## Analytical Chemistry Division

## SUBCOMMITTEE ON SOLUBILITY AND EQUILIBRIUM DATA

## **Draft Minutes**

## 36<sup>th</sup> Annual Meeting (9<sup>th</sup> of SSED)

to be held in conjunction with the 14<sup>th</sup> ISSP, Leoben, Austria 24<sup>th</sup> and 25<sup>th</sup> July 2010

1.	Introduction of participants	C. Magalhães
	All of the participants were requested to introduce themselves together with their affiliation	
	(A list of participants is attached.)	
2.	Approval of Minutes of the 35 <sup>rd</sup> Annual Meeting (8 <sup>th</sup> of SSED) in conjunction with the 31 <sup>st</sup> ICSC, Innsbruck, Austria,	E.Waghorne
	The minutes had been circulated electronically prior to the meeting and were accepted without change.	
3.	Information	C. Magalhães
	Clara Magalhães informed the committee of the recent sudden death of Dr Ari	
	Horvath, who had been active in Commission V.8 early in the SDS project. Ari's	
	professional activities within IUPAC resulted in the publication of four volumes in	
	the Solubility Data Series which he coedited with Forrest Getzen: Halogenated	
	Benzenes, Toluenes, and Phenols with Water (1985); Halogenated Methanes with	
	Water (1995); Halogenated Ethanes and Ethenes with Water (1999); and	
	Halogenated Aliphatic Hydrocarbons C3-C14 with Water (1999).	
	Clara Magalhães gave the Chairman's report to the committee:	
	• The Chairman of the SSED has been made an associate member of the ACD	
	and will attend ACD meetings in that role.	
	• IUPAC has introduced National Representatives to the Divisions, so the	
	possibility of members of the SSED being nominated to the ACD through	
	this route is open.	

- The ACD has prepared a document detailing the duties of its officers.
- The ACD intends to prepare a list of all of the publications from the division.
- It was noted that the Stability Constant database had not been developed since 2006.
- E. Waghorne read part of a letter from Prof. H. Miyamoto to Mark Salomon. (Copy of the letter attached)

### 4. Other Items for Agenda

### C. Magalhães

### 4.1 - The IYC2011

Heinz Gamsjaeger explained that Maria Filomena Camões would be the IUPAC representative at the 14<sup>th</sup> ISSP and could present information about the IYC as part of her address.

4.2- - The internet forum page

It was decided to use the forum page as an archive for SSED documents.

To try to develop a complete historical record of the SSEd and Commission V.8 it was decided to ask all members for any minutes, reports or other documents that they might have.

4.3 - The Orange Book

Clara Magalhães reported the suggestion that the SSED become involved at a late stage of the revision of the Orange Book, to define solubility terms that were present.

Following discussion it was decided to propose that the *Glossary of Terms Related to Solubility* be included as a chapter or part of a chapter.

4.4 - Electronic database

It was agreed to support James Sangster's proposal for a project to continue the Octanol/Water partition coefficient database (LogKOW). The need to recruit someone to carry out this project was noted.

Following discussion it was decided to propose that the Equilibrium Constant Data Base could be left without further development, largely because most of the classical systems are adequately reported in the literature up to 2003. It was decided to approach Leslie Pettit about distribution of the existing database

	4.5 - Mechanisms of succession	
	It was proposed that the committee establish a position of Vice-Chairman, who	
	would normally succeed to the role of Chairman, and that they should also attend	
	ACD meetings with the SSED chairman.	
	4.6 - Division financial matters	
	It was noted that the principal SCD expenditure area was the revision of the	
	Orange Book.	
	4.7 - SSED visibility - Chemistry International articles	
	It was noted that the SSED is well represented by articles in Chemistry	
	International.	
	4.8 - Interactions with chemistry societies	
	It was noted that there had been an approach to IUPAC from the American	
	Chemical Society to have some form of formal linkages.	
5.	SSED members	C. Magalhães
	It was agreed that, in the next review of the membership of the committee,	
	members who were not currently active in a project would not be removed from the	
	list of members. New members would be added to the list, which is held on the	
	IUPAC web-site.	
6.	Chairman's Report for 2009 - 2010	C. Magalhães
	(The Chairman's Report is attached as a powerpoint presentation.)	
7.	Franzosini Award	H. Gamsjäger and C. Magalhães
	Heinz Gamsjaeger presented two Francosini Awards:	2
	Professor Jitka Eysseltova, Charles University, Prague, the Czech Republic Professor Stanislav Frančišković Bĕlinski, Ruder Bošković Institute, Zagreb, Croatia (copy of CI report attached)	

- 8. Editor-in-Chief's Report for 2009 2010 M. Salomon
  Clara Magalhães presented the EIC report in the absence of the Editor in Chief.
  (The report is attached)
- 9. Old solubility volumes C. Magalhães, Allan Harvey and Mark Salomon

Clara Magalhães presented a proposal from Alan Harvey that out of print volumes should be scanned, converted to PDF format and made available through the NIST database. The SSED supported this proposal with the provisos that the original source (IUPAC SDS volume) and attribution (editors, compilers, evaluators) be retained and displayed. It was noted that there might be complication if Pergamon had any copyrights. 10. Projects - progress reports and new proposals C. Magalhães Clara Magalhães presented a list of the current projects and the status of each was discussed. Afternoon Session 14:00 - 15:45 11. Deliberations of Subcommittees Subcommittee: Gas Solubilities J. Salminen (Chair) Subcommittee: Liquid Solubilities D. Shaw (Chair) Subcommittee: Solid Solubilities W. Voigt (Chair) G. Hefter (Chair) Subcommittee: Stability Constants Afternoon Session 16:00 - 18:00 12. Reports of Subcommittees and Discussions Heinz Gamsjaeger gave a brief summary of the Guide to the IUPAC-NIST Solubility Data Project Subcommittee: Gas Solubilities J. Salminen (Chair) Clara Magalhães reported that Justin Salminen had given her a verbal report that the projects were in the same state as they were in his last report. Subcommittee: Liquid Solubilities (copy attanched) D. Shaw (Chair) W. Voigt (Chair) Subcommittee: Solid Solubilities (copy attached)

Subcommittee: Stability Constants

G. Hefter (Chair)

- Volumes for next year's SDS proposals (Copy attached)
- 14. Report on the 14<sup>th</sup> ISSP Leoben, Austria, 2010 H. Gamsjaeger
  Heinz Gamsjaeger made a brief presentation about the upcoming ISSP. (Copy attached)
- Future International Symposia on Solubility Phenomena
  C. Magalhães
  It was decided to hold the 2011 SSED meeting would be held in conjunction with
  the 32<sup>nd</sup> ACSC.

There was a discussion about possible venues for the ISSP after 2012. Clara Magalhães agreed to make some inquiries to participants during the 14<sup>th</sup> ISSP.

16. Adjournment

C. Magalhães

M. Salomon

## <u> Item 1</u>

### Attendees at the Meeting

### BELAREW, Prof. Christo

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#### Item 3

### With the Compliments of the Author

2010. 6. 30.

Dear Mark,

Enclosed is the reprint of SDS Vol. 85 published in J. Phys. Chem. Ref. Data (2008). I would like to take this opportunity to express greatfully acknowledge your reviewing and editorial works concerning all of the halate solubility volumes. Much of the success of these volumes can be attributed to your kind and helpful contribution.

As is well known, the Vol. 85 is the fourth and final volume in the halate solubility series. The first volume on "Alkaline Earth Metal Halates" has been published in 1983, and the second volume on "Alkali Metal Halates" has been published in 1987. The third volume on "Copper and Silver Halates" was already published in 1990 and then the fourth volume was published in 2008. I again say I would like to thank your contribution to the halate series.

I would like to talk about my short story of Solubility Data Project work. Now, I am remembering that I received your invitation letter concerning the participation in IUPAC'S solubility project at spring 1977. In that day, I was very surprised for the letter and repeated to read your letter in my office. The sample tubes for a solubility determination were rotated in a thermostat placed in next room. I have published the papers concerning the solubility studies of the slightly soluble salts such as sliver halates in that time and lead sulfate has determined previously. I considered I was able to contribute in a field of the solid in liquid systems.

After I received both a guideline for the compilers and the sample data sheets from you, I started to collect the papers which the halate solubility were reported. Niigata University was established in 1949 by reconstructed the educational system in Japan after the Second World War. The former Niigata Medical School was established in

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1910. All of the Chemical Abstracts with Subjects and Authors Indexes from Vol. 1 published in 1907 until recently published volumes were kept in Niigata University Library Center. I easily could investigate the CA and prepared a list of the halate solubility studies.

After the Davos meeting held in 1979, Prof. Kertes came to Japan in order to attend the CODATA meeting held in Kyoto, and then also attended the Kiryu meeting organized by Prof. Akaiwa of Gunma University. I took about Prof. Kertes a status of my SDS project in Kyoto by helping Prof. Nakanishi of Kyoto University and after the meeting I attended the Kiryu meeting, too. In the Kiryu meeting, I heard from Prof. Kertes that I will recommend one of the candidates of a member of the Solubility Data Center establishd in Emory University in Atlanta.

I first met Prof. Clever of Emory University in the Leuben Meeting held in summer 1981. After the meeting I visited Atlanta and then started my project work in the Solubility Data Center placed in Emory University from autumn, that year. All day, I was typing the drafts of halate solubility data on many formal compilation sheets and evaluation sheets in friendly atmosphere.

Prof. Clever and I by Larry's car attended the commission meeting held in North Carolina, June 30-July 2, 1982. According to the minutes of the meeting, Prof. Clever reported that Miyamoto has spent a profitable year at the "Project (Solubility Data Center placed in Emory University)" and will complete two volumes by the time he leaves in August. Dr. Salomon also reviewed the status of currently nearing completion as follows. The Alkaline Earth Metal Halates volume edited by H. Miyamoto and me (M. Salomon) will be completed as manuscripts in late calendar 1982. Both the Silver, Copper and Gold volume and the Alkali Metal Halates and Ammonium Iodate volume will be completed in 1983.

After I retired from Niigata University in 1995, I received the revised manuscripts of the 4 th and final halate volume reviewed by Prof. Guminski., that is, those of the transition metal, lanthanide, and actinide volume. The volume was published in 2008.

I am now seeing a photocopy of the Varna meeting printed in the IUPAC magazine (Chemistry International). I am remembering all of the solubility project works, that is the compilation and evaluation of all hatate solubilities, the activities of the commission meetings, and the ISSP, of course, included the conference tours. Your face

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is found. I can find, of cource, Dr. Mark Salomon, Prof. Heinz Gamsjeger, Prof. Roger Cohen-Adad, Prof. Cezary Guminski, Prof. Jetka Eysseltova, Prof. Cristo Balarew, Prof. Hitoshi Ohtaki with Dr. Ryo also and all of the other commission members. All of the commission members are special acknowledged.

I would like to talk about the subcommittee meeting held in Aveiro at 2004. I offered to Commission chairman to make a little final speech at the meeting, 2004. The final sentence of the speech was as follows; "Now I am seventy-five years old. Soon it will be difficult for me to take a long flight to attend the meetings. I would like to thank you very much for your kind advice and comments on my SDP activity. Thank you very much to Heinz and IUPAC friends!"

As soon as my speech was finished, I received from the audience a storm of the standing ovation. Chairman and Mark came to my desk and then I said only thank you ••••. Chairman went back to his desk and then he declared to close the meeting. When I look back upon the past, a thousand emotions crowd in my mind.

I am looking forward to seeing you again, if possible. But I regret to say that I cannot attend the Leoben meeting this summer because I am not good now. I hope that the meeting will be held successfully. I wish from Japan that all of the SDP members will have a happy life and the SDP activity will develop continuously.

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## Chairman's report as Powerpoint

Item 6

## http://www.iupac.org/publications/ci/2010/3206/iw4\_franzosini.html

#### Two Franzosini Awards in 2010

Jitka Eysseltova and Stanislav Frančišković-Bilinski each received the Franzosini Award in recognition of their separate contributions to the IUPAC Solubility Data Project. They were honored at the 9th Annual Meeting of the IUPAC Subcommittee on Solubility and Equilibrium Data held 25–30 July 2010 in Montanuniversität Leoben, Austria.

Jitka Eysseltova, a retired professor at Charles University, Prague, Czech Republic, has been working on solubility projects for more than 30 years. Her first contact with the IUPAC solubility group, then named the Solubility Data Commission V.8, was in 1979. In 1981, she participated in its annual meeting, held in Louvain, Belgium, in spite of Czechoslovakian laws in force at that time prohibiting such involvement. Starting in 1983, she participated in all annual meetings of Commission V.8, and since 2002 she has attended all meetings of the Subcommittee on Solubility and Equilibrium data. In 1988, she coauthored SDS volume 31 on "Alkali Metal Orthophosphates" (with the late T.P. Dirkse). Since 1988, she has contributed to all ISSPs, with



Franzosini Award winners Jitka Eysseltova (left) and Stanislav Frančišković-Bilinski.

oral and/or poster presentations and by chairing sessions. From 1991–1995 she served as titular member of Commission V.8, and from 1995–1997 she was a member of a V. 8 group working on a Copernicus Project. The head of this group was the late R. Cohen-Adad. In 1998, she coauthored SDS volume 66 on "Ammonium Phosphates" (also with T.P. Dirkse). From 2008–2009 she chaired the task group of the project "Solubility in Systems with Lithium and/or Sodium Nitrates," and in 2010 she submitted for publication an SDS volume on lithium nitrate. At the 14th International Symposium on Solubility Phenomena and Related Equilibrium Processes in July 2010 she presented an excellent Franzosini communication on "Saturated Electrolyte Solutions: Thermodynamics and Reality."

Stanislav Frančišković-Bilinski is a research associate at the Laboratory for Physical Chemistry of Traces, Division for Marine and Environmental Research, "Ruđer Bošković" Institute, Zagreb. He received his doctorate in geology at the University of Zagreb, Croatia in 2005. Frančišković-Bilinski has been, and still is, the principal investigator of geochemically oriented bilateral projects between Croatia and Austria as well as Croatia and Hungary. His scientific oeuvre mainly deals with the interaction of natural waters with sediments (e.g., "An Assessment of Multielemental Composition in Stream Sediments of Kupa River Drainage Basin, Croatia for Evaluating Sediment Quality Guidelines," Fresenius Environmental Bulletin [2007], 16, 561–575). Thus, his expertise is a prerequisite for the success of solubility data projects of geochemical and environmental relevance which will be proposed by SSED in the near future. At the 14th ISSP he presented a comprehensive Franzosini communication titled "Toxic Elements in Stream Sediments as Indicators of Environmental Problems."

## E-i-C Report August, 2009 – July 2010 (Mark Salomon)

I have been working very closely with Allan Harvey who has done an outstanding job is getting all volumes to the AIP. The following is a summary of publications and manuscripts in course of publication which I have been working on (updates for liquid-liquid volumes have been reviewed by David Shaw).

During 2009-210, the publication of the three parts to the Rare Earth Metal Chlorides was completed (Mioduski, Guminski and Zeng).

Part 1 of Jitka Eysseltova's volume on alkali metal nitrates, LiNO3, is at the AIP ready for publication.

Ayako Goto Hiroshi Miyamoto and their colleagues have submitted a very complete revision on **Hydroxybenzoic Acids**, **Hydroxybenzoates and Hydroxybenzoic Acid Salts in Water and Aqueous Systems.** The 459 page manuscript has been submitted to JPCRD, and part 2 is nearing completion.

Latest communication from Larry Clever indicates that his update on oxygen and ozone is nearing completion. Details will be forthcoming.

A complete guide to the preparation and use of compilations and evaluations for the *IUPAC-NIST Solubility Data Series* were jointly published by IUPAC and NIST.

H. Gamsjäger, J.W. Lorimer, M. Salomon, D.G. Shaw and R.P.T. Tomkins in

Pure Appl. Chem., **82(5)**, 1137 (2010) and J. Phys. Chem. Ref. Data, **39(2)**, 023101 (2010)

Allan Harvey, editor of JPCRD, has put forward a proposal to publish out of print SDS volumes. The proposal is to scan these volumes and using OCR technology republish in JPCRD. Permission from the copyright holder (IUPAC) is required, and this is being pursued by the SSED Chair.

The status of other volumes for Gas/Liquid and Solid/Liquid systems will be discussed at the meeting by the chairs of each topic.

## Report on activities in the field of Solid - Liquid Solubilities W. Voigt

## Leoben, 24<sup>th</sup> - 25<sup>th</sup> July 2010

## Alkaline earth metal carbonates. Alex de Visscher, J. Vanderdeelen, E. Königsberger (2002-031-1-500)

Once more the importance of this volume for the actual, world-wide efforts to improve the understanding of the interactions of  $CO_2$  in the environment is emphasized.

Due to the complexity of the evaluation in the Dublin meeting it was already decided to split the volume into 2 or 3 parts:

Part I: Beryllium and magnesium carbonate,

Part II: Calcium carbonate.

After completion of this work it will be decided, weather a third volume will be needed for strontium and barium carbonate or not.

Work on part I is mostly ready, so that it will be sent to the editor in chief until the end of 2010. Part II will be finished in 2011.

## Metal carbonates (Mn, Fe, Co, Ni, Cu, Zn, Ag, Cd, Hg, Pb) C. Magalhães, H. Gamsjäger and K. Sawada (2002-032-1-500)

The various carbonates will also be published in separate parts. In the year 2010 the part with cadmium carbonate will be finished by C. Magalhães and H. Gamsjäger, so that it can go to print in 2011.

## Solubility of hydroxybenzoic acids and hydroxybenzoates A. Goto, H. Miyamoto (2002-036-1-500)

This volume is in the last stage of corrections and will go to print this year.

## Solubility of halogenated aromatic hydrocarbons A. Goto, R. Goto, M. Makino, and H. Miyamoto (2002-037-1-500)

Since the material is not sufficient to allow evaluations on the basis of experimental data it was decided in 2009 to summarize the material as a technical paper of IUPAC in combination with some predictive methods of Prof. Schüürmann (Germany). No activity was reported on this topic.

## Solubility of substances related to urolithiasis. E. Königsberger and L.-C. Königsberger (2002-035-1-500)

The project will no longer be followed.

## Rare Earth Metal Chlorides in Water and Aqueous Systems. T.

Mioduski, C. Guminski and D. Zeng.

## The chloride volume is printed in 3 parts:

Part I. Scandium Group (Sc, Y, La) Part II: Light Lanthanides (Ce-Eu) Part III: Heavy Lanthanides (Gd-Lu)

## Solubility in aqueous systems containing $LiNO_3\,and/or\,NaNO_3$ . I. Eysseltova. (2007-044-1-500)

Due to the large number of papers with NaNO<sub>3</sub>, the volume is split into 2 parts, part I with LiNO<sub>3</sub> and part II with NaNO<sub>3</sub>. Part I is ready for print this year.

## Solubility of Potassium sulfate in aqueous solutions (I. Esseltova, R. Bouaziz)

I. Eysseltova accepted to take over the responsibility for the volume of  $K_2SO_4$ -H<sub>2</sub>O at the Torino meeting and will finish this work without financial support in 2011.

## **Proposal of new projects**

## Aqueous lanthanoide bromide systems. C. Guminski, D. Zeng , T. Mioduski, H. Voigt

## Aqueous lanthanoide iodide systems. C. Guminski, D. Zeng, T. Mioduski,

For these two volumes the proposal forms has been prepared and sent to the AD of IUPAC. The volume for the iodide will be prepared first and it is expected to ready at the end of 2010.

The work on bromides will be finished in 2011, because experimental work on the system  $LaBr_3 - H_2O$  shall be included, which is still going on. The investigation on  $LaBr_3 - H_2O$  represents the only example with a complete phase diagram down to low temperatures, which then could be compared with the corresponding chloride system.

## Solubility of Lithium sulfate and its double salts in aqueous solutions. W. Voigt, J. Schmitt, D. Zeng

Solubility data of lithium salts are highly needed for the development of efficient technologies for lithium recovery from salt lake brines and lithium battery recycling. A proposal will be formulated this year and the volume will be established during the year 2011 and shall go to print in 2012.

Wolfgang Voigt Chair of Solid-Liquid Solubilities Leoben, 28th July 2010

## Report of the Liquid-Liquid Group Solubility and Equilibrium Data Subcommittee International Union of Pure and Applied Chemistry

Prepared by D Shaw Prior to 2010 Meeting of SSED

## Volume Published Since Last Meeting:

2007-046-1-500 Volume 88 Mutual Solubility of Esters with Water, M Goral et al. Part 1 ( $C_2$ - $C_4$ ) published in JPCRD Vol 38 No 4, 2009 Part 2 ( $C_5$ - $C_6$ ) published in JPCRD Vol 39 No 1, 2010 Part 3 ( $C_7$ - $C_9$ ) published in JPCRD Vol 39 No 2, 2010 Part 4 ( $C_{10}$ - $C_{36}$ ) in press

## Other Publication

2008-008-1-500 A Guide to Preparation and Use on Compilations and Evaluations, H Gamsjaeger et al.

Published simultaneously in JPCRD (Vol 39, No 2, 2010) and PAC (Vol 85, No 5, 2010)

Note: This publication was the work of a Task Group including members from all SSED subcommittees; it is mentioned here for completeness.

## **Projects in Preparation:**

2007-047-1-500 Nitriles C+3: Binary and Multicomponent Systems, V Sazonov. Valerii Sazonov status: no communication; status unknown

## New Project:

M Goral and A Maczynski suggested a volume on the mutual solubility of nitrogen containing substances with water.

IUPAC-NIST Solubility Data Series. 88. Esters with Water–Revised and Updated Part 3. C<sub>7</sub> to C<sub>9</sub> Esters with Water (Also published is part 4) Part 4. C<sub>10</sub> to C<sub>32</sub> Esters with Water Volume Editors Marian Góral Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland David G. Shaw University of Alaska, Fairbanks, Alaska, USA Andrzej Mączyński and Barbara Wiśniewska-Gocłowska, Assistants Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY ANALYTICAL CHEMISTRY DIVISION\* SUBCOMMITTEE ON SOLUBILITY AND EQUILIBRIUM DATA\*\*

## GLOSSARY OF TERMS RELATED TO SOLUBILITY (IUPAC RECOMMENDATIONS 200-)

Prepared for publication by

HEINZ GAMSJÄGER1, JOHN W. LORIMER2, PIRKETTA SCHARLIN3 AND DAVID G. SHAW4,‡.

## **Editorial: IUPAC-NIST Solubility Data Series**

Allan H. Harveya..

Co-Editor, Journal of Physical and Chemical Reference Data, Thermophysical Properties Division, National Institute of Standards and Technology, 325 Broadway, Boulder, Colorado 80305-3337, USA

Mark Salomonb...

*Editor-in-Chief, IUPAC-NIST Solubility Data Series, 2 Eastborne Drive, Little Silver, New Jersey 07739, USA* \_Received 10 May 2010; published online 7 June 2010\_

# The IUPAC-NIST Solubility Data Series: A Guide to Preparation and Use of

## **Compilations and Evaluations\***

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### Reginald P. T. Tomkins

Department of Chemical Engineering, New Jersey Institute of Technology, University Heights, Newark, NJ 07102, USA \_Received 26 February 2010; accepted 26 February 2010; published online 1 June 2010\_

#### Item 14

#### **Conference report**

(See also <a href="http://www.iupac.org/publications/ci/2010/3206/cc1\_250710.html">http://www.iupac.org/publications/ci/2010/3206/cc1\_250710.html</a> for Cl report)

## 14<sup>th</sup> International Symposium on Solubility Phenomena 25–30 July, 2010, Montanuniversität Leoben, Austria

The 14th International Symposium on Solubility Phenomena and Related Equilibrium *Processes* was held at the Montanuniversität Leoben in Austria under the auspices of IUPAC. Along with the symposium a workshop entitled "From Chemical Equilibrium to Process Modeling, Inclusion of Kinetics into Thermodynamic Reasoning" was organized. The Subcommittee on Solubility & Equilibrium Data of Division V (Analytical Chemistry) of IUPAC met on Saturday July 24 prior to the symposium with Prof. Clara Magalhães (Portugal) in the chair. The joint organizers of the symposium were the Chairs of Ceramics, Metallurgy and Nonferrous Metallurgy of Montanuniversität Leoben, as well as the Subcommittee on Solubility & Equilibrium Data (SSED). Sponsors for the Symposium, in addition to Montanuniversität Leoben and the chairs mentioned above, were: Das Land Steiermark, the Stadtgemeinde Leoben, the RH I AG, the Gesellschaft von Absolventen und Freunden der Montanuniversität, and the Austrian Chemical Society GÖCH. IUPAC generously granted financial support for six young scientists of Eastern European Countries and in addition the Organizing Committee waived the registration fees of all successful applicants. The participation of a delegate from Nepal was financially supported by the Lion's Club Leoben. The symposium was chaired by Profs. Helmut Antrekowitsch and Heinz Gamsjäger, with assistance of Karin Schober and Bettina Hörmann, conference secretaries, and Profs. Harald Harmuth and Johannes Schenk as members of the local Organizing Committee. The symposium was reported in the IUPAC, the Montanuniversität Leoben, and the GÖCH web sites.

Ninety participants including accompanying persons from twenty four countries (Algeria, Australia, Austria, Bulgaria, Canada, China, Croatia Czech Republic, Finland, Germany, Great Britain, Iran, Ireland, Japan, Libya, Luxembourg, Nepal, Poland, Portugal, Russia, Serbia, Spain, Switzerland, USA) attended the Annual Meeting of SSED and the Symposium.

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The opening ceremony was presided over by the Rector of Montanuniversität Leoben, Professor Wolfhard Wegscheider. Greetings were brought by Professor Filomena Camões, the Representative of IUPAC and Vice President of Division V, Emeritus Professor Heinz Gamsjäger, Symposium Co-chair, and Professor Clara Magalhães, Chair of SSED.

Six plenary and four invited lectures highlighted the wide scientific spectrum covered by this conference, which successfully integrated the traditional theme of solubility in and between solids, liquids and gases with process modelling and inclusion of kinetics into thermodynamic reasoning emphasized by the workshop. Professor Filomena Camões (Portugal) gave the opening plenary address, entitled "Analytical chemistry and solubility phenomena: interdisciplinary methods, concepts, and projects". This lecture convinced the audience that progress in special topics of chemistry has been, is, and will be always brought about by interdisciplinary approaches. Prominent examples are Svante Arrhenius' ionic theory (1884) and Walther Nernst's solubility study on silver acetate (1889) which led him to formulate a concept later named solubility product. The first plenary lecture of the workshop was given by Professor Klaus Hack, (Germany) whose lecture on "Computational thermochemistry: a tool for daily use in industry and academia," provided a comprehensive overview of the history, theory, and scientific as well as industrial applications of Gibbs energy minimization. The other key note lectures dealt with: chemistry of salts in aqueous solutions: experiments, theory, applications (W. Voigt, Germany), recovery of pure magnesium oxide and other products by hydrometallurgical processing of ultramafic rock (M. Grill, Austria), applications of the constrained free energy minimization method (P. Koukkari, Finland), supersaturations and their role in phase transformations (M. Rettenmayr, Germany), solubility phenomena of calcium sulphate and its hydrates in the hydrometallurgical process of heavy metals (D. Zeng, China), tidying up the environment: a journey from exponential curves to hydrodynamics in environmental dissolutions (V. W. Truesdale, Great Britain), kinetics of diffusive phase transformations: from local equilibrium to mobility driven migration of thick interfaces (E. Gamsjäger, Austria), and solubility of 'impurities' in hydrometallurgical processes (E. Königsberger, Australia). The authors of these key note lectures and the authors of two excellent oral communications "Stabilities of sampleite and lavendulan and the formation of sampleite in the Northparkes copper-gold ore system" by M. Clissold, P. Leverett and P. A. Williams, and "Melt corrosion of refractories in the non-ferrous industry and the electric arc furnace: a thermochemical approach" by V. Reiter and H. Harmuth have been invited

to submit their papers to *Pure and Applied Chemistry*. Where, after undergoing the well established review process, they will be published under the editorship of Professor Peter Williams (Australia, ISSP) and Professor James Bull (*PAC*).

Twenty eight short communications and thirty five posters were presented during afternoon and morning sessions. The oral and poster contributions ranged from solubility phenomena discussed on an interdisciplinary basis emphasizing industrial applications to thermodynamic peculiarities of liquid - liquid systems and solubility aspects of diseases and medical drugs. The delegates continued their scientific discussions over lunch in the university cafeteria, thus providing a scientifically stimulating and socially friendly atmosphere throughout the conference.

The three IUPAC poster prizes were given to Mr. Oleg I. Silyukov (Department of Chemistry, Saint Petersburg State University, Saint Petersburg, Russia) for poster, "Behavior of solids with layered type of structures in aqueous systems", to Mr. Alexey N. Manin (Institute of Solution Chemistry, Russian Academy of Sciences, Ivanovo, Russia) for poster, "Solubility, solvation processes of hydroxyl- and carboxyacetanilides" and Melanie Oestreich (Institute of Inorganic Chemistry, TU Bergakademie Freiberg, Germany) for poster, "Determination of solubilities in the system MgO-MgCl<sub>2</sub>-H<sub>2</sub>O at 25°C, 40°C and 120°C".

The participants enjoyed a half-day excursion to Vordernberg, where Profs. Herbert Hiebler and Gerhard Sperl guided the English and Mr. A. Lampl the German speaking visitors through blast furnace and finery museum Radwerk IV and Lehrfrischhütte, respectively. At the Gasthof "Schwarzer Adler" a typical Styrian "Brettljause" (afternoon tea on a wooden plate) was served. Accompanying persons enjoyed guided tours to the cities of Leoben and Graz, and a tour through the Enns valley seeing the "Gesäuse" panorama and the monastery library in Admont. This library is one of the most important cultural properties of Austria.

At the conference banquet in the university cafeteria the participants followed the old ISSP tradition to express their gratitude to the hosts in their native language. The colleagues from Freiberg, Germany honoured the hosts by a serenade (Ständchen).

The 15<sup>th</sup> ISSP will be held in July 2012 in Xining, China.

Heinz Gamsjäger (Symposium Co-chair), Clara Magalhães (Chair of SSED) Filomena Camões (IUPAC Representative)