

# ARKIVOC: A Hard Copy Journal of Organic Chemistry Freely Available on the Web

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## Background

ARKIVOC (Archive for Organic Chemistry) was conceived in an attempt to alleviate a number of adverse trends in the practice and publication of organic chemistry, which are particularly acute in countries of the second and the third world. These include the following:

- Increasing difficulty for researchers in accessing the primary chemical literature because of the increasing cost of journals. The costs of some of the leading journals of organic chemistry are given in Table 1. Even in Western Europe and North America, and in major universities, libraries face severe difficulties with their budgets.
- Increasing difficulties for authors to publish their work in journals that are widely available. The pressure on library budgets caused by point 1 above has recently led to the disappearance (often by amal-

**Table 1** Prices (in USD for 2000) and pages per annum (approximate) of leading journals in organic chemistry.

<i>Journal of Organic Chemistry</i>	1626/10,000
<i>Organic Letters</i>	2403/4000
<i>Journal of Chemical Society, Perkin I</i>	1843/4000
<i>Journal of Chemical Society, Perkin II</i>	1535/2500
<i>Tetrahedron</i>	11,624/9000
<i>Tetrahedron Letters</i>	8859/10,000
<i>Synthesis</i>	1099/1800
<i>Synletters</i>	702/1800
<i>European J. of Organic Chemistry</i>	2698/5000

Notes: Page numbers are given for the year 2000. Prices reflect costs for year 2000 in countries other than that of the producer for an institutional subscription. In making price comparisons, the different sizes of pages and densities of printing need to be taken into consideration, which has not been done.

gamation) of many second rank (and some first rank!) journals. The amalgamated journals are accepting only the best, the most novel of research that is carried out. Other sound work is now often published in a third rank journal (e.g., a university journal with low distribution) or not at all.

- Increasing needs for equipment, starting materials, infrastructure, etc., which cause shortages of funds for actual research. This point is so self-evident that no further explanation is required.
- The potential for random testing by high throughput screening of compounds prepared during research projects with completely different objectives. Several commercial organizations are already collecting specimens worldwide and selling them to pharmaceutical companies and other interested organizations. While these efforts are undoubtedly of considerable value to the recipient organizations, the proportion of the gross income returned to the producers of the compounds is often a fraction of the selling price.

## Strategy

The not-for-profit Archive for Analysis and Testing Foundation (ARKAT) was created in an attempt to address simultaneously the four points outlined above. We publish and circulate on the Internet a new freely accessible journal: ARKIVOC (Archive for Organic Chemistry). The cost of publishing ARKIVOC on the web will be met in a number of ways. We solicit contributions from companies and granting organizations. We hope to produce and sell hard copy issues of the journal at a later date. We run the Florida Heterocyclic conferences (see p. 184, 3<sup>rd</sup> column) as an income-producing activity to support ARKIVOC.

## ARKIVOC Submission and Processing of Manuscripts

All correspondence is handled electronically. After experimenting with a more idealistic system, we rapidly moved to traditional anonymous refereeing. Thus, all manuscripts are forwarded electronically to our coordinating editor, A. John Boulton (detailed instructions are available on the Web at [www.arkat-usa.org](http://www.arkat-usa.org)), who assigns two referees, a technical editor, and a scientific editor to deal with each manuscript. The corresponding author is informed of the name of the scientific editor. The referees and the technical editor are sent the manuscript and name of the scientific editor to whom

they are asked to send their reports directly. The scientific editor is sent the manuscript and the names of the referees and the technical editor. If reports are not received within two weeks, the scientific editor reminds the referee. After receipt of the referees' and the technical editor's reports, the scientific editor can directly accept or reject the paper. Normally, the scientific editor will communicate the referees' and technical editor's reports (anonymously) to the author, who will be asked to modify the paper as necessary. At any time, the scientific editor may correspond further with the original or additional referees or with the technical editor.

At present, our Editorial Board of Referees consists of 228 scientists from 46 countries covering six continents. The Chairman of this Board (George Newkome) maintains general contact with members.

ARKIVOC now has eight scientific editors, seven of whom handle general manuscripts; two are in the United Kingdom (Chris Ramsden and Tom Gilchrist), two are in continental Europe (Mike Begtrup and Joachim Schantl), two are in the United States (Alan Marchand and Paul Krapcho), and one is in India (G. S. Subba Rao). The eighth scientific editor (Eric Scriven) deals with reviews and accounts. Spiros Grivas and Ramaiah Muthyala are our technical editors.

Accepted papers are forwarded by scientific editors to the Publishing Editor (Eric Scriven), and, under his direction, the manuscripts are given a uniform appearance and readied for online display and search. HTML and PDF format manuscripts are prepared for easy viewing, downloading, and printing.

### **Electronic and Hard Copy Publication of ARKIVOC**

Issues of ARKIVOC are released onto the web site electronically as soon as they are ready. The electronically released issues are formatted precisely for convenient downloading and binding; thus, each issue has an appropriate cover page, title page, and contents page. There are no restrictions on (or charges for) downloading individual papers or complete issues of ARKIVOC for scientific research purposes, for distribution throughout the downloading organization, or for binding and placing them in a library. However, any reproduction of ARKIVOC for sale or for transfer to another commercial organization requires permission from the ARKAT USA Foundation as publisher.

In due course, we hope to provide (for a fee) copies of the journal issues ready for binding for the convenience of organizations (or individuals) who so prefer.

### **Scientific Scope of ARKIVOC**

ARKIVOC accepts submissions dealing with all branches of organic chemistry, including physical organic, bioorganic, and organic materials chemistry. The prime criteria for acceptance of manuscripts by ARKIVOC are soundness and proper characterization

of all compounds described (for detailed instructions, see Web site). In addition to original papers, ARKIVOC also publishes reviews and accounts (shorter, focused overviews).

An important objective of ARKIVOC is to ensure the permanent archival availability of organic chemistry research results worldwide. Because of our cost-free availability, ARKIVOC offers potentially wider dissemination of organic chemical results than existing journals. ARKIVOC, which has no page charges or costs for authors, offers equal opportunities for chemists worldwide to make their results available to the widest possible audience.

### **Commemorative Issues of ARKIVOC**

A secondary objective of ARKIVOC is to provide the opportunity to recognize the achievements of chemists by means of commemorative issues. Such commemorative issues are well known, but the chemists so honored currently tend either to come from a small group of developed countries or to receive dedicated issues in journals of relatively low circulation.

ARKIVOC seeks to honor distinguished chemists worldwide, particularly those whose contributions have deserved wider recognition. Instructions for suggesting names and the procedure for commemorative issues are given on the web site. Suggestions can be made to Alan Katritzky, Chair of the Commemorative Issues Committee of ARKIVOC.

### **Progress with ARKIVOC**

Substantial progress has been achieved with our journal. Volume 1, published during 2000, comprises six issues containing 90 papers and totaling over 1000 pages.

Our original objective of 100 papers totaling 1000 pages in year 2000 has thus been reached. We hope to achieve 200 papers with 2000 pages in 2001. It is interesting to compare this success with the early years of *Tetrahedron*. *Tetrahedron's* first three years were 1957 (384 pages for USD 17), 1958 (1138 pages for USD 51), and 1959 (1038 pages for USD 51).

### **Indexing and Abstracting of ARKIVOC**

Each issue of ARKIVOC carries graphical abstracts of all papers in that issue. It is planned that the text and structures in ARKIVOC will be searchable electronically using authors' names and keywords. *Chemical Abstracts* and *Current Chemical Contents* are already abstracting ARKIVOC regularly.

### **Policy and Direction of ARKIVOC**

ARKAT USA is managed by its Directors, in accordance with goals and objectives set out in its charter. The promotion of ARKIVOC is one of ARKAT USA's primary objectives.

ARKIVOC has its own Control Board (Chair:

Charles Rees; Secretary: Chris Ramsden) consisting of the Coordinating Editor, the Scientific Editors, the Technical Editors, Chair of the Editorial Board of Referees, and Chair of the Commemorative Issues Committee. A steering committee reporting to the ARKAT USA Board oversees day-to-day activities of ARKIVOC and the Flohet conferences. Meetings of the steering committee and available ARKIVOC Control Board members take place (often at chemical conferences) at irregular intervals around the world; e.g., in 2000 such meetings were held in London (2), Florida, and Alexandria (Egypt).

Control Board members regularly send details of progress to the Board Secretary, who coordinates these into a monthly report to all Control Board members.

#### Other Activities of ARKAT USA

ARKAT USA exists to help scientists in general, and chemists in particular, throughout the world and particularly in developing countries. Present activities and those under consideration include the following:

- Organization of conferences.
- Provision of quality online educational resources to students, to encourage interactive learning, help them with their course work, and alleviate the acute shortage of qualified teachers for science subjects.
- Publishing useful reference materials for practicing chemists. The first such publication, a dictionary of named reactions, compiled by John Boulton and Purabi Devi, is now available in part from the ARKAT USA Web site.

All those wishing to publish with ARKAT should visit the ARKAT USA Web site for details.

#### We Need Your Help!

We hope that you will agree that ARKAT USA and the ARKIVOC journal offer real help to chemists worldwide. If so, please help us in some of the following ways (more details at [www.arkat-usa.org](http://www.arkat-usa.org)):

- Submit a manuscript to our coordinating editor.
- Read and cite papers already published in ARKIVOC.
- Ask your library to download and bind the journal (no fee).
- Spread the word about ARKIVOC among your friends.
- Send comments or suggestions to any of the authors of this article.
- Please give ARKAT USA your support in our efforts to raise funds for these projects.
- If you are affiliated with a corporation, please send us details of whom we may contact for a financial donation and to discuss advertising and product promotions on the ARKAT Web site.

The inception of ARKAT USA and ARKIVOC has been made possible by the unpaid efforts of the ARKAT USA directors and the ARKIVOC editors and referees and by an initial personal financial gift. We are now working to put the organization on a self-supporting basis, and we believe that this goal can, indeed, be achieved to create a permanent ongoing organization for the benefit both of chemistry and of humanity worldwide.

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## “Heavy Metals”—A Meaningless Term

Dr. John H. Duffus (Director, Edinburgh Centre for Toxicology, 43 Mansionhouse Road, Edinburgh, EH9 2JD, Scotland, UK; E-mail: [j.h.duffus@btinternet.com](mailto:j.h.duffus@btinternet.com)), Chairman of the IUPAC Commission on Toxicology (VII.C.2), has submitted the article that appears below.

### Introduction

Over the past two decades, the term “heavy metals” has been used increasingly in various publications and in legislation related to chemical hazards and the safe use of chemicals. It is often used as a group name for metals and semimetals (metalloids) that have been associated with contamination and potential toxicity or ecotoxicity. At the same time, legal regulations often specify a list of heavy metals to which they apply. Such lists may differ from one set of regulations to the other, or the term may be used without specifying which heavy metals are covered. In other words, the term “heavy

metals” has been used inconsistently. This practice has led to general confusion regarding the significance of the term. The inconsistent use of the term “heavy metals” reflects inconsistency in the scientific literature. It is, therefore, necessary to review the usage that has developed for the term, paying particular attention to its relationship to fundamental chemistry. Without care for the scientific fundamentals, confused thought is likely to prevent advances in scientific knowledge and to lead to bad legislation and to generally bad decision-making.

### A Review of Current Usage of the Term “Heavy Metal”

Table 1 lists all the current definitions of the term “heavy metal” that the author has been able to trace in scientific dictionaries or in other relevant literature. It must be noted that frequently the term has been used without

an associated definition, presumably by authors who thought that there was agreement about the meaning of the term. The table shows how wrong this assumption is and explains some of the confusion in the literature and in related policy and regulations. It should also be noted before going further that the term “heavy metal” has even been applied to semimetals (metalloids) such as arsenic, presumably because of the hidden assumption that “heaviness” and “toxicity” are in some way identical. This example further illustrates the confusion that surrounds the term.

Before 1936, the term was used with the meanings “guns or shot of large size” or “great ability” [1,2]. The oldest scientific use of the term to be found in the English literature, according to the *Oxford English Dictionary*, is in Bjerrum’s *Inorganic Chemistry*, 3<sup>rd</sup> Danish edition, as translated by Bell in collaboration with Bjerrum, published in London in 1936 [3]. It is worth noting that no comparable inorganic chemistry textbook published since seems to have used Bjerrum’s classification, and it has not been included in the IUPAC *Compendium of Chemical Terminology* [4], which is the gold standard of terminology for chemists.

Bjerrum’s definition of heavy metals is based upon the density of the elemental form of the metal, and he classifies heavy metals as those metals with elemental densities above 7 g/cm<sup>3</sup>. Over the years, this definition has been modified by various authors, and there is no consistency. In 1964, the editors of Van Nostrand’s *International Encyclopedia of Chemical Science* [5] and in 1987, the editors of Grant and Hackh’s *Chemical Dictionary* [6] included metals with a specific gravity greater than 4. A little later, in 1989, 1991, and 1992, Parker [7], Lozet and Mathieu [8], and Morris [9] chose a defining specific gravity “greater than 5”. However, Streit [10] used a specific gravity of 4.5 as his reference point, and Thornton [11] chose 6. The *Roempp Chemical Dictionary* [12] gives 3.5 as a possible defining specific gravity. However you work with these definitions, it is impossible to come up with a consensus. Accordingly, this basis for defining heavy metals must be abandoned as yielding nothing but confusion.

At some point in the history of the term, it has been realized that density or specific gravity is not of great significance in relation to the reactivity of a metal. Accordingly, definitions have been formulated in terms of atomic weight or mass, which brings us a step closer to the periodic table—traditionally the most sound and scientifically informative chemical classification of the elements. However, the mass criterion is still unclear. Bennet [13] and Lewis [14] opt for atomic weights greater than that of sodium, i.e., greater than 23, thus starting with magnesium, while Rand *et al.* [15] prefer metals of atomic weights greater than 40, thus starting with scandium. Lewis [14] also suggested that forming soaps with fatty acids is an important criterion of “heavi-

ness”. This suggestion, together with the absurdity of classifying magnesium as a heavy metal when there has developed a conventional association of heaviness with toxicity, makes the Bennet and Lewis definition untenable. As for starting with scandium, it has a specific gravity of just under 3 and so would not be a heavy metal under any of the definitions based on density. Thus, again we have no consistent basis for defining the term.

Another group of definitions is based on atomic number. Here there is more internal consistency because three of the definitions cite heavy metals as having atomic numbers above 11, that of sodium. Interestingly, one of them comes from the chapter by Lyman in Rand (1995) [16] and contradicts the definition favored by Rand himself cited in the previous paragraph. The problem with citing metals of atomic number greater than sodium as being “heavy” is that it includes essential metals, such as magnesium and potassium, and flatly opposes the historic basis of definition tied to density or specific gravity, because it includes elements of specific gravity lower than any one that has been used as a defining property by other authors. Burrell’s definition [17] even includes the semimetals arsenic and tellurium and the nonmetal selenium.

A fourth group of definitions is based on other chemical properties, with little in common: density for radiation screening, density of crystals, and reaction with dithizone. This litany brings us to the definitions based vaguely on toxicity. One of these definitions [18] even refers to heavy metals as an “outdated term”. The same authors also point out, as we have already noted in Table 1, that the term has been applied to compounds of the so-called heavy metals, including organic derivatives where the biological and toxic properties may reflect more on the organic moiety than on the metal itself, thus making the term even more misleading than usual in the literature.

With the above in mind, it is not surprising that the most widely used textbook in toxicology, *Casarett and Doull’s Toxicology* [19], never uses the term “heavy metal”. It is not surprising either that Phipps, one of the authors whose definitions are cited in the table, calls the term “hopelessly imprecise and thoroughly objectionable” [20], or that, recently, vanLoon and Duffy conclude that “there is no chemical basis for deciding which metals should be included in this category (heavy metals)” [21]. What is surprising is the persistence of the term and its continuing use in literature, policy, and regulations, with widely varying definitions leading to confusion of thought, failure in communication, and considerable waste of time and money in fruitless debate.

## Conclusion

The term “heavy metal” has never been defined by any authoritative body such as IUPAC. Over the 60 years

**Table 1** Definitions of heavy metal: Survey of current usage (April 2001).

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**Definitions in terms of density (specific gravity)**

- metals fall naturally into two groups—the light metals with densities below 4, and the heavy metals with densities above 7 [3]
- metal having a specific gravity greater than 4 [5]
- metal of high specific gravity, especially a metal having a specific gravity of 5.0 or greater [22]
- metal with a density greater than 5 [23]
- metal with a density greater than 6 g/cm<sup>3</sup> [24]
- metal of specific gravity greater than 4 [6]
- metal with a density of 5.0 or greater [25]
- metal whose specific gravity is approximately 5.0 or higher [7]
- metal with a density greater than 5 [8]
- (in metallurgy) any metal or alloy of high specific gravity, especially one that has a density greater than 5 g/cm<sup>3</sup> [9]
- metal with a density higher than 4.5 g/cm<sup>3</sup> [10]
- metal with a density above 3.5–5 g/cm<sup>3</sup> [12]
- element with a density exceeding 6 g/cm<sup>3</sup> [11]

**Definitions in terms of atomic weight (mass)**

- metal with a high atomic weight [26]
- metal of atomic weight greater than sodium [13]
- metal of atomic weight greater than sodium (23) that forms soaps on reaction with fatty acids [14]
- metallic element with high atomic weight (e.g., mercury, chromium, cadmium, arsenic, and lead); can damage living things at low concentrations and tend to accumulate in the food chain [27]
- metallic element with an atomic weight greater than 40 (starting with scandium; atomic number 21); excluded are alkaline earth metals, alkali metals, lanthanides, and actinides [15]
- metal with a high atomic mass [28]
- heavy metals is a collective term for metals of high atomic mass, particularly those transition metals that are toxic and cannot be processed by living organisms, such as lead, mercury, and cadmium [29]
- metal such as mercury, lead, tin, and cadmium that has a relatively high atomic weight [30]
- rather vague term for any metal (in whatever chemical form) with a fairly high relative atomic mass, especially those that are significantly toxic (e.g., lead, cadmium, and mercury). They persist in the environment and can accumulate in plant and animal tissues. Mining and industrial wastes and sewage sludge are potential sources of heavy metal pollution [31].
- a metal such as cadmium, mercury, and lead that has a relatively high relative atomic mass. The term does not have a precise chemical meaning [32].
- metal with a high relative atomic mass. The term is usually applied to common transition metals such as copper, lead, or zinc [33].

**Definitions in terms of atomic number**

*In biology:*

- in electron microscopy, metal of high atomic number used to introduce electron density into a biological specimen by staining, negative staining, or shadowing [34]
- in plant nutrition, a metal of moderate to high atomic number, e.g., Cu, Zn, Ni, or Pb, present in soils owing to an outcrop or mine spoil, preventing growth except for a few tolerant species and ecotypes [34]

*In chemistry:*

- the rectangular block of elements in the Periodic Table flanked by titanium, hafnium, arsenic, and bismuth at its corners but including also selenium and tellurium. The specific gravities range from 4.5 to 22.5 [17].
- any metal with with an atomic number beyond that of calcium [35]
- any element with an atomic number greater than 20 [36]
- metal with an atomic number between 21 (scandium) and 92 (uranium) [16]
- term now often used to mean any metal with atomic number >20, but there is no general concurrence [20]

**Definitions based on other chemical properties**

- heavy metals is the name of a range of very dense alloys used for radiation screening or balancing purposes. Densities range from 14.5 for 76% W, 20% Cu, 4% Ni to 16.6 for 90% W, 7% Ni, 3% Cu [37].
- intermetallic compound of iron and tin (FeSn<sub>2</sub>) formed in tinning pots that have become badly contaminated with iron. The compound tends to settle to the bottom of the pot as solid crystals and can be removed with a perforated ladle [38].
- lead, zinc, and alkaline earth metals that react with fatty acids to form soaps. "Heavy metal soaps" are used in lubricating greases, paint dryers, and fungicides [39].
- any of the metals that react readily with dithizone (C<sub>6</sub>H<sub>5</sub>N), e.g., zinc, copper, lead, etc. [40].
- metallic elements of relatively high molecular weight [41].

**Definitions without a clear basis other than toxicity**

- element commonly used in industry and generically toxic to animals and to aerobic and anaerobic processes, but not every one is dense or entirely metallic; includes As, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn [42]
- outdated generic term referring to lead, cadmium, mercury, and some other elements that generally are relatively toxic in nature; recently, the term "toxic elements" has been used. The term also sometimes refers to compounds containing these elements [18].

**Definitions preceding 1936**

- guns or shot of large size [1]
  - great ability [2]
-

1												18					
H												He					
2												13	14	15	16	17	
<i>Li</i>	<i>Be</i>											B	C	N	O	F	Ne
<i>Na</i>	<i>Mg</i>	3	4	5	6	7	8	9	10	11	12	<i>Al</i>	<i>Si</i>	<i>P</i>	<i>S</i>	<i>Cl</i>	<i>Ar</i>
<i>K</i>	<i>Ca</i>	<i>Sc</i>	<i>Ti</i>	<i>V</i>	<i>Cr</i>	<i>Mn</i>	<i>Fe</i>	<i>Co</i>	<i>Ni</i>	<i>Cu</i> <i>Cu</i>	<i>Zn</i>	<i>Ga</i>	<i>Ge</i>	<i>As</i>	<i>Se</i>	<i>Br</i>	<i>Kr</i>
<i>Rb</i>	<i>Sr</i>	<i>Y</i>	<i>Zr</i>	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	<i>Sn</i>	Sb	Te	I	Xe
<i>Cs</i>	<i>Ba</i>	<i>La</i> <sup>*</sup>	<i>Hf</i>	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	<i>Pb</i> <i>Pb</i>	Bi	Po	At	Rn
<i>Fr</i>	<i>Ra</i>	<i>Ac</i> <sup>**</sup>	Rf	Db	Sg	Bh	Hs	Mt	110	111							

*lanthanides	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
**actinides	<i>Ac</i>	<i>Th</i>	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No

**Fig. 1** Periodic table of the elements showing those metals classified as Class A, Class B, and Borderline metals. N.B.: Copper may be either Class B or Borderline, depending on whether it is Cu(I) or Cu(II), respectively. Lead may be either Class B or Borderline, depending on whether it is Pb(IV) or Pb(II).

or so in which it has been used in chemistry, it has been given such a wide range of meanings by different authors that it is effectively meaningless. No relationship can be found between density (specific gravity) or any of the other physicochemical concepts that have been used to define heavy metals and the toxicity or ecotoxicity attributed to heavy metals.

Understanding bioavailability is the key to assessment of the potential toxicity of metals and their compounds. Bioavailability depends on biological parameters and on the physicochemical properties of metals, their ions, and their compounds. These parameters, in turn, depend upon the atomic structure of the metals, which is systematically described by the periodic table. Thus, any classification of the metals to be used in scientifically based legislation must itself be based on the periodic table or on some subdivision of it. One possibility for such a system was suggested more than 20 years ago by Nieboer and Richardson [43] when they also condemned the use of the term heavy metals. Such a classification of metals by their Lewis acidity as *Class A (hard)*, *Class B (soft)*, or *Borderline* indicates the form of bonding in their complexes, and this designation determines the possibilities for complex formation and, thus, for toxicity. Class A metal ions, which are hard or nonpolarizable, preferentially form complexes with similar nonpolarizable ligands, particularly oxygen donors, and the bonding in these complexes is mainly

ionic. Class B or soft metal ions preferentially bind to polarizable, soft ligands to give rather more covalent bonding. In general, it is noticeable that hard-hard or soft-soft combinations are preferred wherever possible.

Even if the term heavy metal should become obsolete because it has no coherent scientific basis, there will still be a problem with the common use of the term "metal" to refer to a metal and all its compounds. This usage implies that the pure metal and all its compounds have the same physicochemical, biological, and toxicological properties. Thus, sodium metal and sodium chloride are assumed by this usage to be equivalent. However, nobody can swallow sodium metal without suffering serious, life-threatening damage, while we all need sodium chloride in our diet. As another example, epidemiological studies show that chromium and its alloys can be used safely in medical and dental prostheses even though chromate is identified as a carcinogen.

Finally, it should be emphasized that nobody uses the term "carbon" to refer to all carbon compounds. If they did, carbon would have to be labeled as a human carcinogen because so many carbon compounds fall into this category. If metallic elements are to be classified sensibly in relation to toxicity, the classification must relate logically to the model adopted for carbon, and each metal species and compound should be treated separately in accordance with their individual chemical, biological, and toxicological properties.

## Acknowledgment

This paper is based on a review of the usage of the term heavy metal carried out for Eurometaux by the author. This review is available from Eurometaux.

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## News from IUPAC

### Report on Second Workshop on Thermochemical, Thermodynamic, and Transport Properties of Halogenated Hydrocarbons and Mixtures, 9–11 April 2001, Paris, France

Dr. John H. Dymond (Department of Chemistry, University of Glasgow, University Avenue, Glasgow, Scotland G12 8QQ, UK; E-mail: johnd@chem.gla.ac.uk), Secretary of the IUPAC Commission on Thermodynamics (I.2), has submitted the following report:

The objective of this IUPAC project (2000-027-1-100) is to increase knowledge and understanding of the thermodynamic and transport properties of halogenated organic compounds, especially halogenated aliphatic hydrocarbons, of their mixtures, and also of their mixtures with hydrocarbons.

In the first workshop, which was held in Pisa, Italy, 15–18 December 1999 (and reported in *Chemistry International*, Vol. 22, p. 162, 2000), all the submitted papers that related to this general topic were accepted for oral communication or poster presentation. A final, roundtable discussion considered the priorities for further research. As a result of this effort, a Certificate of Research Needs was drawn up. The main goals are to present and discuss new experimental measurements, particularly for the following systems:

- propane/butane + refrigerants
- binary and ternary hydrofluorocarbons (HFCs)
- higher alkanes/ethers + refrigerants
- lubricant oils + refrigerants
- gas + perfluorocompounds, with medical application

The goals also include presenting and discussing the results of calculations, particularly the following:

- intermolecular potential calculations for methane-, ethane-, and propane-derived HCFCs using *ab initio* methods, to develop models for theory-based calculation of macroscopic properties
- molecular simulations, particularly for methane derivatives
- improved correlation methods

Further details are given on the web site (see <http://www.iupac.org/projects/2000/2000-027-1-100.html>).

This second workshop was structured with four main themes: i) environmental constraints and regulation, ii) new products, iii) new measurements, and iv) fundamentals and simulation.

There were 11 invited lectures. In the opening lecture, Dr. C. Ewald (Ministère de l'Aménagement du Territoire et de l'Environnement, Paris, France) described the objectives of the French policy to stabilize greenhouse gas emissions by prevention of leakage, confinement, recovery, and recycling. For the longer term, there is a need to encourage use of fluids with low global warming potential, consistent with the requirements of safety, energy efficiency, and reasonable investment costs. Dr. P. Horrocks (European Commission, Brussels, Belgium) described the main groups of provisions in regulation EC 2037/00, which has applied in all Member States since 1 October 2000. First, it will ban all hydrochlorofluorocarbon (HCFC) use within four years, except for the maintenance of existing equipment, which is well before that agreed in the Montréal Protocol. Second, it will introduce a slightly faster reduction schedule, but the same phaseout date, as that of the Montréal Protocol for methyl bromide use in agriculture. Third, there are measures to minimize emissions of all ozone-depleting substances. Dr. N. Campbell (ATOFINA, Paris la Défense, Paris) reviewed existing European legislation on chlorofluorocarbons (CFCs) and HCFCs, and detailed existing discussions on hydrofluorocarbons (HFCs) taking place within the European Union. A subgroup of the European Commission has been set up to recommend policies and measures to control the emissions of HFCs as part of its European Climate Change Program. Dr. J. Morley (DuPont Fluoroproducts, Hemel Hempstead, England, UK) addressed the question "Are we near an industry standard for refrigerant properties?" He discussed the various important worldwide activities that were taking place to determine accurate thermophysical properties of candidate alternative refrigerant working fluids.

Prof. K. Watanabe (Keio University, Yokohama, Japan) reported  $P$ ,  $r$ ,  $T$ ,  $x$  measurements for R-134a (1,1,1,2-tetrafluoroethane) + R-290 (propane) and R-125 (pentafluoropropane) + R-290. Determination of such thermodynamic properties of binary mixtures of hydrocarbons (HCs) blended with nonflammable HFCs is important in solving the problem of the flammability of HCs, which otherwise are promising alternative fluids in refrigeration-based applications, as they have zero ozone-depletion potential and negligible global warming potential. Prof. S. I. Sandler (University of Dela-



ware, Newark, Delaware, USA) discussed the use of computational chemistry to make phase behavior predictions. He illustrated his talk with two examples of *ab initio* quantum mechanical calculation methods. The first example used interaction energies determined from quantum mechanics to compute thermodynamic properties by molecular simulation. In the second example, the chemical potential for dense fluids was calculated in Monte Carlo simulations in a Gibbs ensemble, as a result of moving molecules from a gas-like box to a liquid-like box.

Prof. Th. de Loos (Delft University of Technology, The Netherlands) gave examples of complex fluid phase behavior to be observed for binary systems of alkanes, ethers, alkanols, and ammonia with halocarbons. He showed that systematic changes in the type of behavior are found in families of a light gas (e.g., a halocarbon) with members of a homologous series. Prof. G. M. Schneider (University of Bochum, Germany) described the continuity that exists between phase equilibria in fluid mixtures (liquid–liquid, liquid–gas, and gas–gas), and illustrated it with examples where a particular fluid (e.g., a fluorocompound) was combined with a second fluid that was systematically altered in molecular mass, size, shape, structure, or polarity, by selecting compounds from different homologous series.

Prof. E. Wilhelm (University of Vienna, Austria) spoke about the importance of molecular models for interpreting thermodynamic properties. He showed how data analysis had led to information on the rotational behavior of tetrachloromethane, on the trans-gauche equilibrium in 1,2-dihaloethanes, and on the significantly enhanced solubility of oxygen in perfluorinated hydrocarbons, which is of interest for artificial blood systems. Dr. A. Laesecke (National Institute of Standards and Technology, Boulder, Colorado, USA) reported observations of the dielectric behavior of ten binary and ternary mixtures composed of difluoromethane, 1,1,1,2-tetrafluoroethane, pentafluoroethane, and propane. Such results give insights into the molecular interactions of these systems and are important for the development of more realistic potential models for property calculation.

Prof. G. Scalabrin (Universita di Padova, Italy) demonstrated “conformality” within a corresponding states format in different thermodynamic functions for fluids belonging to the alkane and halogenated alkane series. A volumetric model, a heat of vaporization model, and two further models, for enthalpy and entropy, for pure fluids and mixtures provide a high level of prediction accuracy with the given scaling parameters.

There were an additional 27 oral communications, which included measurements on pure fluids [density for compressed difluoromethane; vapor–liquid equilibria for difluoromethane; thermodynamics of vaporiza-

tion and heat capacities of hydrofluorocarbons; activity coefficients at infinite dilution in perfluoroalkanes; and dipole moment of liquid HFC-227ea (1,1,1,2,3,3,3-heptafluoropropane)] and on mixtures (high-pressure vapor–liquid equilibria for 1,1,1,2-tetrafluoroethane + propane; thermodynamic properties of refrigerants + lubricant oils). Results were presented for theoretical calculations (perturbation theory applied to thermodynamic properties of alkane + haloalkane systems, thermodynamic and dielectric properties of fluoromethanes from Monte Carlo simulations, prediction of thermodynamic properties of mixtures of alternative refrigerants by molecular simulations, and new intermolecular potentials for chlorofluorocarbon fluids), and other papers were concerned with data correlation and prediction (use of density data to calculate an equation of state through a new extended corresponding states–neutral network technique, correlation and prediction of transport properties based on consideration of hard-sphere models, and viscosity equations for refrigerants based on an extended corresponding states model).

A poster discussion session was held for the 60 poster presentations, and the workshop closed with a panel discussion of the main points of the workshop. The proceedings of this workshop will be published as a special issue of *Fluid Phase Equilibria*.

This highly successful workshop, which attracted about 120 participants, was excellently organized by Professor D. Richon (École Nationale Supérieure des Mines de Paris) and his Scientific and Local Organizing Committees. A followup workshop, to be organized by Profs. U. K. Deiters (University at Cologne, Germany) and M. J. Assael (Aristotle University, Thessaloniki, Greece), is planned for July–August 2002 in Rostock, Germany.

We are saddened to report the death of Prof. Robert P. Panico (France), who passed away on 6 August 2001. Prof. Panico served as Vice-Chairman and was for many years a Titular Member of the IUPAC Commission on Nomenclature of Organic Chemistry (III.1). He was also a coeditor of “A Guide to IUPAC Nomenclature of Organic Compounds, Recommendations 1993” (A Guide to the “Blue Book”).

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## Reports from IUPAC-Sponsored Symposia

### 6<sup>th</sup> International Workshop on High-Temperature Superconductors and Novel Inorganic Materials Engineering (MSU-HTSC VI), 24–30 June 2001, Moscow to St. Petersburg, Russia

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This workshop was organized by the Departments of Chemistry and Materials Science of the Moscow State University. The workshop was held on a boat (“Fedor Shalyapin”) going from Moscow (departure: 24 June 2001) to St. Petersburg (arrival: 30 June 2001). The meeting was superbly organized by our Russian colleagues, Prof. Yu. D. Tret’yakov, Prof. E. V. Antipov, Prof. A. R. Kaul, and Dr. R. V. Shpanchenko.

More than 200 participants from all over the world contributed 9 plenary lectures, 73 oral presentations, and 107 posters. The evening poster sessions never stopped before midnight; scientific discussions continued during the “white nights”. The central part of the scientific program was focused on superconductivity and oxide materials, including theoretical aspects, structure/property relationships, and applications. However, time was also allowed for nonoxide materials. Of course, the boride superconductor was also presented in two plenary lectures given by Prof. J. Akimutsu (Japan) and Prof. J. Jorgensen (USA). These results contributed to an intensive and sometimes controversial roundtable discussion on “Design of new inorganic materials”.

The workshop was a real treat—not least because of the excursion program that was offered every day during a boat stop for a few hours. We saw impressive monasteries, churches, and icons during the excursions and fascinating scenery during the boat trip. And, finally, we reached wonderful St. Petersburg! Congratulations and thanks again to the organizers.

**Prof. Dr. Rüdiger Knip**  
**Max-Planck-Institut für Chemische Physik fester Stoffe**  
**Nöthnitzer Strasse 40**  
**01187 Dresden, Germany**

### 15<sup>th</sup> Bratislava International Conference on Polymers: Preparation of Nonconventional Polymer Dispersions, 25–28 June 2001, Smolenice, Slovak Republic

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The conference took place at a fairy tale-looking castle of Smolenice located about 60 km north of the Slovak

capital, Bratislava. Both the interesting venue of the conference and the well-organized scientific and social programs added to the success of the event. The organization was competently mastered by Dr. Ignác Capek from the Polymer Institute of the Slovak Academy of Sciences in Bratislava, with the efficient help of his team of coworkers.

The scope of the conference covered the preparation of polymer particles ranging from a few tens of nanometers to the millimeter size, kinetics of particle formation, and the advanced design of particle structure. The synthetic approaches using microemulsions, miniemulsions, and emulsions have been discussed extensively. Specialty products included magnetic, conducting, and colored colloids, thermosensitive microparticles, and other objects with unique physicochemical properties. Applications in drug delivery and the capture of various active species have been demonstrated. The titles of several lectures are illustrative:

- “Kinetics and mechanism of oil/water (o/w) microemulsion polymerization of styrene” (M. Nomura, Japan)
- “Polymer dispersions as intermediate states during synthesis of specialty polymers” (K. Tauer, Germany)
- “ESR study on radical polymerization and its application to microemulsion systems” (M. Kamachi, Japan)
- “Recent progress in reactive surfactants in emulsion polymerization” (A. Guyot, France)
- “Polymerization in nanostructured media: Application to the synthesis of associating polymers” (F. Candau, France)

The conference was organized in honor of Dr. Jaroslav Barton, the former Director of the Polymer Institute, in appreciation of his 40 years of scientific contributions to the development of free radical polymerization in homogeneous and heterogeneous media. On the whole, 62 active participants from 10 countries generated a friendly working atmosphere and presented 15 main lectures, 11 contributed lectures, and 16 posters. The speakers were recognized experts in the field. There is a chance that a similarly oriented meeting will be held in about five years.

**Dr. Jaroslav Stejskal**  
**Secretary, IUPAC Commission on Structure and Properties of Commercial Polymers IV.2**  
**Institute of Molecular Chemistry**  
**Academy of Sciences of the Czech Republic**  
**Prague, Czech Republic**

20<sup>th</sup> Discussion Conference on  
Scattering Methods for the Investigation  
of Polymers, 9–12 July 2001,  
Prague, Czech Republic

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This discussion conference was the 60<sup>th</sup> event in the series of Prague Meetings on Macromolecules organized by the Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic. The experience of the organizers extending over the past three decades virtually guaranteed that the organization of this meeting would be highly professional.

The conference was attended by 99 active participants and 9 accompanying persons from 23 countries. Altogether, 7 main lectures, 23 short special lectures, 2 panel discussions, and 2 poster sessions (41 posters) constituted the scientific program of the meeting, which was devoted to the application of scattering methods to the characterization of polymers. The scope of the meeting included neutron, X-ray, and light-scattering methods and their use in the description of structural transitions and chain organization involving simple polymers, block copolymers, various advanced polymer architectures, polymer blends, gels, and other objects. The titles of main lectures may serve as examples:

- “Neutron reflectivity of polymer–polymer interfaces” (J. S. Higgins, UK)
- “Scattering studies of universality and hierarchical structure in polymer mixtures undergoing spinodal decomposition” (T. Hashimoto, Japan)
- “Crystallization in block copolymers” (A. J. Ryan, UK)
- “Structure and dynamics of silica-filled polymer by SANS and coherent SAXS” (E. Geissler, France)
- “New results in sphere-forming block copolymers” (T. P. Lodge, USA)
- “Structure and dynamics in aqueous polymer solutions studied by SAXS and DLS” (O. Glatter, Austria)
- “Polymer brushes and mushrooms in polymeric matrices” (S. H. Anastasiadis, Greece)

Two panel discussions on topical problems were skillfully moderated by G. D. Wignall (USA) and W. Burchard (Germany). A relaxed atmosphere at poster sessions stimulated informal communication between the participants.

The social program of the meeting included a welcoming reception and a trip to the Holy Mountain close to the town of Pøíbram, followed by a visit to the Castle of Dobøš and its beautiful parks about 40 km southwest of Prague. Accompanying persons, in particular, enjoyed seeing the sights of historic parts of Prague.

Appreciation for the fine organization of the scientific program is due to Dr. Josef Pleštil, Chairman of the Conference, and to the Organizing Committee from



the host institute. An important point to be noted is that Prof. Henri Benoît (France), a pioneer in the scattering methods applied to polymers, celebrated his 80<sup>th</sup> birthday in Prague; congratulations to him!

**Dr. Jaroslav Stejskal**  
**Secretary, IUPAC Commission on Structure and Properties of Commercial Polymers IV.2**  
**Institute of Molecular Chemistry**  
**Academy of Sciences of the Czech Republic**  
**Prague, Czech Republic**

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41<sup>st</sup> Microsymposium on Polymer  
Membranes, 16–19 July 2001,  
Prague, Czech Republic

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The series of Prague Meetings on Macromolecules continued with this microsymposium devoted to the highly topical theme of polymer membranes. The Organizing Committee, chaired by Dr. Miroslav Bleha, produced a scientific program of outstanding quality in a pleasant working atmosphere, with all the positive attributes typical of scientific events with a long-term tradition.

The scope of the meeting included the chemistry of membrane design, morphology control, characterization of structure and properties of membranes, and the use of membranes. Applications of membrane systems included separation of liquids by pervaporation, gas separation, catalysis, construction of fuel cells, polymer supports for metal ion complexes, ion-exchange membranes, and many other techniques. The invited speakers were well selected to cover virtually all topical aspects of polymer membrane science, as follows:

- “Conductive polymer membranes” (J. Sarrazin, France)
- “Why are permselective polymers low-permeable?” (Yu. P. Yampolskii, Russia)
- “Polymer electrolyte membranes for fuel cells”

(M. H. V. Mulder, Netherlands)

- “Controlled flux behavior of membrane fractionation” (J. Howell, UK)
- “Membrane hybrid systems: Idea, mechanisms, and performance” (R. Wódzki, Poland)
- “Poly(ether imide) membrane formation by vapor-induced phase inversion” (A. Deratani, France)
- “Membrane gas separation opportunities in the control of greenhouse effect” (P. S. Puri, USA)

The four-day conference was attended by 106 active participants and 19 accompanying persons from 18 countries. The scientific program of the meeting was devoted to principles and applications of membrane science and consisted of 8 main lectures, 20 short special lectures, and 2 poster sessions (74 posters). A highly topical panel discussion, “The role of polymeric membranes in the 21<sup>st</sup> century”, coordinated by M. Wessling (Netherlands), was stimulating for all participants.

A fine social program included an excursion to the

Castle of Dobříš with an informal dinner and also a piano recital in Brevnov Benedictine Archabbey, which recently celebrated the millennium of its founding. Accompanying persons attended guided tours to the Prague Castle and Charles Bridge and participated in sightseeing trips around Prague.

The Prague Meetings on Macromolecules, organized under the auspices of IUPAC, will continue in 2002 with the 21<sup>st</sup> Discussion Conference and 9<sup>th</sup> International EPROS (Electrical and Related Properties of Polymers and Other Organic Solids) Conference, 15–18 July 2002, Prague, Czech Republic.

**Dr. Jaroslav Stejskal**  
**Secretary, IUPAC Commission on Structure and Properties of Commercial Polymers IV.2**  
**Institute of Molecular Chemistry**  
**Academy of Sciences of the Czech Republic**  
**Prague, Czech Republic**

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## New Projects

Visit <http://www.iupac.org/projects/> for complete information and further links.

### Glossary of Atmospheric Chemistry Terms

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In 1990, under the auspices of the Commission on Atmospheric Chemistry (VI.2), IUPAC published a “Glossary of atmospheric chemistry terms” (J. G. Calvert, *Pure Appl. Chem.* **62**, 2167–2219, 1990). At its 1999 meeting during the IUPAC General Assembly in Berlin, Commission VI.2 agreed to undertake a revision of this document by first placing the earlier version on the Web and inviting comments from the interested atmospheric chemistry community. The project of revising the document will be coordinated by Dr. Stephen E. Schwartz, Environmental Chemistry Division, Brookhaven National Laboratory, P.O. Box 5000, Building 815E, 75 Rutherford Drive, Upton, New York 11973-5000, USA; Tel.: +1 631 344 3100; Fax: +1 631 344 2887; E-mail: ses@bnl.gov.

Individuals interested in participating in this activity are invited to submit suggestions for the revision to Dr. Schwartz using the above contact information, with the subject line “IUPAC Glossary”. These suggestions may take the form of new entries (with definitions) or

suggestions for the deletion or revision of existing entries. It is intended to eliminate terms that are otherwise standard chemical terms for which definition in a glossary of terms for atmospheric chemistry is unnecessary.

To facilitate this process, the 1990 glossary has been placed on a Web server that is accessible from the project page on the IUPAC Web site at <http://www.iupac.org/projects/1999/1999-033-1-600.html>. Please note also that the IUPAC “Gold Book” (Compendium of Chemical Terminology, 2<sup>nd</sup> edition, compiled by A. D. McNaught and A. Wilkinson, Blackwell Science, 1997 [ISBN 0-86542-6848]), referred to in the 1990 Glossary, is now available online via a link at <http://www.iupac.org/publications/books/author/mcnaught.html>. This document can serve as a guide for definitions and style. A question remains as to what extent, if any, the “Glossary of atmospheric chemistry terms” should duplicate the “Gold Book”. Certainly there should be no conflict.

See <http://www.iupac.org/projects/1999/1999-033-1-600.html> for project description and update.

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## Provisional Recommendations

### IUPAC Seeks Your Comments

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In this section, we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry (PAC)*.

If you would like to comment on the provisional recommendations, please visit the IUPAC Web site at <http://www.iupac.org/reports/provisional/index.html>, where the full texts are available for downloading as draft pdf files. Alternatively, you can write to your nearest national/regional center to request a copy; the most recent list of national/regional centers is available on the Web site at the address above and last appeared in *CI*, Vol. 17, p. 141 (1997).

#### **Inorganic Chemistry Division. Commission on Nomenclature of Inorganic Chemistry— The Naming of New Elements**

<[http://www.iupac.org/reports/provisional/abstract01/koppenol\\_310302.html](http://www.iupac.org/reports/provisional/abstract01/koppenol_310302.html)>

A procedure is proposed to name new elements. After the discovery of a new element is established by a joint IUPAC–IUPAP (International Union of Pure and Applied Physics) Working Group, the discoverers are invited to propose a name and a symbol to the IUPAC Inorganic Chemistry Division. Elements can be named after a mythological concept, a mineral, a place or country, a property, or a scientist. After examination and acceptance by the Inorganic Chemistry Division, the proposal follows the accepted IUPAC procedure for recommendations, and is then submitted to the Council of IUPAC for approval.

Comments by 31 March 2002 to Prof. Dr. W. H. Koppenol, Laboratorium für Anorganische Chemie, Eidgenössische Technische Hochschule Hönggerberg, Universitätsstrasse 6, CH-8093 Zürich, Switzerland. Tel.: +41-1-632-2875, Fax: +41-1-632-1090, E-mail: [koppenol@inorg.chem.ethz.ch](mailto:koppenol@inorg.chem.ethz.ch).

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## New Books and Publications

### New Publications from the International Union of Pharmacology (IUPHAR)

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*The IUPHAR Compendium of Receptor Characterization and Classification, 2<sup>nd</sup> Edition*, compiled by the IUPHAR Committee on Receptor Nomenclature and Drug Classification, 360 pages, October 2000. Available from IUPHAR Media, 68 Half Moon Lane, London SE24 9JE England, United Kingdom for GBP 30.00 (members of national pharmacological societies) or GBP 40.00 (nonmembers) plus GBP 5.00 for postage and packing. Discounts are available on orders of 5+.

The second edition of this widely acclaimed compendium includes a complete revision of all chapters and the addition of nine new classifications.

#### *Contents*

##### **Introductory texts**

Current status of the IUPHAR Committee on Receptor Nomenclature and Drug Classification  
Revised NC-IUPHAR recommendations for nomenclature of receptors  
The IUPHAR Receptor Code  
The IUPHAR Receptor List

Classification of ion channels  
Classification of nuclear receptors  
Classification of olfactory receptors

##### **Classifications**

Acetylcholine  
  Muscarinic acetylcholine receptors  
  Nicotinic acetylcholine receptors  
Adenosine receptors  
Adrenoceptors  
  Gamma-aminobutyric acid receptors  
  GABA A receptors  
  GABA B receptors  
Angiotensin receptors  
Calcium channels  
Cannabinoid receptors  
Chemokine receptors  
Cholecystokinin receptors  
Dopamine receptors  
Endothelin receptors  
Excitatory amino acid receptors  
  Ionotropic glutamate receptors  
  Glucagon receptor family  
Histamine receptors  
5-Hydroxytryptamine receptors  
Leukotriene receptors

Melatonin receptors  
Melanocortin receptors  
Neuropeptide Y receptor family  
Nucleotide receptors  
    P2X receptors  
    P2Y receptors  
Opioid receptors  
Potassium channels  
Prostanoid receptors  
Somatostatin receptors  
Urotensin receptors  
Vasoactive intestinal polypeptide and pituitary adenylate cyclase-activating peptide receptors  
Product finder

## New Publications from the World Health Organization

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### ***Disinfectants and Disinfectant By-products, Environmental Health Criteria No. 216***

2000, xxvii + 499 pages (English, with summaries in French and Spanish), ISBN 92-4-157216-7, CHF 102.-/USD 91.80; In developing countries: CHF 71.40, Order No. 1160216. WHO Marketing and Dissemination, CH-1211 Geneva 27, Switzerland; E-mail: bookorders@who.ch; Tel.: +41 22 791 24 76; Fax: +41 22 791 48 57.

This book evaluates the risks to human health posed by disinfectants and disinfectant by-products found in treated drinking-water. Noting that chlorine and other widely used disinfectants were approved for use almost 100 years ago, when toxicological data were limited, the report responds to the need for reassurance that consumption of treated drinking-water will not have adverse effects on health. Particular concern centers on the potential of chlorine to react with natural organic matter and form a large number of by-products, some of which have been intensively studied as potential human carcinogens. With these concerns in mind, the report evaluates over 800 recent studies in an effort to clarify understanding of the chemistry and toxicology of disinfectants and disinfectant by-products, and provide a balanced assessment of the associated risks to human health.

The report is issued at a time when public health authorities and utilities providers in several countries are considering alternative methods of disinfection aimed at reducing the formation of specific by-products. In this context, the report stresses the overriding importance of microbiological safety, and warns that adequate disinfection must not be compromised by efforts to control chemical by-products.

The first chapter, on the chemistry of disinfectants and disinfectant by-products, examines the many complex factors, including methods of water treatment, that govern the formation of by-products and influence their

type and amount. Of special interest to utilities providers, the chapter explains the physical and chemical properties that influence the behavior of specific by-products in drinking-water and determine their toxic actions. By-products of greatest concern are identified as trihalomethanes, including chloroform and bromodichloromethane; haloacetic acids, including dichloroacetic acid and trichloroacetic acid; bromate; and chlorite. The chapter concludes that the adoption of alternative disinfecting chemicals often amounts to nothing more than a trade-off between one group of by-products and another. Removal of natural organic matter is singled out as the most effective control strategy.

Chapter 2 reviews what is known about the toxic effects of the principal disinfectants: chlorine and hypochlorite, chloramine, and chlorine dioxide. On the basis of this evaluation, the report concludes that disinfectants probably do not increase the risk of cancer or have other significant adverse effects on health. Chapter 3 evaluates the toxic effects of 14 by-products, concentrating on the large number of studies of carcinogenicity and mutagenicity.

Epidemiological studies are reviewed in Chapter 4, which considers extensive investigations of possible associations with cancer, cardiovascular disease, and adverse effects on reproduction and development. While most studies have concentrated on an increased risk of bladder cancer, risks of colon, rectal, and other cancers have also been investigated. Noting the uncertainties surrounding many of these studies, the report cautions against a simple interpretation of observed associations and concludes that more comprehensive water quality data must be collected to improve exposure assessments. Evidence was considered insufficient to determine whether observed associations are causal and which specific by-products or other contaminants play a role.

In the final chapters, focused on risk characterization and assessment, the report concludes that the risks to health from disinfectant by-products, at the levels at which they occur in drinking-water, are extremely small in comparison with the risks associated with inadequate disinfection. In supporting efforts to minimize the formation of by-products, the report further concludes that protection of source waters, aimed at reducing the presence of natural organic matter, is often the most efficient approach to control.

### ***Flame Retardants: Tris(2-butoxyethyl) Phosphate, Tris(2-ethylhexyl) Phosphate, and Tetrakis(hydroxymethyl) Phosphonium Salts, Environmental Health Criteria No. 218***

2000, xix + 130 pages (English, with summaries in French and Spanish), ISBN 92-4-157218-3, CHF 30.-/USD 27.00; In developing countries: CHF 21.-, Order No. 1160218.

This book evaluates the risks to human health and

the environment posed by exposure to selected flame retardants, including chemicals widely used to treat textiles. Although data were inadequate to support a full scientific evaluation, the report reaches several preliminary conclusions concerning the likelihood of risks to human health.

Compounds are covered in separate monographs. Tris(2-butoxyethyl) phosphate (TBEP) is covered in the first. TBEP is used in floor polishes and as a plasticizer in rubber and plastics. Studies of concentrations in various environmental samples show that TBEP is readily biodegradable. Most potential exposure of the general population arises from the use of TBEP in packaging materials for food and from the possible contamination of drinking-water from synthetic rubbers used in plumbing washers. The report concludes that exposure from both sources is very low. The risk to workers, exposed by the dermal route during manufacturing, was likewise judged to be very low. Studies in experimental animals indicate that the liver is the target organ for TBEP toxicity. Data on other toxic effects were judged to be weak or inconsistent.

Tris(2-ethylhexyl) phosphate (TEHP) is covered in the second monograph. TEHP is used as a flame retardant, a plasticizer for polyvinyl chloride and cellulose acetate, and a solvent. While the compound has not been detected in outdoor air, some studies have found concentrations in indoor air. The limited data on environmental fate indicate that the compound is rapidly biodegraded in natural waters. In experimental animals, the compound demonstrates low acute toxicity. Studies conducted in rats revealed no toxic effects. Although some long-term studies suggest carcinogenic potential, the report concludes that TEHP does not represent a significant carcinogenic risk to humans. In studies conducted in human volunteers, no skin irritation was reported. The report concludes that the risk to both the general population and occupationally exposed workers is very low.

The final and most extensive monograph evaluates tetrakis(hydroxymethyl) phosphonium (THP) salts. These compounds are the major class of chemicals used as flame retardants for cotton, cellulose, and cellulose-blend fabrics. Data were considered inadequate to support an evaluation of effects on the environment. Studies conducted in animals show moderate acute toxicity and low dermal toxicity. The liver is the main target organ for toxic effects in experimental animals. The report found no convincing evidence that fabrics treated with THP salts are mutagenic or carcinogenic. Concerning possible migration from textiles, the report cites evidence that the flame retardant polymer is not released during cleaning processes that would normally be employed by consumers.

All three monographs conclude with a list of further studies needed to support a full scientific evaluation.

## ***Fumonisin B<sub>1</sub>*, Environmental Health Criteria No. 219**

2000, xix + 150 pages (English, with summaries in French and Spanish), ISBN 92-4-157219-1, CHF 36.-/USD 32.40; In developing countries: CHF 25.20, Order No. 1160219.

This book evaluates the risks to human and animal health posed by the consumption of maize and maize-based products contaminated with fumonisin B<sub>1</sub>. This naturally occurring mycotoxin, produced by the mold *Fusarium verticillioides*, is found in high concentrations throughout the world, and is believed to be the most prevalent and toxic of the fumonisins. Consumption is known to cause two fatal diseases in farm animals. Possible adverse effects on human health are of particular importance in several developing countries, where maize and maize-based products are the staple food for large populations.

A section on sources of human exposure considers factors that influence the vulnerability of maize to contamination during growth, storage, and processing. Weather conditions that favor *Fusarium* kernel rot are noted to cause significant accumulation of fumonisin B<sub>1</sub>. Studies of the effects of different processing techniques demonstrate the toxin's stability. Dry milling results in its distribution into the bran, germ, and flour. In experimental wet milling, fumonisin has been detected in steep water, gluten, fiber, and germ, but not in the starch.

A review of studies on the environmental fate of fumonisin B<sub>1</sub> concludes that fumonisins are heat-stable, light-stable, water-soluble, poorly absorbed, poorly metabolized, and rapidly excreted by animals. As a result, most fumonisin is recycled into the environment in a manner that concentrates its spatial distribution.

A section on environmental levels and human exposure reviews a large number of studies measuring levels of contamination in maize and maize-based foods for human consumption and in animal feeds. The highest levels of contamination have been recorded in Europe, followed by North America, Africa, Asia, and Latin America.

The most extensive section reviews toxicity data from studies in experimental animals and *in vitro* test systems. Fumonisin B<sub>1</sub> has been shown to be hepatotoxic in all animal species tested, and nephrotoxic in several species. The report found no evidence that consumption of fumonisins causes adverse effects on development of reproductive functions in farm animals or humans. Studies in some species indicate an association between exposure and the development of renal and liver cancers. The evaluation also drew on extensive investigations of equine leukoencephalomalacia and porcine pulmonary edema syndrome, fatal diseases that have been causally linked to the consumption of fumonisin-contaminated feeds. These and other lines of evidence suggest that fumonisin B<sub>1</sub> exerts its toxic

action by inhibiting cell growth and causing accumulation of free sphingoid bases and alteration of lipid metabolism.

The evaluation of effects on human health draws on limited evidence from correlation studies, in South Africa and China, and an analytical study, from northern Italy, suggesting a link between direct fumonisin exposure and esophageal cancer. Owing to weaknesses in all these studies, no firm conclusions could be reached. No confirmed records of acute fumonisin toxicity in humans were available for evaluation.

A final section draws attention to the urgent need for more knowledge about the effects of food processing and cooking, especially in developing countries, on levels of contamination, for epidemiological studies of adverse health effects, and for better understanding of the mode of toxic action in humans.

### ***Dinitro-ortho-Cresol, Environmental Health Criteria No. 220***

2000, xvii + 87 pages (English, with summaries in French and Spanish), ISBN 92 4 157220 5, CHF 26.-/USD 23.40; In developing countries: CHF 18.20, Order No. 1160220.

This book evaluates the risks to human and animal health posed by exposure to dinitro-ortho-cresol, a chemical used for over a century as an acaricide, larvicide, and ovicide to control the dormant forms of many insects in orchards. The chemical is also sprayed on potatoes to prevent virus and disease contamination of the tubers. Although the chemical's use as a pesticide has been banned in many countries, significant volumes of obsolete stocks are still found in several parts of the world, especially in developing countries. Dinitro-ortho-cresol continues to be used in the plastics industry as an inhibitor of polymerization in styrene and vinyl aromatic compounds.

Concerning environmental behavior, studies indicate that the chemical is rapidly biodegraded in soil and has no potential to volatilize when released to water. Evidence further suggests that uptake by treated fruit trees or potatoes, leaving residues at harvest time, does not occur. Food is, therefore, not considered an important source of exposure for the general population. Occupational exposures during agricultural spraying and during manufacturing and formulation are regarded as the principal sources of human exposure. Studies of kinetics and metabolism demonstrate that absorption through the skin and the ingestion or inhalation of aerosols are the principal routes of exposure. In agricultural workers, the skin is the principal route of exposure.

The most extensive part of the report evaluates the results of toxicity studies in laboratory mammals and *in vitro* test systems. Short-term dietary administration decreased body-weight gain in some species, usually

without significant alteration in food consumption. At high doses, adverse effects on the liver have been observed. A single long-term dietary feeding study produced no evidence of adverse effects. Data on embryotoxicity, teratogenicity, mutagenicity, and carcinogenicity were judged inadequate for evaluation.

The evaluation of effects on human health draws on data obtained during the limited use of dinitro-ortho-cresol in the 1930s as a therapeutic agent for the treatment of obesity, and on cases of acute poisoning. Symptoms associated with toxicity include restlessness, flushed skin, sweating, thirst, deep and rapid respiration, severe increase of body temperature, and cyanosis leading to collapse, coma, and death. Concerning adverse effects on occupationally exposed workers, the report cites a dramatic decline over the last 25 years in reported cases of occupational intoxication. The decline is attributed to better education of users, the use of adequate protective equipment, and improvements in application techniques, equipment, and formulations. The report concludes that, when used according to registered recommendations, and when measures for personal protection are followed, exposure to dinitro-ortho-cresol is reduced to levels that do not cause systemic toxicity.

### ***The Use of Essential Drugs, 9<sup>th</sup> Report of the WHO Expert Committee (including the Revised Model List of Essential Drugs), WHO Technical Report Series No. 895***

2000, v + 61 pages (available in English; French and Spanish in preparation), ISBN 92-4-120895-3, CHF 14.-/USD 12.60; In developing countries: CHF 9.80, Order No. 1100895.

This report presents and explains the 11<sup>th</sup> model list of essential drugs issued by WHO as part of its efforts to extend the benefits of modern drugs to the world's population. Intended to guide the selection of drugs in countries where the need is great and resources are small, the list identifies a core group of prophylactic and therapeutic substances judged capable of meeting the vast majority of health needs and, thus, deserving priority in purchasing decisions and procurement schemes. The model list also serves as an information and educational tool for health professionals and consumers, and facilitates the development of treatment guidelines, national formularies, information for patients, and other measures to improve drug use.

WHO model lists, the first of which was issued in 1977, are regularly updated to ensure that recommendations are in line with the latest data on the comparative safety, efficacy, and costs of specific drugs, as well as their relevance to priority health problems. Factors of stability, quality control, and international availability are also considered when validating and revising the lists.



The first part of the report provides updated information on several components of national drug policy necessary to ensure that essential drugs, corresponding to essential health needs, are available at all times in adequate amounts and in the proper dosage. Information includes guidelines for the selection of pharmaceutical dosage forms, the importance of bioavailability in assessments of drug quality, recommended use of the Anatomical Therapeutic Chemical classification system and the Defined Daily Dose as a measuring unit when conducting drug utilization studies, and the growing problem of resistance to some of the widely available and relatively cheap antimicrobials included in the list.

In view of the increasingly high levels of resistance to standard antituberculosis drugs, the report designated nine drugs and formulations as essential for the treatment of multidrug-resistant tuberculosis. The report also describes plans for a major revision of the procedures used when updating the model list.

The 11<sup>th</sup> WHO model list of essential drugs is presented in the second part, together with an explanation of changes made when revising the list. Organized according to therapeutic group, the list includes information on route of administration, dosage forms, and strengths for each of 306 drugs. To qualify for inclusion, a drug must be supported by sound data demonstrating safety, efficacy, and consistent performance in a variety of medical settings.

The report concludes with an explanation of changes made in the list. These changes include the addition of nevirapine for the prevention of mother-to-child transmission of HIV, of artesunate for the treatment of malaria resistant to older drugs, and of levonorgestrel for emergency contraception.

**WHO Expert Committee on Biological Standardization, 49<sup>th</sup> Report, WHO Technical Report Series No. 897**

2000, vi + 106 pages (available in English; French and Spanish in preparation), ISBN 92-4-120897-X, CHF 20.-/USD 18.00; In developing countries: CHF 14.-, Order No. 1100897.

This report presents the recommendations of a WHO expert committee commissioned to coordinate a range of research and other activities needed to assure the purity, potency, safety, and stability of biological products used in medicine. Work includes the development and adoption of detailed recommendations for the manufacturing, licensing, and control of vaccines and other biologicals. The committee also coordinates the establishment of international reference materials for measuring the potency and other characteristics of biological products. These reference materials are used worldwide and play a crucial role in ensuring the comparability of products on a global basis.

The report has four parts. The first provides a brief discussion of general concerns being addressed by WHO in its efforts to ensure the safety and efficacy of biological medicines. Topics discussed include the safety of vaccines prepared using chicken cells, and the proposed introduction of International Nonproprietary Names for products manufactured by biotechnological processes. Also summarized are the results of an independent review of WHO's remit and activities in the field of biologicals.

The second part provides a brief review of the status of various international guidelines and recommendations relevant to the manufacture and quality control of biologicals, and identifies recommendations in need of revision. Part three summarizes activities relating to the status and development of biological reference materials for selected antibodies, antigens and related substances, cytokines, and other substances requiring international reference materials.

As guidance for national control authorities and manufacturers, the fourth and most extensive part issues detailed recommendations for the production and quality control of *Haemophilus influenzae* type b conjugate vaccines, and provides an addendum to the 1990 requirements for oral poliomyelitis vaccine. The updated recommendations for the production and control of *H. influenzae* type b vaccine reflect recent developments and advances in vaccine control strategies, and focus in particular on physicochemical tests to monitor consistency of production of the polysaccharide, the protein carrier, and the bulk conjugate. For poliomyelitis vaccine, the addendum responds to the need for additions in four areas. These areas include new tests for ensuring that the working seed stocks are free of detectable sequences of simian virus 40, guidance on technical performance of the MAPREC assay for poliovirus type 3, the need to improve laboratory containment of wild polioviruses, and guidance on antibody screening tests for colony-bred or intensively monitored animals to encourage their use as sources of primary kidney-cell cultures.

The report concludes with a 30-page inventory of WHO international biological reference preparations held and distributed by the WHO International Laboratories for Biological Standards.

**Chemistry and Specifications of Pesticides, 16<sup>th</sup> Report of the WHO Expert Committee on Vector Biology and Control, WHO Technical Report Series No. 899**

2001, iv + 68 pages (available in English; French and Spanish in preparation), ISBN 92-4-120899-6, CHF 14.-/USD 12.60; In developing countries: CHF 9.80, Order No. 1100897.

This book records the conclusions of an expert committee commissioned to evaluate trends in the use of

pesticides for public health purposes, to identify issues of safety or quality requiring international attention, and to propose appropriate actions. The committee also recommends specifications for individual pesticides for use in quality control by purchasing and regulatory authorities. Information in the report responds to striking recent changes in the use of pesticides, including further integration of vector control into basic health services, greater individual responsibility for personal protection, and greater community responsibility for vector control.

The report has two parts. The first discusses several activities aimed at improving the safety and quality of pesticides used in vector and public health pest control. The WHO Pesticide Evaluation Scheme is described in the first section, which explains the scheme's methodology of evaluation and testing, and outlines several activities designed to strengthen and expand its role. Section 2 assesses regional trends in the use of pesticides, concentrating on public health initiatives that account for the greatest use of specific insecticides and larvicides. On the basis of this analysis, the report draws a number of conclusions concerning the continuing importance of vector-borne disease, the continued reliance on chemical methods of control, and the need for better monitoring and management of insecticide resistance.

A section on analytical methods and quality control in developing countries addresses the major problem of substandard products and the need to make quality control capacity available in all countries currently lacking access to the necessary analytical facilities. In response to recent trends, a section on specifications for pesticides reviews the current status of specifications being developed for household insecticide products, bacterial larvicides, and plant-based pesticides, and makes recommendations for the establishment of appropriate WHO specifications. Possibilities for harmonizing procedures used in the development of specifications for agricultural and public health pesticides are also considered. The remaining sections address the need for guidance on safety and stability issues relating to containers, packaging, and the marking and storage of pesticides, and issue recommendations for responding to the widespread and common problem of unusable pesticide stocks requiring costly disposal operations.

The second part of the report issues recommended changes to existing specifications for 20 pesticides, recommended specifications for two new pesticides and formulations, and procedures for performing four new WHO test methods.

***Climate Change and Stratospheric Ozone Depletion: Early Effects on Our Health in Europe*, WHO Regional Publications, European Series No. 88. Edited by Sari Kovats, Bettina Menne, Anthony McMichael, Roberto Bertollini, and Colin Soskoin, WHO Regional Office for Europe, Copenhagen**

2000, xii + 116 pages (English only), ISBN 92-890-1355-9, CHF 35.-/USD 31.50; In developing countries: CHF 24.50, Order No. 1310088.

People are concerned about the impact on their health of the climate warming and stratospheric ozone depletion that Europe has been experiencing for the last century. This publication attempts to clarify the early effects these environmental changes are having on our health, and the further effects they may have in the future.

What is certain is that more frequent thermal stress, associated or not with air pollution, causes illness and death, especially among the elderly; extreme weather events such as floods cause death, illness, and material damage; some water- and food-borne diseases increase during extreme weather conditions, such as heavy rainfall and heatwaves; malaria could increase with climate warming; and ozone depletion increases skin cancer and weakens the immune system. While much is still uncertain about the precise relationship between changes in the climate and changes in disease patterns, the need for action is clear: action either to reduce the climate change itself, or to reduce its harmful effects.

*Contents*

Introduction

1. Climate change in Europe
2. Effects on health of climate change in Europe
3. Health effects of stratospheric ozone depletion
4. Early effects of climate change on human health
5. Action to reduce the health effects of climate change
6. Conclusions

*Also included:*

- policy document prepared for the Third Ministerial Conference on Environment and Health, London, June 1999, containing recommendations on action to reduce and prevent the effects of climate change on people's health
- list of members of the working group who produced it

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## Reports from Commissions and Division Committees

### Commission on Atomic Weights and Isotopic Abundances—II.1

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#### Summary of Minutes of Commission Meeting at IUPAC General Assembly, Brisbane, Australia, 30 June–2 July 2001

The Commission on Atomic Weights and Isotopic Abundances (II.1) met for three days of discussions under the chairmanship of Prof. Ludolf Schultz during the 41<sup>st</sup> IUPAC General Assembly in Brisbane. As well as the normal scientific work of Commission II.1, considerable discussion also took place on the continued existence of the Commission and the operations of its subcommittees under the project-driven post-2001 IUPAC.

The standard atomic weights of four chemical elements have been changed, based on new determinations of isotopic abundances and reviews of previous isotopic abundances. The standard atomic weight of zinc was changed from 65.39(2) to 65.409(4), of krypton from 83.80(1) to 83.798(2), of molybdenum from 95.94(1) to 95.94(2), and of dysprosium from 162.50(3) to 162.500(1). These changes in atomic weights will be published in a new Table of Standard Atomic Weights 2001, which will be submitted to *Pure and Applied Chemistry (PAC)* by the end of 2001. The Commission also continued its review of publications on the variation in the natural isotopic abundances in both terrestrial and extraterrestrial materials. The groundbreaking work of the Subcommittee for Natural Isotope Fractionation (SNIF) has produced a valuable isotopic composition database for use by the other subcommittees in determinations of the uncertainties of atomic weights

and culminated in a major manuscript currently being finalized for publication in *PAC*. In the future, the work performed by the SNIF will be undertaken by the Subcommittee for Isotopic Abundance Measurements. The element-by-element review 2000 project, coordinated and edited over the last few years by Prof. John de Laeter, has resulted in a major document of special historical and scientific interest. This report is also now being prepared for publication in *PAC*.

The future of the Commission and its scientific work was discussed in a joint session with the Commission on Isotopic Specific Measurements as Traceable References (II.4). The joint session supported the proposal before the Bureau and Council to establish a Commission on Isotopic Abundances and Atomic Weights. It was recommended that the following subcommittees be formed by the Division Committee: Subcommittee for Isotopic Abundance Measurements (SIAM), Subcommittee for Extraterrestrial Isotopic Ratios (SETIR), and Subcommittee for Applications of Isotopic Specific Measurements (SAISR). A number of projects were prepared by the subcommittees for presentation to the Division Committee.

On a very sad note, the Commission learned of the most unexpected death of a long-standing Titular Member, Dr. Gregory Ramendik, in the days immediately following the Commission meeting. Gregory's efforts on behalf of the Commission will be long remembered, and our deepest sympathy and condolences are extended to his family and colleagues.

**Robert D. Loss**  
Secretary, IUPAC Commission on Atomic Weights and Isotopic Abundances II.1

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## Conference Announcements

57<sup>th</sup> Annual Session of the Sri Lanka Association for the Advancement of Science (SLAAS), 26 November–1 December 2001, Rawatawatte, Moratuwa, Sri Lanka

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This meeting has the focal theme "Toward a Knowledge-Based Economy: The Role of Scientists and Technologists". Topic sessions will emphasize human resources development, product design, partnerships for rapid economic growth, potential for using traditional knowledge, agro-based industry, agricultural growth



designates IUPAC sponsorship

and development, rapid growth of selected chemical industries, value addition in mineral resources, engineering capabilities, communications and information technology, software development, knowledge for better health, and environmental conservation toward sustainable economic growth.

For additional information, contact SLAAS, 120/10 Vidya Mawatha, Colombo 07, Sri Lanka, E-mail: [slaas@slt.lk](mailto:slaas@slt.lk); Tel.: +94 01 691681 or +94 01 688740; Fax: +94 01 691681.

## Asia-Pacific Conference on Analytical Science (APCAS) and 18<sup>th</sup> Philippine Chemistry Congress, 19–22 February 2002, Manila, Philippines

This conference is organized by the Kapisanang Kimikang Philipinas (KKP, Chemical Society of the Philippines), Division of Analytical Science (DAS), and the Philippine Organic Chemistry Teachers' Association under the sponsorship of the Federation of Asian Chemical Societies and the Philippine Federation of Chemistry Societies. It hopes to gather scientists from the Asia-Pacific region to share and discuss recent developments in the various areas of analytical science. The conference aims to forge an active cooperation among the participants in harnessing analytical science in the regional effort toward economic growth, environmental management, and health protection. Expo Kimika 2002, a mega-exhibit to popularize chemistry, will be a part of the proceedings.

In addition to plenary and keynote lectures presented by prominent analytical scientists, the scientific program will feature concurrent symposia and poster sessions on spectroscopy, electrochemical analysis, separation methods, bioanalytical methods, radiochemical analysis, surface analysis, process analytical science, environmental analysis, food and agricultural analysis, pharmaceutical and biomedical analysis, chemical sensors and biosensors, analytical instrumentation, automated methods of analysis, chemometrics, and education in analytical science.

*For further information, contact Dr. Christina Binag, Research Center for the Natural Sciences, University of Santo Tomas, España, Manila, 1008 Philippines, E-mail: chrabina@ustcc.ust.edu.ph; Tel./Fax: +63 2 731 4031.*

## Mustafa Kemal University International Organic Chemistry Meeting (MKU-IOCM), 25–28 March 2002, Antakya, Hatay, Turkey

MKU-IOCM



25-28 March, 2002



and computational chemistry.

This meeting, organized with the collaboration of the Mustafa Kemal University Foundation, the Turkish Chemical Society, and TUBITAK, will feature sessions on synthetic and natural organic compounds, spectroscopy, chromatography, analytical applications in organic chemistry, electroorganic chemistry, photochemistry, macromolecular chemistry,

*For more information, contact MKU-IOCM Secretariat, Prof. Dr. Mahmut Caliskan, Mustafa Kemal University, Science and Letters Faculty, Tayfur Sokmen Campus, 31040 Antakya, Hatay, Turkey, E-mail: mku-iocm@mku.edu.tr; Tel.: +90 326 245 58 66; Fax: +90 326 245 58 67; Web site: <http://www.mku.edu.tr/mku-iocm/>.*

## 2<sup>nd</sup> International Conference on Counter-Current Chromatography (CCC-2002), 15–20 April 2002, Beijing, China

This conference is organized by the Chinese Chemical Society, Beijing Institute of New Technology Application, Beijing Center for Separation and Purification, and Technologies of Natural Products; coorganized by the Beijing Natural Science Foundation and Beijing Medicine Trade Association; and supported by Pharma Tech Research Corporation (USA), National Engineering Center for Traditional Chinese Medicine of China, Hong Kong Institute of Biotechnology Ltd., Zhejiang Recover Biology Technical Co. Ltd., and Shenzhen Tauto Biotech Co. Ltd.

The focal theme of the conference will be on how and in which directions counter-current chromatography (CCC) will be developing as a bioprocessing technology—especially for natural products—in the new century. Topic sessions will cover basic CCC; CCC methodology; centrifugal partition chromatography; coil planetary centrifugation; CCC theory; applications of CCC to natural products, pharmaceutical medicines, proteins, and other compounds including inorganics; advanced applications of CCC; process-scale CCC; and pH zone refining CCC. An exhibition will offer the opportunity for the display of instruments, research results, and books.

*For additional information, contact Prof. Xibai Qiu, Secretary of 2<sup>nd</sup> CCC, c/o Chinese Chemical Society, P.O. Box 2709, Beijing 100080, China, E-mail: qiuxb@infoc3.icas.ac.cn; Tel.: +86 10 62568157 or +86 10 62564020; Fax: +86 10 62568157.*

## 7<sup>th</sup> International Conference on Nuclear Analytical Methods in the Life Sciences (7<sup>th</sup> NAMLS), 16–21 June 2002, Antalya, Turkey



The overall objective of this conference is to promote the development and application of nuclear (all types of neutron, photon, and charged-particle activation analyses) and related [e.g., particle-induced X-ray emission (PIXE), energy-dispersive X-ray fluorescence (ED-XRF), and ICP-MS] analytical methods in the life sciences. Approximately 150–200 scientific participants

from around the world are expected to attend the 7<sup>th</sup> NAMLS.

For additional information, contact Prof. Namik K. Aras, Bahcesehir University, 34900 Istanbul, Turkey, E-mail: aras@bahcesehir.edu.tr; Tel.: +90 212 669 6523; Fax: +90 212 669 4398.

### 36<sup>th</sup> Convention of the South African Chemical Institute (SACI2002), 1–5 July 2002, Port Elizabeth, South Africa

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The theme of this convention is “Chemistry for Prosperity”. It is the aim of the organizers to allow chemists from diverse backgrounds in South Africa and Africa as a whole to present recent research that they are pursuing and, specifically, to focus on the role that chemistry can play in uplifting people’s lives. Special features will include presentations that highlight the following:

- contribution that chemistry makes to the economy (emphasis on industrial applications)
- contribution that chemistry makes to quality of life (including water and waste treatment, measurement of water quality, new drugs, etc.)
- prospects for new materials and what they might do

The organizers also plan to hold a one-day parallel symposium for physical science teachers and educators and a public debate on the importance of chemistry to the community, with the hope of raising public appreciation of chemistry and the intention of highlighting chemistry’s role in some local causes (e.g., environmental problems of a chemical nature, recycling, etc.). Approximately 450–500 scientific participants are expected to attend SACI2002.

For more information, contact Dr. Chris Woolard, Department of Chemistry, University of Port Elizabeth, P.O. Box 1600, Port Elizabeth 6000, South Africa, E-mail: saci2002@upe.ac.za; Tel.: +27 41 5042147; Fax: +27 41 5042109.

### 21<sup>st</sup> International Carbohydrate Symposium (21<sup>st</sup> ICS), 7–12 July 2002, Cairns, Queensland, Australia

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This biennial event encompasses all aspects of the chemistry and biochemistry of carbohydrates, including structure, synthesis, analysis, and biology. The purpose of the symposium is to gather the world’s glycochemists and glycobiologists together to present the recent developments in the field. The International Carbohydrate Symposium (ICS) is the premier forum for glycoscientists. Approximately 500 scientific participants from around the world are expected to attend the 21<sup>st</sup> ICS.

For additional information, contact Prof. R. V. Stick, Department of Chemistry, University of Western Aus-

tralia, Nedlands 6007, Western Australia, Australia, E-mail: rvs@chem.uwa.edu.au; Tel.: +61 8 9380 3200; Fax: +61 8 9380 1005; Web site: <http://www.ics2002.uwa.edu.au/>.

### Polymers and Organic Chemistry 2002, 14–18 July 2002, San Diego, California, USA

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The aim of this meeting is to bridge the gap between organic and polymer chemistry. Speakers and participants will be drawn worldwide from both the organic and the polymer communities. Topical sessions of the conference will focus on the impact of polymers in the following subject areas:

- combinatorial chemistry (2 sessions)
- reagents and catalysts
- organic synthesis
- separations
- nanotechnology
- biotechnology

No other international or U.S. meeting for many years has brought together polymer chemists and the organic chemists working on combinatorial methods and polymer-supported reagents and catalysts. The two groups have much to learn from each other. New synthesis techniques developed by organic chemists can be applied by polymer chemists toward modifying the properties of the materials they prepare. In addition, new polymers prepared by polymer chemists can be used by organic chemists to improve the yield and selectivity of combinatorial syntheses.

Approximately 150–200 scientific participants from around the world are expected to attend this meeting.

For further information, contact Prof. Spiro Alexandratos, Office of Academic Affairs, City University of New York, 535 East 80<sup>th</sup> Street, New York, New York 10021, USA, E-mail: sdabh@cunyvm.cuny.edu; Tel.: +1 212 794 5470; Fax: +1 212 794 5706 or Prof. Warren T. Ford, Department of Chemistry, Oklahoma State University, Stillwater, Oklahoma 74078, USA, E-mail: wtford@okstate.edu; Tel.: +1 405 744 5946; Fax: +1 405 744 6007.

### XI<sup>th</sup> International Meeting on Boron Chemistry (IMEBORON XI), 28 July–2 August 2002, Moscow, Russia

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This triennial meeting provides an international forum for presentation of the latest results and future trends as well as for discussion of the key problems in various fields of boron chemistry. The main goals of the conference are to assess the state-of-the-art in boron chemistry, to encourage newcomers to the field, and to give experts fresh motivation for future development. An-



other principal objective is to intensify the dialogue among young scientists, academia, and industry.

For a long time, boron compounds have played an important role in fundamental chemistry, owing to an exclusively fortunate combination of

their unique structure and a wide range of practical applications. Boron compounds are used as fuels, in design of thermally stable materials, in microelectronics, in agriculture, and in medicine (including boron neutron capture therapy for cancer). Many classes of organoboron and inorganic boron compounds are applied in modern fine organic synthesis and asymmetrical synthesis (e.g., for obtaining biologically important natural compounds and pharmaceuticals, for creating modern nanomaterials, and as catalyst components in stereoselective alkene polymerization). Two prominent chemists, Prof. W. N. Lipscomb and Prof. H. C. Brown, received Nobel Prizes for their outstanding achievements in the field of boron chemistry.

Scientific sessions at IMEBORON XI will cover the following areas:

- theoretical studies
- organoboron compounds
- boranes and carboranes
- metallaboranes and metallacarboranes
- applications in organic synthesis and catalysis
- applications in medicine
- synthesis and catalysis
- materials and polymers

Approximately 300 scientific participants from around the world are expected to attend IMEBORON XI.

For additional information, contact Prof. Yu. N. Bubnov, A. N. Nesmeyanov Institute of Organoelement Compounds of the Russian Academy of Sciences, Vavilov str. 28, Moscow V-334, GSP1, 119991 Russian Federation, E-mail: imeboron@ineos.ac.ru; Tel.: +7 095 135 6166 or +7 095 135 7405; Fax: +7 095 135 5085; Web site: <http://www.ineos.ac.ru/imeboron/>.

Polymer Networks 2002,  
2–6 September 2002, Autrans (near  
Grenoble), France



This meeting aims to promote understanding of the latest experimental and theoretical developments of polymer networks having functional attributes. This subject encompasses filled networks, optically active sys-

tems, polyelectrolyte gels, drug release systems, activators, biological applications, etc., including their structure and synthesis. Given their many applications, our imperfect understanding of the underlying mechanisms, and the growing awareness of their complexity, interest in these gels has recently greatly increased. Approximately 150–200 scientific participants from around the world are expected to attend Polymer Networks 2002.

For more information, contact Prof. Erik Geissler, Laboratoire de Spectrométrie Physique, B.P. 87, Université J. Fourier de Grenoble, 38402 St. Martin d'Hères cedex, France, E-mail: erik.geissler@ujf-grenoble.fr; Tel.: +33 476 63 58 23; Fax: +33 476 51 45 44.

4<sup>th</sup> International Conference of the  
Commission on the History of Modern  
Chemistry (CHMC) of the International  
Union of History and Philosophy of  
Science (IUHPS), 3–5 October 2002,  
Philadelphia, Pennsylvania

This conference will focus on industrial–academic relations in the chemical and molecular sciences. The general theme of the conference is the interactions between the chemical and molecular sciences, technologies, and related industries since 1900.

Traditionally, studies in this area have employed a linear approach to the science–technology relationship. However, it is well established that such transfers are rarely unidirectional. The organizers of this conference hope to encourage further a shift in emphasis toward multidirectional transfers. Knowledge, practices, transfer successes and failures, technology, materials, organizational networks, management of research and development, and labor are all potential objects of study within these exchanges. Related themes include interactions with other research centers beyond the academy, e.g., national laboratories, military centers, experimental stations, nongovernmental organizations (NGOs), and colonial institutions. Papers are invited on and around this theme. Comparative and international perspectives are strongly encouraged.

For further information, contact Thomas C. Lassman, Associate Historian, Chemical Heritage Foundation, 315 Chestnut Street, Philadelphia, Pennsylvania 19106, USA, E-mail: CHMC2002@chemheritage.org; Tel.: +1 215 925 2222, Ext. 271; Fax: +1 215 925 1954; Web site: <http://www.chemheritage.org/>.

3<sup>rd</sup> International Symposium on  
Separations in Biosciences (SBS'03):  
100 Years of Chromatography,  
13–18 May 2003, Moscow, Russia

This symposium will commemorate the 100<sup>th</sup> anniversary of chromatography as one of the most important discoveries in the history of science.



March 21, 1903 is a special date in the history of chromatography. On that day, at a meeting of the Warsaw Society of Natural Scientists, Mikhail Semenovitch Tswett presented a lecture entitled "On a New Category of Adsorption Phenomena and its Application in Biochemical Analysis". Thus, chromatography was introduced by a 30-year-old Russian specialist in botany, biochemistry, and physiology, and it went on to become the premier separation technique of the 20<sup>th</sup> century. The list of 100 most distinguished chemists of the past that was compiled recently by the Federation of European Chemical Societies (FECS) includes Tswett's name (see *CI*, Vol 23, No. 1, pp. 7–11, 2001). It is no exaggeration that the contribution of chromatography to the successful development of biosciences and chemistry just cannot be overestimated.

The scientific program will cover all aspects of modern liquid and gas chromatography, as well as electromigration techniques. The program will include a few invited lectures giving an overview of major achievements and modern trends of the principal branches of chromatography in a historical perspective, keynote lectures on the state-of-the-art of basic chromatographic techniques, oral presentations on novel chromatographic separation phenomena, and poster presentations of recent experimental findings. Special emphasis will be given to achievements and applications of chromatography in the natural sciences.

For more information, contact Symposium Chairman, Prof. V. Davankov, E-mail: [davank@ineos.ac.ru](mailto:davank@ineos.ac.ru) or Symposium Secretariat, Dr. L. Kolomiets, Institute of Physical Chemistry, Leninsky Prospekt 31, E-mail: [kolom@phyche.ac.ru](mailto:kolom@phyche.ac.ru); Tel./Fax: +7 095 952 0065.

11<sup>th</sup> International Conference on  
High Temperature Materials Chemistry  
(HTMC XI), 19–23 May 2003,  
Tokyo, Japan



The aim of this conference is to provide an up-to-date forum for the latest science and technology for advanced inorganic materials (e.g., ceramics, metals, and salts) used or prepared at high temperatures. The scope of the meeting ranges from fundamentals (e.g., atomic scale models) to applications (e.g., component behavior in service).

Topical sessions will cover the following areas:

- thermodynamic and kinetic measurements (e.g., phase equilibria, thermodynamic data, and diffusion coefficients)
- gas phase chemistry, molecules, clusters, and vaporization
- interface processes (e.g., corrosion): solid/gas, solid/liquid, and solid/solid
- applications and synthesis of advanced high-temperature bulk materials, composites, and coatings
- thermochemical databases and modeling

Approximately 200–250 scientific participants from around the world are expected to attend.

For additional information, contact Prof. Michio Yamawaki, Department of Quantum Engineering and Systems Science, Graduate School of Engineering, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan, E-mail: [yamawaki@q.t.u-tokyo.ac.jp](mailto:yamawaki@q.t.u-tokyo.ac.jp); Tel.: +81 3 5841 7422; Fax: +81 3 5841 8633.

39<sup>th</sup> IUPAC Congress and 86<sup>th</sup>  
Conference of The Canadian Society for  
Chemistry: Chemistry at the Interfaces,  
10–15 August 2003,  
Ottawa, Ontario, Canada



Considerable attention is being focused on greater interdisciplinary opportunities at the interface of chemistry with other disciplines. Because of this integration, the boundaries between the traditional subdisciplines (organic, physical, inorganic, and analytical) are becoming less pronounced. The congress will highlight the interfaces not only between these branches of chemistry, but also disciplinary interfaces with biology, physics, computers, and medicine. New fields have arisen, such as materials science, surface science, nanoscience, and cheminformatics, whose scope spans several areas. Other important interfaces are societal in nature and involve such interactions as university–industry–government, chemistry and health, the economy, and the environment. This broad and inclusive theme should stimulate the organization of

symposia illustrating the pure and applied aspects of the discipline.

For additional information, contact Secretariat, 39<sup>th</sup> IUPAC Congress and 86<sup>th</sup> Conference of The Canadian Society for Chemistry, National Research Council

Canada (NRC), Conference Services Office, Building M-19, Montreal Road, Ottawa, Ontario, Canada K1A 0R6, E-mail: [iupac2003@nrc.ca](mailto:iupac2003@nrc.ca); Tel.: +1 613 993 0414; Fax: +1 613 993 7250; Web site: [www.nrc.ca/confserv/iupac2003/](http://www.nrc.ca/confserv/iupac2003/).

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## Conference Calendar

Visit <http://www.iupac.org> for complete information and further links.

**NEW** designates a new conference since the last issue.

2001

### Biodiversity

3–8 November 2001

3<sup>rd</sup> IUPAC International Conference on Biodiversity (ICOB-3), Antalya, Turkey.

*Prof. B. Sener, Department of Pharmacognosy, Faculty of Pharmacy, Gazi University, P.O. Box 143 06572, Maltepe-Ankara, Turkey*

*Tel.: +90 312 212 2267*

*Fax: +90 312 213 3921*

*E-mail: [blgsener@tr-net.net.tr](mailto:blgsener@tr-net.net.tr)*

### Polymers

11–15 November 2001

6<sup>th</sup> Brazilian Polymer Conference / IX International Macromolecular Colloquium, Gramado, RS, Brazil.

*Prof. Raquel Santos Mauler, Instituto de Química, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, 91501-970 Porto Alegre, RS - Brazil*

*Tel.: +55 51 3166296*

*Fax: +55 51 319 1499*

*E-mail: [mauler@ifufrgs.br](mailto:mauler@ifufrgs.br)*

### Sweeteners

13–17 November 2001

2<sup>nd</sup> International Symposium on Sweeteners, Hiroshima-Shi, Japan.

*Prof. Kasuo Yamasaki, Institute of Pharmaceutical Sciences, Faculty of Medicine, Hiroshima University Kasumi, Minami-ku, Hiroshima 734-8551, Japan*  
*Tel.: +81 82 257 5285*

*Fax: +81 82 257 5289*

*E-mail: [yamasaki@](mailto:yamasaki@pharm.hiroshima-u.ac.jp)*

*[pharm.hiroshima-u.ac.jp](mailto:pharm.hiroshima-u.ac.jp)*

2002

### Carotenoids

6–11 January 2002

13<sup>th</sup> International Symposium on Carotenoids, Honolulu, Hawaii, USA.

*Dr. John S. Bertram, Cancer Research Center, University of Hawaii, 1236 Lauhala Street, Honolulu, Hawaii 96813, USA*

*Tel.: +1 808 586 2757*

*Fax: +1 808 586 2970*

*E-mail: [John@crch.hawaii.edu](mailto:John@crch.hawaii.edu)*

### Polymer Characterization

7–11 January 2002

10<sup>th</sup> International Conference on Polymer Characterization (POLYCHAR), Denton, Texas, USA.

*Dr. Witold Brostow, Department of Materials Science, University of North Texas, Denton, Texas, 76203-5310 USA*

*Tel.: +1 940 565 4358, -3262, or 4337*

*Fax: +1 940 565 4824*

*E-mail: [brostow@unt.edu](mailto:brostow@unt.edu) or*

*[polychar@marta.phys.unt.edu](mailto:polychar@marta.phys.unt.edu)*

### Bioinformatics

6–8 February 2002

International Conference on Bioinformatics 2002: North–South Networking, Bangkok, Thailand.

*Dr. Prasit Palittapongarnpim, BIOTEC, 15<sup>th</sup> Fl, Gypsum*

*Metropolitan Tower, 539/2 Sri-Ayudhya Road, Ratchadevi, Bangkok, Thailand*

*Tel.: +66 2 642532231, ext 228*

*Fax: +66 2 488304*

*E-mail: [incob@biotec.or.th](mailto:incob@biotec.or.th)*

### Heterocycles

6–8 March 2002

3<sup>rd</sup> Florida Heterocyclic Conference, Gainesville, Florida, USA.

*Prof. Alan R. Katritzky, Department of Chemistry, University of Florida, P.O. Box 11720, Gainesville, Florida 32611, USA*

*Tel.: +1 352 392 0554*

*Fax: +1 352 392 9199*

*E-mail: [katritzky@chem.ufl.edu](mailto:katritzky@chem.ufl.edu)*

### Macromolecules

25–29 March 2002 !!new dates!!

5<sup>th</sup> Annual UNESCO School and South African IUPAC Conference on Macromolecules and Materials Science, Stellenbosch, South Africa.

*Prof. R. D. Sanderson, UNESCO Associated Centre for Macromolecules and Materials, Institute for Polymer Science, University of Stellenbosch, Private Bag XI, Matieland 7602, South Africa*

*Tel.: +27 21 808 3172*

*Fax: +27 21 808 4967*

*E-mail: [rds@maties.sun.ac.za](mailto:rds@maties.sun.ac.za)*

### $\pi$ -Electron Systems

30 May–4 June 2002

5<sup>th</sup> International Symposium on Functional  $\pi$ -Electron Systems (F $\pi$ 5), Ulm/Neu-Ulm, Germany

*Prof. Dr. Peter Bäuerle, Abteilung Organische Chemie II, Universität Ulm, Albert-Einstein-*



### How to Apply for IUPAC Sponsorship

To apply for IUPAC sponsorship, conference organizers should complete an Advance Information Questionnaire (AIQ). The AIQ form is available at <http://www.iupac.org> or by request at the IUPAC Secretariat, and should be returned between 2 years and 12 months before the conference. Further information on granting sponsorship is included in the AIQ and available online.

*Allee 11, 89081 Ulm, Germany*  
Tel.: +49 731 502 2850  
Fax: +49 731 502 2840  
E-mail: [peter.baeuerle@chemie.uni-ulm.de](mailto:peter.baeuerle@chemie.uni-ulm.de)

### Polymer Systems

3–7 June 2002  
4<sup>th</sup> International Symposium on Molecular Order and Mobility in Polymer Systems, St. Petersburg, Russia  
*Prof. T. M. Birshstein, Institute of Macromolecular Compounds, Russian Academy of Sciences, Bolshoi pr. 31, St. Petersburg 199004, Russia*  
Tel.: +7 812 328 85 42  
Fax: +7 812 328 68 69  
E-mail: [birshstein@imc.macro.ru](mailto:birshstein@imc.macro.ru)

### Drug Residue Analysis

4–7 June 2002  
4<sup>th</sup> International Symposium on Hormone and Veterinary Drug Residue Analysis, Antwerp, Belgium.  
*This conference has declined IUPAC sponsorship.*

### Nuclear Analytical Methods

16–21 June 2002  
7<sup>th</sup> International Conference on Nuclear Analytical Methods in the Life Sciences (7<sup>th</sup> NAMLS), Antalya, Turkey.  
*Prof. Namik K. Aras, Bahcesehir University, 34900 Istanbul, Turkey*

Tel.: +90 212 669 6523  
Fax: +90 212 669 4398

### Macromolecules

7–12 July 2002  
39<sup>th</sup> International Symposium on Macromolecules - IUPAC World Polymer Congress 2002 (MACRO 2002), Beijing, China.  
*Prof. Fosong Wang, The Chinese Academy of Sciences, Beijing 100864, China*  
Tel.: +86 10 62563060  
Fax: +86 10 62573911  
E-mail: [fswang@mimi.cnc.ac.cn](mailto:fswang@mimi.cnc.ac.cn)

### Solid-State Chemistry

7–12 July 2002  
5<sup>th</sup> Conference on Solid-State Chemistry (SSC 2002), Bratislava, Slovakia.  
*Prof. P. Sajgalik, Slovak Academy of Sciences, Dubravska c. Brastislava, SK-842 36 Slovakia*  
Tel.: +421 7 59410400  
Fax: +421 7 59410444  
E-mail: [ssc2002@savba.sk](mailto:ssc2002@savba.sk)

### Organometallic Chemistry

7–12 July 2002  
20<sup>th</sup> International Conference on Organometallic Chemistry (20<sup>th</sup> ICOMC), Corfu, Greece.  
*Dr. Constantinos G. Screttas, National Hellenic Research Foundation, Institute of Organic and Pharmaceutical Chemistry, 48 Vas. Constantinou Avenue, 116 35 Athens, Greece*  
Tel.: +30 1 7273876  
Fax: +30 1 7273877  
E-mail: [kskretas@eie.gr](mailto:kskretas@eie.gr)

### Carbohydrates

7–12 July 2002  
XXI<sup>st</sup> International Carbohydrate Symposium, Cairns, Queensland, Australia.  
*Prof. R. V. Stick, University of Western Australia, Department of Chemistry, Nedlands, 6007, Western Australia*  
Tel.: +61 8 9380 3200  
Fax: +61 8 9380 1005  
E-mail: [rvs@chem.uwa.edu.au](mailto:rvs@chem.uwa.edu.au)

### Polymers and Organic Chemistry **NEW**

14–18 July 2002  
Polymers and Organic Chemistry 2002, San Diego, California, USA.  
*Prof. Spiro Alexandratos, Office of Academic Affairs, City University of New York, 535 East 80<sup>th</sup> St., New York, New York 10021, USA*  
Tel.: +7 095 135 6166 or +7 095 135 7405  
Fax: +7 095 135 5085

### Organic Synthesis

14–19 July 2002  
14<sup>th</sup> International Conference on Organic Synthesis (ICOS-14), Christchurch, New Zealand.  
*Prof. Margaret A. Brimble, Department of Chemistry, University of Auckland, 23 Symonds St., Auckland, New Zealand*  
Tel.: +64 9 373 7599, Ext. 8259  
Fax: +64 9 373 7422  
E-mail: [m.brimble@auckland.ac.nz](mailto:m.brimble@auckland.ac.nz)

### Photochemistry

14–19 July 2002  
XIX<sup>th</sup> IUPAC Symposium on Photochemistry, Budapest, Hungary.  
*Prof. H. D. Roth, Rutgers University, Department of Chemistry and Chemical Biology, 610 Taylor Road, New Brunswick, NJ 08854-8087 USA*  
Tel.: +1 732 445 5664  
Fax: +1 732 445 5312  
E-mail: [roth@rutchem.rutgers.edu](mailto:roth@rutchem.rutgers.edu)

### Electrical Polymers

15–18 July 2002  
21<sup>st</sup> Discussion Conference and 9<sup>th</sup> International ERPOS Conference on Electrical and Related Properties of Polymers and Other Organic Solids, Prague, Czech Republic.  
*Prof. Dr. Drahomir Vyprachticky, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic,*

Heyrovského nám. 2, 162 06  
Praha 6, Czech Republic  
Tel.: +420 2 20403251 or +420 2  
20403332  
Fax: +420 2 35357981  
E-mail: vyprach@imc.cas.cz or  
sympo@imc.cas.cz

### Solubility Phenomena

22–26 July 2002  
International Symposium on  
Solubility Phenomena (10<sup>th</sup> ISSP),  
Varna, Bulgaria.  
Prof. Christo Balarew, Institute of  
General and Inorganic Chemistry,  
Bulgarian Academy of Sciences,  
BG-Sofia 1040, Bulgaria  
Tel.: +359 (2) 9793925  
Fax: +359 (2) 705 024  
E-mail: balarew@svr.igic.bas.bg

### Chemical Thermodynamics

28 July–2 August 2002  
17<sup>th</sup> IUPAC Conference on  
Chemical Thermodynamics,  
Rostock, Germany.  
Prof. A. Heintz, FB Chemie,  
Universitat Rostock, Hermannstr.  
14, D-18051 Rostock, Germany  
Tel.: +49 381 498 1852  
Fax: +49 381 498 1854  
E-mail: andreas.heintz@  
chemie.uni-rostock.de

### Natural Products

28 July–2 August 2002  
23<sup>rd</sup> International Symposium on  
the Chemistry of Natural Products  
(ISCNP-23), Florence, Italy.  
Prof. B. Botta, Dip. Studi Chimica  
e Tecnologia Sostanze,  
Biologicamenta Attive, University  
“La Sapienza”, P.le A. Moro 5,  
00185 Roma, Italy  
Tel.: +39 06 49912781 or +39 06  
49912783  
Fax: +39 06 49912780  
E-mail: bruno.botta@  
uniroma1.it

### Boron Chemistry

28 July–2 August 2002  
XI<sup>th</sup> International Meeting on  
Boron Chemistry (IMEBORON  
XI), Moscow, Russia.  
Prof. Yu. N. Bubnov, A. N.  
Nesmeyanov Institute of

Organoelement Compounds of the  
Russian Academy of Sciences,  
Vavilov str. 28, Moscow V-334,  
GSP1, 119991 Russian Federa-  
tion  
Tel.: +7 095 135 6166 or +7 095  
135 7405  
Fax: +7 095 135 5085  
E-mail: imeboron@ineos.ac.ru

### Crop Protection

4–9 August 2002  
10<sup>th</sup> IUPAC International Con-  
gress on the Chemistry of Crop  
Protection (formerly International  
Congress of Pesticide Chemistry),  
Basel, Switzerland.  
Dr. Bernard Donzel, c/o Novartis  
CP AG, WRO-1060.3.06, CH-  
4002 Basel, Switzerland  
Tel.: +41 61 697 22 67  
Fax: +41 61 697 74 72  
E-mail: bernard.donzel@  
cp.novartis.com

### Physical Organic Chemistry

4–9 August 2002  
16<sup>th</sup> International Conference on  
Physical Organic Chemistry:  
Structure and Mechanism in  
Organic Chemistry, San Diego,  
California, USA.  
Prof. Charles L. Perrin, Depart-  
ment of Chemistry, University of  
California at San Diego, La Jolla,  
California 92093-0358, USA  
Tel.: +1 858 534 2164  
Fax: +1 858 822 0386  
E-mail: cperrin@ucsd.edu

### Chemical Education

6–10 August 2002  
17<sup>th</sup> International Conference on  
Chemical Education (17<sup>th</sup>  
ICCE)—New Strategies for  
Chemical Education in the New  
Century, Beijing, China.  
Prof. Xibai QIU, 17<sup>th</sup> ICCE c/o  
Chinese Chemical Society, P.O.  
Box 2709 Beijing 100080, China  
Tel.: +86 10 62568157, 86 10  
62564020  
Fax: +86 10 62568157  
E-mail: qiuxb@infoc3.  
icas.ac.cn

### Visas

It is a condition of sponsor-  
ship that organizers of meet-  
ings under the auspices of  
IUPAC, in considering the lo-  
cations of such meetings,  
should take all possible steps  
to ensure the freedom of all  
bona fide chemists from  
throughout the world to at-  
tend irrespective of race, re-  
ligion, or political philoso-  
phy. IUPAC sponsorship im-  
plies that entry visas will be  
granted to all bona fide  
chemists provided applica-  
tion is made not less than  
three months in advance. If a  
visa is not granted one month  
before the meeting, the  
IUPAC Secretariat should be  
notified without delay by the  
applicant.

### Bioorganic Chemistry

11–14 August 2002  
6<sup>th</sup> International Symposium on  
Bioorganic Chemistry (ISBOC-6),  
Toronto, Canada.  
Dr. Ronald Kluger, Department of  
Chemistry, University of Toronto,  
Toronto, Canada M5S 3H6  
Tel.: +1 416 978 3582  
Fax.: +1 416 978 3482  
E-mail: rkluger@  
chem.utoronto.ca

### Polymer Networks 2002

2–6 September 2002  
Polymer Networks 2002, Autrans,  
France.  
Prof. E. Geissler, Université J.  
Fourier de Grenoble, Laboratoire  
de Spectrométrie Physique, B.P.  
87, F-38402 St Martin d'Herès  
cedex, France  
Tel: +33 476 635823  
Fax: +33 476 514544  
E-mail: erik.geissler@ujf-  
grenoble.fr

### Physical Chemistry of Liquids

6–15 September 2002  
European Molecular Liquids

Group (EMLG) Annual Meeting on the Physical Chemistry of Liquids. Novel Approaches to the Structure and Dynamics of Liquids: Experiments, Theories, and Simulations, Rhodes, Greece  
*Prof. Dr. Jannis Samios*  
Tel.: +30 1 7274534 or +30 1 7274751

Fax: +30 1 7274752  
E-mail: [isamios@cc.uoa.gr](mailto:isamios@cc.uoa.gr)

### Polymer Science and Technology

2–5 December 2002  
IUPAC Polymer Conference on the Mission and Challenges of Polymer Science and Technology, Kyoto, Japan.  
*Prof. Seichi Nakahama, Faculty of Engineering, Tokyo Institute of Technology, 2-12-1 Ohokayama,*

*Meguro-ku, Tokyo 152-8552, Japan*  
Tel.: +81 3 5734 2138  
Fax.: +81 3 5734 2887  
E-mail: [snakaham@polymer.titech.ac.jp](mailto:snakaham@polymer.titech.ac.jp)

2003

### High-Temperature Materials

19–23 May 2003  
11<sup>th</sup> International Conference on High Temperature Materials Chemistry (HTMC XI), Tokyo, Japan.  
*Prof. Michio Yamawaki, University of Tokyo, Department of Quantum Engineering and Systems Science, 7-3-1 Hongo, Bunkyo-ku, Tokyo*

*113-8656, Japan*  
Tel.: +81 3 5841 7422  
Fax: +81 3 5841 8633  
E-mail: [yamawaki@q.t.u-tokyo.ac.jp](mailto:yamawaki@q.t.u-tokyo.ac.jp)

### 39<sup>th</sup> IUPAC Congress

NEW

10–15 August 2003  
39<sup>th</sup> IUPAC Congress and 86<sup>th</sup> Conference of The Canadian Society for Chemistry: Chemistry at the Interfaces, Ottawa, Ontario, Canada.  
*National Research Council Canada (NRC), Conference Services Office, Building M-19, Montreal Road, Ottawa, Ontario, Canada K1A 0R6*  
Tel.: +1 613 993 0414  
Fax: +1 613 993 7250  
E-mail: [iupac2003@nrc.ca](mailto:iupac2003@nrc.ca)

## Index

### Awards and Prizes

American Chemical Society Patterson–Crane Award (Gerard P. Moss), 117  
CNC/IUPAC Travel Awards Announced, 23  
“Honoris Causa” from Institut National Polytechnique de Toulouse (INPT) (Nicola Senesi), 118  
Society of Chemical Industry (SCI) Perkin Medal (Elsa Reichmanis), 117

### Conference Announcements

Adjuvants for Agrochemicals (ISAA 2001), 6<sup>th</sup> International Symposium on, 27  
Agricultural Science and Technology (ICAST 2001), International Conference on, 153  
Air Pollution, Local and Regional Contribution to, and Local Radiative Balance in Asian Developing Countries, Workshop on, 61  
American Association of Cereal Chemists (AACC) Annual Meeting 2001, 153  
Analytical Science, Asia-Pacific Conference on (APCAS) and 18<sup>th</sup> Philippine Chemistry Congress, 180  
AOAC International Annual Meeting and Exposition, 115<sup>th</sup>, 119  
Bioinformatics 2002, International Conference on: North-South Networking, 90  
Biological Monitoring in Occupational and Environmental Health, 5<sup>th</sup> International Symposium on, 119  
Boron Chemistry, XI<sup>th</sup> International Meeting on (IMEBORON XI), 181  
Calorimetry and Thermal Analysis (JCAT 32), 32<sup>nd</sup> Conference on, 59  
Carbohydrate Symposium, 21<sup>st</sup> International (21<sup>st</sup> ICS), 91, 181

Carotenoids, 13<sup>th</sup> International Symposium on, 121  
Ceramics Congress, 10<sup>th</sup> International and 3<sup>rd</sup> Forum on New Materials (CIMTEC 2002), 155  
Chemical Education (17<sup>th</sup> ICCE), 17<sup>th</sup> International Conference on, 28  
Chemical Engineering Conference, 51<sup>st</sup> Canadian (2001: A Chemical Engineering Odyssey), 120  
Chemical Thermodynamics, 15<sup>th</sup> Russian Conference on, 154  
Chemistry and Environment, International Congress of, 121  
Chemistry in Africa (8<sup>th</sup> ICCA), 8<sup>th</sup> International Conference on: Chemistry and Quality of Life, 90  
Clinical Chemistry and Laboratory Medicine (EUROMEDLAB 2001), 14<sup>th</sup> IFCC-FESCC European Congress of, 25  
Clinical Chemistry and Laboratory Medicine (18<sup>th</sup> ICCCL 2002 Kyoto), 18<sup>th</sup> International Congress of, 29  
Clinical Laboratory and *In Vitro* Diagnostics Industry, European Symposium on the, 59  
Counter-Current Chromatography, 2<sup>nd</sup> International Conference on (CCC-2002), 180  
Crystal Growth (ICCG-13), 13<sup>th</sup> International Conference on, and Vapor Growth and Epitaxy (ICVGE-11), 11<sup>th</sup> International Conference on, 26  
Electrochemistry and Interfacial Chemistry in Environmental Cleanup and Green Chemical Processes, IUPAC/ICSU Workshop on, 24  
Electronic Structure of Solids and Surfaces—EuroConference on Computer Simulation of Complex Interfaces: Out of the Vacuum and into the Real World, 60  
Emulsion Polymerization and Latex Technology, 32<sup>nd</sup>

- Annual Short Course on Advances in, 26
- Emulsions, 3<sup>rd</sup> World Congress on: From Fundamentals to Industrial Applications, 93
- Endocrine-Active Substances, International SCOPE/IUPAC Symposium on, 156
- European Molecular Liquids Group (EMLG) Annual Meeting on the Physical Chemistry of Liquids, 156
- Food and Nutrition Conference AIFST, 153
- Food Ingredients, Semi-Finished Products, Product Development and Quality Control, Food Ingredients (FI) Central & Eastern Europe International Exhibition and Conference on, 121
- Food Ingredients, Semi-Finished Products, Product Development and Quality Control, Food Ingredients (FI) Europe International Exhibition and Conference on, 121
- Formulation, Forumla III. New Concepts and Strategies in (From the Laboratory to the Industry), 120
- Functional Foods 2002, 122
- Functional p-Electron Systems (F p5), 5<sup>th</sup> International Symposium on, 153
- Green Chemistry Education, IUPAC Workshop on, 90
- Heterocyclic Chemistry (FloHet-III), 3<sup>rd</sup> Florida Conference on, 122
- Heterocyclic Chemistry, 8<sup>th</sup> Ibn Sina Conference of, 122
- High-Temperature Superconductors and Novel Inorganic Materials Engineering (MSU-HTSC-VI), 6<sup>th</sup> International Workshop on, 26
- High Temperature Materials Chemistry, 11<sup>th</sup> International Conference on (HTMC XI), 183
- History of Modern Chemistry (CHMC), 4<sup>th</sup> International Conference of the International Union of History and Philosophy of Science (IUHPS), 182
- History of Science, 21<sup>st</sup> International Congress of, 60
- Hormone and Veterinary Drug Residue Analysis, 4<sup>th</sup> International Symposium on, 28
- International Organization for Standardization (ISO), 24<sup>th</sup> General Assembly and Associated Meetings
- IUPAC Congress, 39<sup>th</sup>, and 86<sup>th</sup> Conference of The Canadian Society for Chemistry: Chemistry at the Interfaces, 183
- Luminescence and Optical Spectroscopy of Condensed Matter (ICL'02), International Conference on, 155
- Macromolecular Colloquium, 9<sup>th</sup> International, and Polymer Conference, 6<sup>th</sup> Brazilian, 28
- Macromolecule-Metal Complexes (MMC-IX), 9<sup>th</sup> International Symposium on, 27
- Medicinal Chemistry, Hungarian-German-Italian-Polish Joint Meeting on, 27
- Metrology, International Conference on Legal, 152
- Nanostructured Advanced Materials, 2<sup>nd</sup> IUPAC Workshop on Advanced Materials (WAM II), 122
- Natural Products (ISCNP-23), 23<sup>rd</sup> International Symposium on the Chemistry of, 155
- Neurobehavioral Methods and Effects in Occupational and Environmental Health, 8<sup>th</sup> International Symposium on, 123
- Nuclear Analytical Methods in the Life Sciences, 7<sup>th</sup> International Conference on (7<sup>th</sup> NAMLS), 180
- Nutrition, 17<sup>th</sup> Institute of Nutritional Sciences (IUNS) International Congress of Nutrition 2001 on Modern Aspects of (Present Knowledge and Future Perspectives), 118
- Optics of Liquid Crystals (OLC2001), 9<sup>th</sup> International Topical Meeting on, 152
- Organic Chemistry Meeting, Mustafa Kemal University International (MKU-IOCM), 180
- Organic Reactivity (ESOR-8), 8<sup>th</sup> European Symposium on, 60
- Organic Synthesis, 1<sup>st</sup> NIAF-MeRinOS Joint Meeting on Fundamental and Applied Aspects of, 120
- Organometallic Chemistry, 15<sup>th</sup> FEChem Conference on, 156
- Organometallic Chemistry (20<sup>th</sup> ICOMC), 20<sup>th</sup> International Conference on, 123
- Pesticides, 8<sup>th</sup> Symposium on Chemistry and Fate of Modern, 118
- Philosophy of Chemistry and Biochemistry, 5<sup>th</sup> Symposium on, 60
- Photochemistry, 19<sup>th</sup> IUPAC Symposium on, 92
- Physical Organic Chemistry, 16<sup>th</sup> International Conference on: Structure and Mechanism in Organic Chemistry, 92
- Polymer Conference, 6<sup>th</sup> Brazilian, and Macromolecular Colloquium, 9<sup>th</sup> International, 28
- Polymer Networks 2002, 182
- Polymer Systems, 4<sup>th</sup> International Symposium on Molecular Order and Mobility in, 154
- Polymers and Organic Chemistry 2002, 181
- Polymers and Other Organic Solids, Electrical and Related Properties of, 21<sup>st</sup> Discussion Conference and 9<sup>th</sup> International ERPOS Conference on, 123
- Separations in Biosciences (SBS'03), 3<sup>rd</sup> International Symposium on, 183
- Soil Science (WCCS), 17<sup>th</sup> World Congress of, 124
- Solid-State Chemistry, 5<sup>th</sup> Conference on, 91
- Solubility Phenomena (10<sup>th</sup> ISSP), 10<sup>th</sup> International Symposium on, 92
- South African Chemical Institute, 36<sup>th</sup> Convention of the (SACI2002), 181
- Sri Lanka Association for the Advancement of Science (SLAAS), 57<sup>th</sup> Annual Session of the, 179
- Synthetic Organic Chemistry (ECSOC-5), 5<sup>th</sup> International Conference on, 119
- Thermochemical, Thermodynamic, and Transport Properties of Halogenated Hydrocarbons and Mixtures, 2<sup>nd</sup> International Workshop on, 25
- Vanadium, 3<sup>rd</sup> International Symposium on Chemistry and Biological Chemistry of, 153
- Vapor Growth and Epitaxy (ICVGE-11), 11<sup>th</sup> International Conference on, and Crystal Growth (ICCG-13), 13<sup>th</sup> International Conference on, 26
- Years of Chromatography, 184

#### Conference Calendar

Listings of IUPAC-Sponsored Conferences and Symposia, 29, 61, 93, 124, 157, 184

#### Featured Articles

ARKIVOC: A Hard Copy Journal of Organic Chemistry Freely Available on the Web, 161

Chemical Education in Eritrea, 97

Chemistry in Egypt, 106

Europe's Favorite Chemists, 7

"Heavy Metals"—A Meaningless Term, 163

Highlights from the Web, 111

Long-Range Research Initiative (LRI) of the American Chemistry Council, 101

Quality of Chemical Measurements, 1

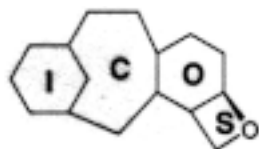
The National Institute of Standards and Technology (NIST) Celebrates its Centennial, 65

#### IUPAC

Atomic Force Microscopy (AFM) in Direct Measurements of Colloidal Forces, New Project on, 145

- Characterization of Carbon Materials, New Project on, 52  
 COCI Visit to China, 139  
 Collecting, Testing, and Disseminating Experiments in Solid-State and Materials Chemistry, New Project on, 113  
 Election of Officers and Bureau Members, 41<sup>st</sup> IUPAC Council Meeting, 72  
 Environmental Analytical Chemistry for Regulatory Chemists and Laboratory Managers, with Emphasis on Mining in Africa, Report on IOCD/IUPAC Workshop on, 45  
 Fats, Oils, and Oilseeds Analysis, Report on International IUPAC Workshop on, 110  
 Free-Radical Polymerization, Critically Evaluated Termination Rate Coefficients for (1. Current Status, Evaluation of Experimental Methods, Data for Styrene and Methyl Methacrylate), New Project on, 86  
 Glossary of Atmospheric Chemistry Terms, New Project on, 172  
 Highlights from the Web, 111  
 Human Drug Metabolism Database, New Project on, 87  
 Immunochemistry of Metal Sensitization, New Project on, 85  
 Ionic Strength Corrections for Stability Constants, New Project on, 18  
 IUPAC Chemical Identifier (IchI), New Project on, 85  
 IUPAC 41<sup>st</sup> General Assembly and 38<sup>th</sup> Congress, Report from, 129  
 IUPAC–NIST Solubility Data Series, 141  
 IUPAC Prize for Young Chemists, 79  
 IUPAC Recommendations for Macromolecular (Polymer) Nomenclature: Guide for the Authors of Papers and Reports in Polymer Science and Technology, 141  
 IUPAC Stability Constants Database, New Project on, 18  
 IUPAC/UNESCO/UNIDO Safety Program Trains Two Scientists in United States, 33  
 Japanese Version of *IUPAC White Book on Chlorine* (Special Issue of *Pure and Applied Chemistry*, Vol. 68, No. 9, 1996), 47  
 Medicinal Chemist, Two Routes to Becoming a, 43  
 Medicinal Chemistry in the Development of Societies, Biodiversity, and Natural Products, 39  
 Metabolism Terms, New Project on, 86  
 New Project Numbers, 18  
 New Projects, 18, 52, 85, 113, 145, 172  
 Pesticides 2000: Regulation, Monitoring, and Evaluation, Report on IUPAC-TACTRI/COA International Workshop on, 46  
 President's Report on the State of the Union, 130  
*Pure and Applied Chemistry*: Special Topic Issue on Green Chemistry, 14  
 Reflections on Three Decades of IUPAC Participation, 110  
 Report of Treasurer and Report of Finance Committee, 136  
 Risk Assessment Terminology, 34  
 Secretary General's Report, 12, 135  
 Selected Free Radicals and Critical Intermediates: Thermodynamic Properties from Theory and Experiment, New Project on, 145  
 Strategy for Educational Policy, 13  
 Thermochemical, Thermodynamic, and Transport Properties of Halogenated Hydrocarbons and Mixtures, Second Workshop on, 168  
 Thermodynamic Characterization of High-Temperature Superconductors in the Yttrium-Barium-Copper-Oxygen System, New Project on, 19  
 Tribute to Prof. Valentin A. Kopytug and his IUPAC Career, 141  
 Two Routes to Becoming a Medicinal Chemist, 43  
 UNESCO/IUPAC Postgraduate Course in Polymer Science, 16  
 University Education in Polymer Science, New Project on, 19
- Meeting Reports**
- Environmental Analytical Chemistry for Regulatory Chemists and Laboratory Managers, with Emphasis on Mining in Africa, Report on IOCD/IUPAC Workshop on, 45  
 Fats, Oils, and Oilseeds Analysis, Report on International IUPAC Workshop on, 110  
 Pesticides 2000: Regulation, Monitoring, and Evaluation, Report on IUPAC-TACTRI/COA International Workshop on, 46  
 Thermochemical, Thermodynamic, and Transport Properties of Halogenated Hydrocarbons and Mixtures, Second Workshop on, 168
- News and Notices from Other Societies and Unions**
- African Association of Pure and Applied Chemistry (AAPAC), 19
- Prizes and Awards**
- See Awards and Prizes
- Provisional Recommendations**
- Naming of New Elements (Commission on Nomenclature of Inorganic Chemistry, II.2), 173  
 NMR Nomenclature: Nuclear Spin Properties and Conventions for Chemical Shifts (Commission on Molecular Structure and Spectroscopy, I.5), 52  
 Nomenclature for Isotope, Nuclear, and Radioanalytical Techniques (Commission on Radiochemistry and Nuclear Techniques, V.7), 53  
 Nomenclature for the  $C_{60}$ - $I_h$  and  $C_{70}$ - $D_{5h(6)}$  Fullerenes (Commission on Nomenclature of Organic Chemistry, III.1), 113  
 pH—Definition, Standards, and Procedures (Working Party on the Definition of pH), 146  
 Phane Nomenclature. Part II: Substitution Derivatives of Phane Parent Hydrides (Commission on Nomenclature of Organic Chemistry, III.1), 146  
 Recommendations for the Use of the Term "Recovery" in Analytical Procedures (Commission on General Aspects of Analytical Chemistry, V.1), 147  
 Selectivity in Analytical Chemistry (Commission on General Aspects of Analytical Chemistry, V.1), 87  
 Terminology for Analytical Capillary Electromigration Techniques (Commission on Separation Methods in Analytical Chemistry, V.3), 148
- Publications**
- Bacillus thuringiensis, Environmental Health Criteria No. 217 (WHO), 116  
 Basic Calculations for Chemical and Biological Analysis, 2<sup>nd</sup> Edition (AOAC International), 55  
 Biological Standardization, WHO Expert Committee on, 49<sup>th</sup> Report, WHO Technical Report Series No. 897 (WHO), 177  
 Carbon Monoxide, Environmental Health Criteria No. 213 (WHO), 114  
 Catalytic Polymerization of Cycloolefins. Ionic, Ziegler–Natta, and Ring-Opening Metathesis Polymerization (Elsevier), 88  
 Chemistry and Specifications of Pesticides, 16<sup>th</sup> Report of

- the WHO Expert Committee on Vector Biology and Control, WHO Technical Report Series No. 899 (WHO), 177
- Climate Change and Stratospheric Ozone Depletion: Early Effects on Our Health in Europe, WHO Regional Publications, European Series No. 88 (WHO), 178
- Color: A Multidisciplinary Approach (Wiley-VCH and Verlag Helvetica Chimica Acta), 87
- Compendium of Microbiological Methods for the Analysis of Food and Agricultural Products (AOAC International), 55
- Dinitro-ortho-Cresol, Environmental Health Criteria No. 220 (WHO), 176
- Disinfectants and Disinfectant By-products, Environmental Health Criteria No. 216 (WHO), 174
- Equations of State for Fluids and Fluid Mixtures, Vol. 5, IUPAC Series on Experimental Thermodynamics (Elsevier), 54
- Flame Retardants: Tris(2-butoxyethyl) Phosphate, Tris(2-ethylhexyl) Phosphate, and Tetrakis(hydroxymethyl) Phosphonium Salts, Environmental Health Criteria No. 218 (WHO), 174
- Fumonisin B<sub>1</sub>, Environmental Health Criteria No. 219 (WHO), 175
- Guide to Rheological Nomenclature: Measurements in Ceramic Particulate Systems, NIST Special Publication 946 (U.S. Department of Commerce), 150
- Human Exposure Assessment, Environmental Health Criteria No. 214 (WHO), 115
- In Situ Monitoring of Aquatic Systems: Chemical Analysis and Speciation, Vol. 6, IUPAC Series on Analytical and Physical Chemistry of Environmental Systems (John Wiley & Sons Ltd.), 20
- IUPHAR Compendium of Receptor Characterization and Classification, 2<sup>nd</sup> Edition (IUPHAR), 173
- Japanese Translation of *IUPAC White Book on Chlorine* (Special Issue of *Pure and Applied Chemistry*, Vol. 68, No. 9, 1996), 54
- Macromolecular Symposia, Volume 156: Macromolecular-Metal Complexes (MMC-8) (Wiley-VCH), 21
- Macromolecular Symposia, Volume 157: Ionic Polymerization (Wiley-VCH), 22
- Macromolecular Symposia, Volume 158: Rheology of Polymer Systems (Wiley-VCH), 22
- Macromolecular Symposia, Volume 161: Controlled Synthesis of Functional Polymers (Wiley-VCH), 148
- Macromolecular Symposia, Volume 165: Developments in Polymer Synthesis and Characterization (Wiley-VCH), 148
- Macromolecular Symposia, Volume 168: Natural and Synthetic Polymers: Challenges and Perspectives (Wiley-VCH), 149
- Nitromethane with Water or Organic Solvents: Binary Systems, IUPAC-NIST Solubility Data Series 71 (*Journal of Chemical and Reference Data*, American Chemical Society and American Institute of Physics), 151
- Nitromethane with Water or Organic Solvents: Ternary and Quaternary Systems, IUPAC-NIST Solubility Data Series 72 (*Journal of Chemical and Reference Data*, American Chemical Society and American Institute of Physics), 151
- Nomenclature of Inorganic Chemistry II: Recommendations 2000 (IUPAC "Red Book II"), 149
- Official Methods of Analysis of AOAC International, 17<sup>th</sup> Edition (AOAC International), 54
- Principles and Practices of Method Validation (Royal Society of Chemistry), 53
- "Red Book II", 141, 149
- Quality Assurance Principles for Analytical Laboratories, 3<sup>rd</sup> Edition (AOAC International), 55
- Use of Essential Drugs, 9<sup>th</sup> Report of the WHO Expert Committee (including the Revised Model List of Essential Drugs), WHO Technical Report Series No. 895 (WHO), 176
- Vinyl Chloride, Environmental Health Criteria No. 215 (WHO), 115
- Reports from IUPAC Bodies**
- Commission on Atomic Weights and Isotopic Abundances (II.1), 179
- Commission on Food (VI.5), 89
- Commission on Nomenclature of Inorganic Chemistry (II.2), 57
- Commission on Photochemistry (III.3), 58
- Commission on Soil and Water Chemistry (VI.3), 24
- Commission on Thermodynamics (I.2), 55
- Physical Chemistry Division Committee (I.0), 23
- Reports from IUPAC-Sponsored Symposia**
- Chemical Thermodynamics, 16<sup>th</sup> IUPAC Conference on (ICCT-2000), 49
- Chemistry, 4<sup>th</sup> International Congress on, and 13<sup>th</sup> Caribbean Conference on Chemistry and Chemical Engineering, 144
- Commission on Atomic Weights and Isotopic Abundances (II.1), 180
- Coordination Chemistry (34-ICCC), 34<sup>th</sup> International Conference on, 47
- Green Chemistry, Report on International Symposium on, 112
- High-Temperature Superconductors and Novel Inorganic Materials Engineering (MSU-HTSC VI), 170
- Macromolecules, 38<sup>th</sup> International Symposium on (World Polymer Congress/MACRO 2000), 81
- Macromolecules, 59<sup>th</sup> Prague Meeting on, and 40<sup>th</sup> Microsymposium on Polymers in Medicine, 48
- Macromolecules and Materials Science, 4<sup>th</sup> Annual UNESCO School and IUPAC Conference on, 143
- Medicinal Chemistry, 16<sup>th</sup> International Symposium on, 83
- Natural Products, 22<sup>nd</sup> IUPAC International Symposium on the Chemistry of (ISCNP-22), 82
- Organic Synthesis (ICOS-13), 13<sup>th</sup> International Conference on, 17
- Photochemistry, 18<sup>th</sup> IUPAC Symposium on, 49
- Physical Organic Chemistry (ICPOC-15), 15<sup>th</sup> International Conference on, 17
- Polymer Dispersions, Preparation of Nonconventional, 15<sup>th</sup> Bratislava International Conference on Polymers, 170
- Polymer Membranes, 41<sup>st</sup> Microsymposium on, 171
- Polymers in Medicine, 40<sup>th</sup> Microsymposium on, and 59<sup>th</sup> Prague Meeting on Macromolecules, 48
- Scattering Methods for the Investigation of Polymers, 20<sup>th</sup> Discussion Conference on, 171
- Solubility Phenomena, 9<sup>th</sup> International Symposium on (9<sup>th</sup> ISSP), 81
- Thermal Analysis and Calorimetry, 12<sup>th</sup> International Congress on, 82
- Trace Elements in Food, 1<sup>st</sup> International IUPAC Symposium on, 84



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