summer of 2009.

Recommendations:

It is recommended that the Inorganic Chemistry Division Committee (**ACTION ITEM**) and IUPAC extend the deadline for this Task Group to December 31, 2009 (at no additional cost to IUPAC) to allow time for the Task Group to complete their discussions and recommendations to CIAAW on the above topics.

Appendix 8

Task group meeting report for the IUPAC project 2003-034-1-200

The first meeting of the task group on the IUPAC project 2003-034-1-200 titled "Classification,Terminology and Nomenclature of Borophosphates", was organized in Huangshan, China in August 2007. Four task-group members participated in the meeting: Professor Rudiger Kniep from the Max-Planck Institute for Chemical Physics of Solids (Germany), Professor Slavi Sevov from University of Notre Dame (USA), Professor Jian-Hua Lin from Peking University (China), and Professor Jing-Tai Zhao from the Shanghai Institute of Ceramics, Chinese Academy of Sciences (China). In addition, Ms. Xin-Xin Yang and Ms. Shuang Chen from the Shanghai Institute of Ceramics, also participated in the meeting by helping with collection of materials associated with the project and with organizing the meeting.

Following the objectives of this project, namely providing terminology, classification and names for the borophosphate compounds based on their structures, connectivity, and composition, the task-group members discussed the issue extensively and in depth. Prior to the meeting, extensive preparation work was carried out in the participants' groups in order to do comprehensive literature search and to collect all relevant publications to date. These data were than used to discuss the broad picture and to generalize the principles.

During the discussions at the meeting, the following points were addressed:

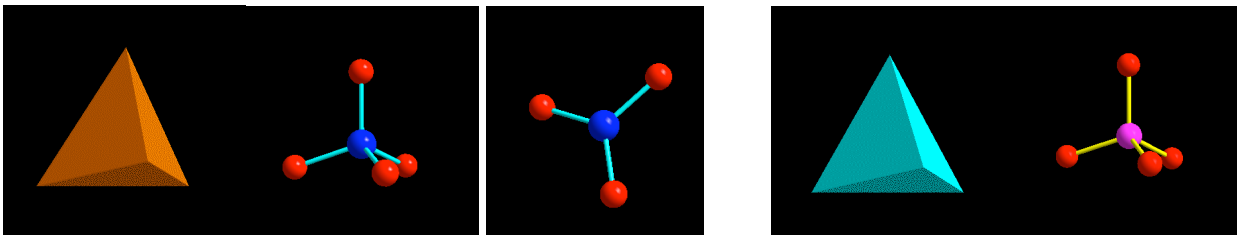
1. The borophosphates are a very diverse group of compounds with complex structures that span across all dimensionalities, i.e. from zero- to three-dimensional, and with variety of compositions. Such structural and compositional diversity is very difficult and often impossible to systematize and organize into one nomenclature. Nonetheless, it was decided that the project is definitely worth the attempt because the successful classification, systematics, and nomenclature will benefit a very wide community of researchers in this field.
2. A few months before the meeting, one of the participants, Prof. Kniep, published a very extensive work on successful classification of the borophosphate compounds based on their composition and structure (*Z. Anorg. Allg. Chem.* **2007**, *633*, 1517-1540). The work, co-authored with B. Ewald and X. Huang and titled "Structural chemistry of borophosphates, metalloborophosphates, and related compounds" was used as a very helpful and efficient guide in the discussions at the meeting. The classification and the special labels used for the borophosphate structural features adopted in the publication were very helpful in the efforts for developing a nomenclature for these compounds. The terminology used in the publication is quite sufficient for the reader to grasp the main features in the known borophosphate structures and, in addition, it will also provide guidance for rationalization of yet-to-be-discovered structures.
3. As for the nomenclature of the compounds according to their structures and linking principles, difficulties are met due to the complexity of the structure associated with the complex connectivity of the boron and phosphorous polyhedra in the structure. Simple cases may be named systematically without introducing extra rules. But cases with joined polyhedra can lead to either ambiguous situations or tedious complexity, such as (1) many rules should be introduced, or (2) the names get unreasonably long. The following are some simple cases with the proposed nomenclatures, and some possible extensions.

I think we need to describe the rules for naming the fragments. I don't remember exactly what we decided, but some of them are the following:

Rules:

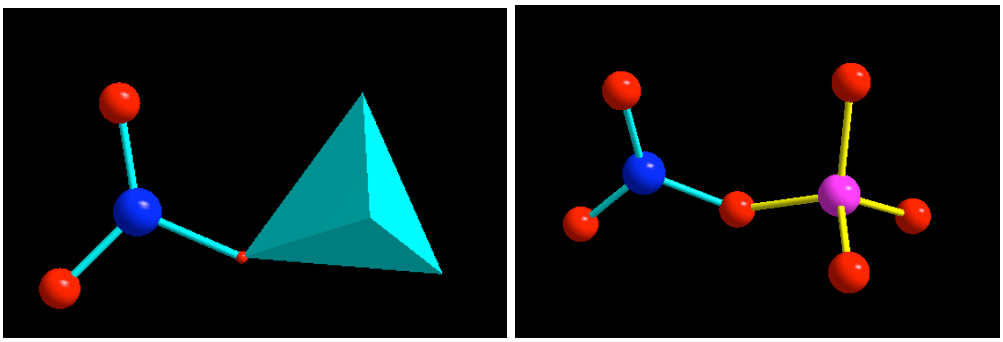
1. Start with the borate part of the borophosphate fragment. Count the number of oxygen atoms bonded to the boron and start the name with that number and add *–oxo-*, i.e. *tri-oxo-* or *tetra-oxo-*. These are the only two possibilities since borates are either triangular planar or tetrahedral. Next in the name comes the word *-boro-*, i.e. either *tri-oxo-boro-* or *tetra-oxo-boro-*.
2. (Not sure about this one, maybe Kniep would remember better?) If two or more borate groups share corners then count the total number of oxygen atoms for the borate fragment. This number is followed by *–oxo-*, then by the number of boron atoms in the fragment, and finally the word *–boro-*, i.e. *hexa-oxo-di-boro-* for a triangular borate sharing a corner with a tetrahedral borate, *hepta-oxo-di-boro-*.
3. The name ends with the number of phosphate tetrahedra sharing corners with the borate fragment and then the word *–phosphate*, i.e. *tri-oxo-boro-phosphate* for one phosphate tetrahedron sharing a corner with triangular borate, *tetra-oxo-boro-di-phosphate* for two phosphate tetrahedra sharing corners with a tetrahedral borate, etc.
4. The number of repeating subunits are denoted with *bis-*, *tris-*, *tetrakis-*, etc. in front of the name.
5. Cyclic and chain formations are denoted by *cyclo-* and *katena-*, respectively, placed in front of the name.
6. Compounds with isolated borate and phosphate groups that are not connected to each other are named *borate-phosphates* and NOT *borophosphates*.

Labels and colors used in the examples below:

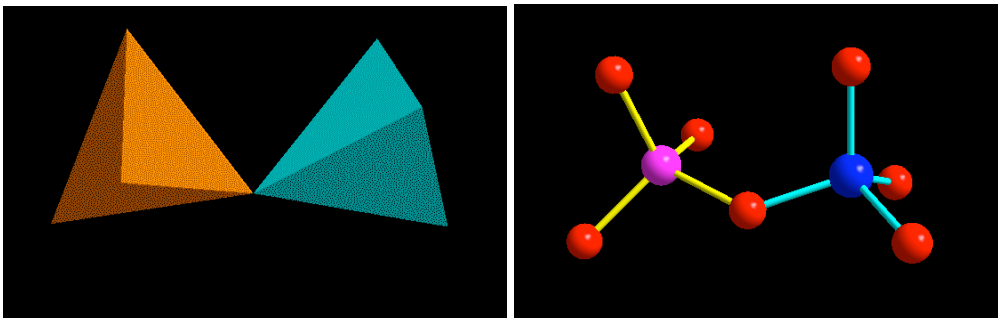


[BO_4] tetrahedron [BO_3] triangle [PO_4] tetrahedron

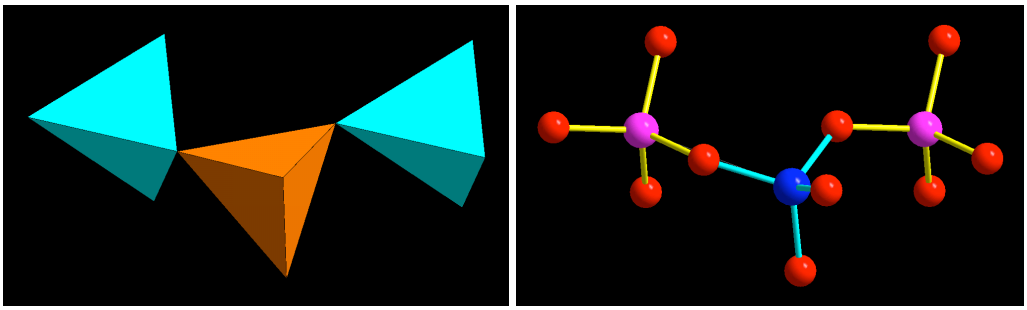
Examples:



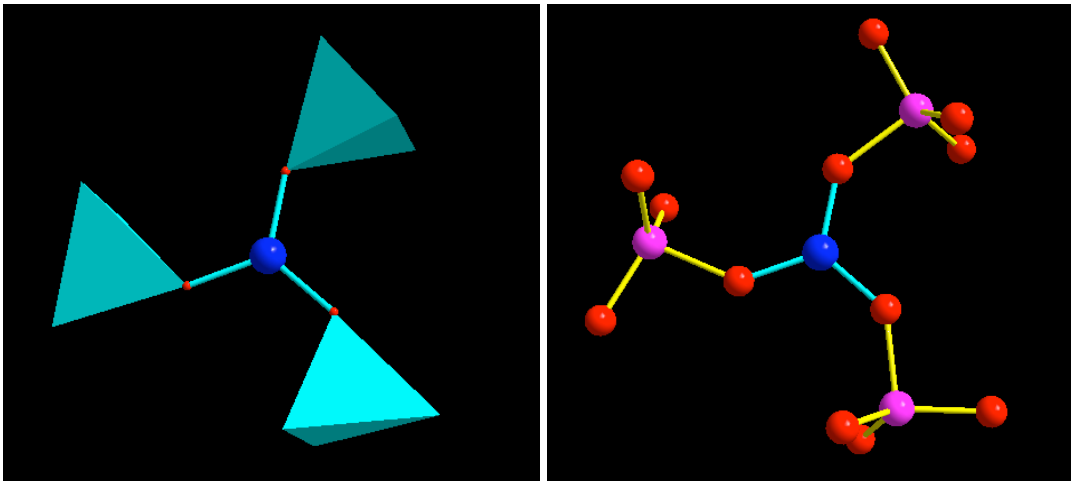
Tri-oxo-boro-phosphate



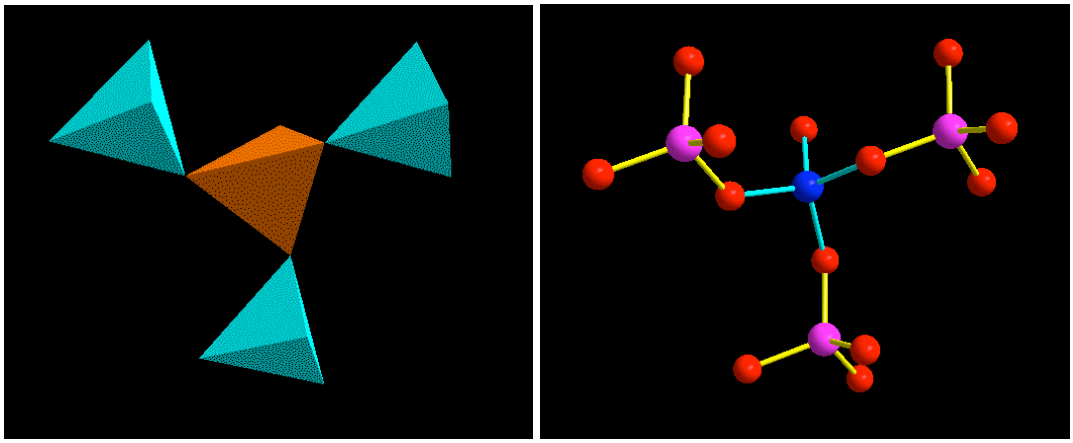
Tetra-oxo-boro-phosphate



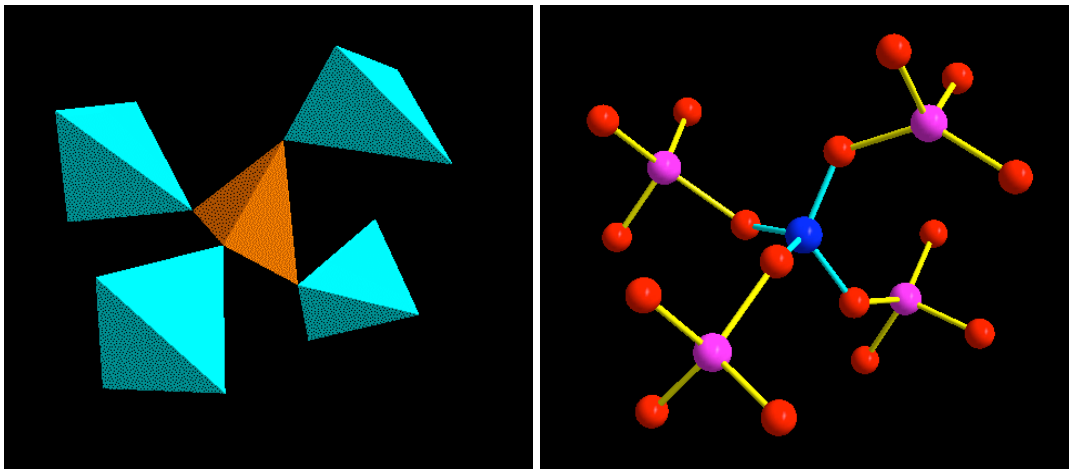
Tetra-oxo-boro-di-phosphate



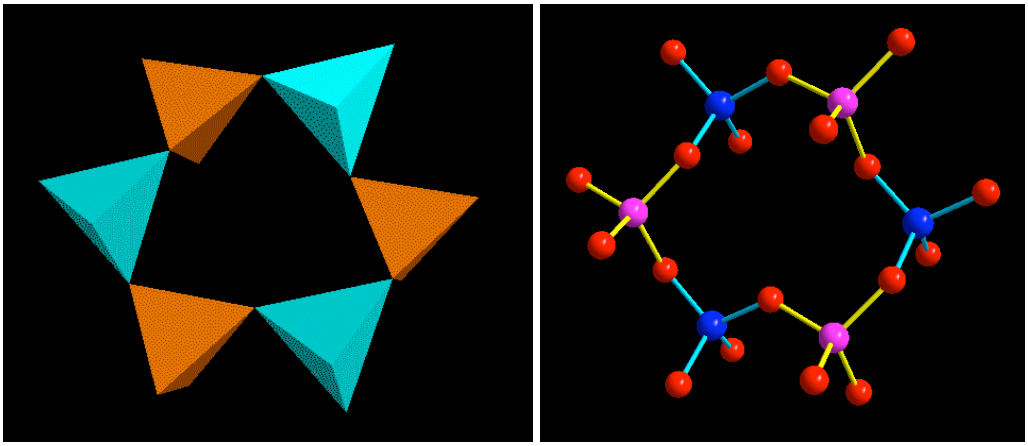
Tri-oxo-boro-tri-phosphate



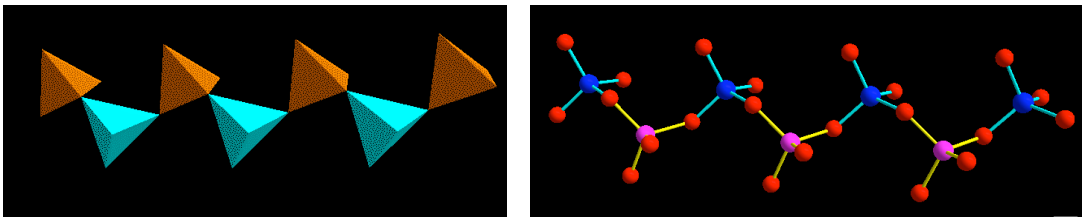
Tetra-oxo-boro-tri-phosphate



Tetra-oxo-boro-tetra-phosphate



Cyclo-tris-[tetra-oxo-boro-phosphate]



Catena-[tetra-oxo-boro-phosphate]

The examples above clearly show that with increasing of the structural complexity the nomenclature becomes more and more nonspecific, and, therefore, longer and longer names with numerous pre- and suffixes result. Thus, in our opinion, this or any other alternative nomenclature that might be developed become quickly too complicated and unrealistic for the description of borophosphate structures with moderately high complexity. Such nomenclatures will be useless for such compounds. Therefore, we concluded that the necessity of a nomenclature for the borophosphates should be reconsidered. It seems reasonable to use the already published scheme for classification of these compounds but without naming rules and, therefore, nomenclature.

Jing-Tai Zhao

Appendix 9

Annual Report on the IUGS/IUPAC Joint Task Group
Project #2006-016-1-200

Norman E. Holden, Division II Monitor

Membership:

M. Bonardi, LASA, Universita degli Studi di Minlano, Italy,
P. DeBievre, Royal Academies of Belgium, Bruxelles, Belgium,
A.Fajgeli, International Atomic Energy Agency, Vienna, Austria,
N.E. Holden, Brookhaven National Laboratory, Upton, New York, USA,
D.Y. Liu, Beijing Shrimp Laboratory, Beijing, China,
I.M. Villa, Institut fur Geologie, Universitat Bern, Bern, Switzerland,
Chairman, P.R. Renne, Berkeley Geochronogy Center, Berkeley, CA, USA.

Status:

Since the last report of this Task Group in August 2007, e-mail communications as well as a series of bilateral meetings among various members in Beijing, China, in Berkeley, California, USA and in Upton, New York, USA were held to discuss various technical details of the project. One of the details involves the standard and the symbol used for the measurement of the half-lives of long-lived radionuclides that are used by the Task Group for age determinations. The standard unit of time for these measurements is the "year". However, the unit of time for the "year" is not a defined quantity according to the International System of Units, the SI.

The major problem with the year for this Task Group is that it is not commensurate with the day, as will be discussed below.

There is also a minor problem that the year is not a constant. The year decreases by 0.530 seconds per century. In addition, there is the problem of leap seconds used to keep Earth rotation time (UT1) based on the variable rotation of the Earth on its axis coordinated with coordinated universal time (UTC) based on steady atomic clocks. Earth's non-constant rotation period can differ from its average by as much as a few milliseconds because of tidal variations, large scale weather phenomena such as "El Nino" geophysical phenomena and tidal deceleration modified by deglaciation. Leap seconds have been applied once every year and a half, since 1972 to adjust the UTC with the UT1. However, this issue deals with correction factors that are too small to have any impact on the age determinations used in the Task Group's work.

The major issue for our Task Group is that if one wishes to use the year as a unit of time interval and the required precision is sufficiently high, you need to explicitly define the year that you are using in terms of the second. The second is the SI unit and the ultimate reference for a unit of time.

For the symbol of the time unit, year, the IUPAP's SUN (Symbols, Units and Nomenclature) Commission and the IUPAC's "Green Book" (Nomenclature and Terminology of Physical Chemistry) recommended the symbol "a" for the annum (annee), independent of its special definition. Unfortunately, all groups do not follow this usage universally.

For the definition of the year in terms of the second (or the day), there are numerous definitions available. Some examples are as follows:

The Julian Year = 365.25 days = 3.155 760 $(10)^7$ seconds.
The Gregorian Year = 365.2420 days = 3.155 690 88 $(10)^7$ seconds.
The Sidereal Year = 365.256 360 417 days = 3.155 814 954 $(10)^7$ seconds.
Calendar Year (non-leap year) = 365.00 days = 3.1536 $(10)^7$ seconds.
Calendar Year (leap year) = 366.00 days = 3.162 24 $(10)^7$ seconds.

For a publication on a half-life measurement for which no specification is given for the standard unit of the year, the uncertainty could be as large as + 0.07% for a non-leap year measurement, while the uncertainty could be as large as – 0.21% for a leap year measurement merely due to the uncertainty in the standard. Thus, the quoted half-life value would have an inherent "type B" uncertainty of 0.21% (see the International Organization for Standardization, ISO, Guide to the Expression of Uncertainty in Measurement, GUM), independent of any other type A or type B uncertainties. This could limit the accuracy of age determinations to no better than 0.2%, depending on the half-life measurement used.

Results:

The Task Group has prepared a publication for the Pure and Applied Chemistry journal (PAC). Comments from the editor of PAC are being resolved at the present time.

Future Plans:

Due to the problems associated with the standard unit, year, an effort to reevaluate the major publications on half-lives being used for age determinations will begin to assess the type A and type B uncertainties in these publications.

Recommendations:

It is recommended that the Inorganic Chemistry Division Committee (**ACTION ITEM**) and IUPAC extend the deadline for this Task Group to December 31, 2009 (at no additional cost to IUGS or IUPAC) to allow time for the reevaluation of the half-life publications. A similar request is being made to the IUGS Executive Committee to extend their funding period for this Task Group to December 31, 2009 also.

Appendix 10

Report on Joint Educational Task Group with Committee on Chemical Education (CCE)
Project #2007-038-3-200

Norman E. Holden, Division II Monitor

Membership:

J.K. Bohlke, US Geological Survey, Reston, Virginia, USA
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J.R. deLaeter, Curtin University, Perth, Western Australia, Australia
P. Mahaffy, Kings University, Edmonton, Alberta, Canada
E. Roth, Sevres, France
R.M. Smith, Loughborough University, Loughborough, Leicestershire, UK
T. Walczyk, National University of Singapore, Singapore
M. Wieser, University Calgary, Calgary, Alberta, Canada
S. Yoneda, National Museum of Nature and Science, Tokyo, Japan
Chairman, N.E. Holden, Brookhaven National Laboratory, Upton, New York, USA

Status:

This project originally had three aspects, a scientific, an educational and an information technology (IT) portion. It was recommended by SNAFU to the Commission on Isotopic Abundances and Atomic Weights (CIAAW) in Pisa, Italy during July 2007. After a series of lengthy negotiations with the IUPAC Projects Committee (PC), it was approved and funded on April 15, 2008 for a considerably lower budget and without the IT component. After the completion of this reduced project, it is hoped that a follow on project including the IT component will be submitted to and funded by the PC. This project was planned to begin during the summer of 2008.

The objective of this project is to clarify the role of isotopes in chemistry and other sciences. This project along with the follow on project will develop, with the help of CCE, learner oriented materials on an interactive periodic table emphasizing isotopes. The web-site version of the periodic table will be addressed in the subsequent project proposal.

Results: The Task Group is just beginning to organize and to examine the materials that will be needed in terms of both basic and applied usage of isotopes in science.

Future Plans: The initial effort will be done via e-mail communications. When sufficient material has been collected across the periodic table of elements, a meeting will be planned for the summer of 2009, prior to the CIAAW meeting at the IAEA in Vienna, Austria in late July 2009.

Recommendations: Since the Task Group has just been funded and is only now beginning to operate, there are no recommendations to the Division Committee at this time.