

Reviews

IUPAC Solubility Data Project 1973–2001

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This is a history of the International Union of Pure and Applied Chemistry Solubility Data Commission and the Solubility Data Project that it organized and supervised. It follows the progress of the project from a working party in 1973 to a Subcommittee of the Equilibrium Data Commission, 1976–1979, to The Solubility Data Commission, 1979–2001, when the Subcommittee on Solubility and Equilibrium Data (SSED) succeeded it.

Most scientists and engineers have a requirement for evaluated property data. Some find their needs met by one comprehensive handbook; others may need to refer to many. Some handbook tables give evaluations, and there is normally little question about their reliability. Other tables give an experimental quantity such as atomic mass, melting point, boiling point, vapor pressure, solubility, and so forth, and in these tables, the reliability and the source of the numbers is often not addressed.

The problem with any handbook is that often only one value is given, usually without uncertainties, without literature citation, and without mention of other data that were not used. Background information is available for some handbook data; for example, the IUPAC Commission on Atomic Weights and Isotopic Abundances publishes periodically the latest background information on atomic masses and isotopic abundances. The National Bureau of Standards Circular 500 (1952) on chemical thermodynamic data published relevant data in one part and the references in a second part.¹ However, most handbooks make little or no effort to show a complete literature survey or to evaluate in a systematic way the data they present. In fact, the successor to Circular 500, The NBS Tables of Chemical Thermodynamic Properties (1982),² contains no references.

The ideal should be to present all available experimental data on a given property, an evaluation of these data, and, where possible, a table of tentative or recommended data. Although the idea may have occurred to many people as a dream wish, the plan has not been followed in preparing handbooks. To do so is time consuming and financially unrewarding. However, we now have an extensive test of the idea, which has been used by the Solubility Data Project since 1979.

The International Union of Pure and Applied Chemistry (IUPAC) has, for many years, had as a goal the production of evaluated data for the chemical sciences, an activity that grew out of its original concern with the maintenance of standardized atomic weights.³ The scientific work of the Union was carried out (until the end of 2001, as explained below) by commissions of experts drawn from the member

countries. The development of commissions is described in the historical works of Fennell³ and Brown.⁴

The Solubility Data Project provides an excellent example of how the IUPAC Commission came into being. The Solubility Data Commission, Commission V.8 of IUPAC, was established in 1979. At the end of 2001, with the dissolution of most existing commissions, the Commission had a 22-year lifetime, and this landmark prompted the preparation of this present brief history. Many details are given here that complement accounts that have appeared in part in other publications,^{5–7} including the obituary of Stevan Kertes,^{6,7} the person most responsible for the establishment of the Solubility Data Project.

Organization of Project

The process of establishing the Solubility Data Project and its associated IUPAC Commission started about 1972 when Stevan Kertes (The Hebrew University, Israel), as a member of IUPAC Commission V.6, Equilibrium Data, proposed that the Commission start a project on collecting and evaluating solubility data. Publications were envisaged in which all reliable data would be presented as they appeared in the original literature. In addition, these data would be evaluated by experts, and, where appropriate, tables, figures, or fitted equations of tentative or recommended data would be prepared and presented for use by the scientific community. Fortunately, the idea had the strong support of Commission V.6 Chair George Nancollas (SUNY Buffalo, NY) and the IUPAC Executive Secretary Maurice Williams.

Commission V.6 appointed a working party, which met in Frankfurt, Germany, in 1973 to consider further the compilation and evaluation of solubility data. The working party gave a positive recommendation to the plan, and Stevan Kertes was authorized to set up a working plan for a group independent of Commission V.6.

A group of recognized experts in the field of solubility work was invited to meet with Professor Kertes at McGill University in Montreal, Canada in October of 1974. This meeting could be called the first Solubility Data Project meeting. Kertes, Nancollas, and Schindler were members of the parent Commission V.6. The complete attendance

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list included R. Battino, Wright State University (U.S.); C. D. Batty, McGill University (Canada); H. L. Clever, Emory University (U.S.); A. F. Clifford, Virginia Polytechnic Institute & State University (U.S.); D. Dyrssen, Chalmers University (Sweden); L. Eicher, NBS (U.S.); I. Eliezer, Weizmann Institute (Israel); H. Gutfreund, Bristol University (U.K.); A. S. Kertes, Hebrew University (Israel); J. A. Kittrick, Washington State University (U.S.); R. A. Laudise, Bell Telephone Labs (U.S.); W. Lippert, Gmelin Institute (Germany); K. L. Loening, Chemical Abstracts (U.S.); G. H. Nancollas, SUNY Buffalo (U.S.); P. W. Schindler, University of Berne (Switzerland); G. K. Sigworth, Inland Steel Co. (U.S.); W. D. Thorpe, McGill University (Canada); and C. L. Young, University of Melbourne (Australia).

Issues that were to come up at almost every future Solubility Data Project meeting were first discussed in Montreal. They included

- (i) guidelines for data sheets and evaluations;
- (ii) evaluation methods and the preparation of useful evaluations;
- (iii) recruitment of compilers, evaluators, and editors; and
- (iv) computers, databases, and electronic publication.

A tentative format for collecting and evaluating solubility data was decided upon. Several attendees took on the task of preparing sample compilations and the evaluation of a single system in their area of expertise. These were later collected to provide models for future work and were published by Pergamon Press as a sample booklet, of which some 200 copies were printed and distributed to potential compilers and evaluators. The need for detailed guidelines for the compilation and evaluation of data was recognized, and Colin Young took on this task, a task that would later be taken over and completed by Alan Barton (Murdoch University, Australia).

The IUPAC General Assembly met in Madrid, Spain, in 1975. Commission V.6 invited observers interested in the solubility project to attend. Larry Clever, Colin Young, and Alan Clifford accepted the invitation and attended the meeting. Plans for the project moved ahead rapidly. The Solubility Data Project was made a subcommittee of Commission V.6. The Solubility Data Subcommittee became a full commission (Commission V.8 of the Analytical Chemistry Division) at the 1979 IUPAC General Assembly in Davos, Switzerland.

In 1999, at the Berlin General Assembly of IUPAC, an extensive reorganization of the way in which the work of IUPAC is carried out was approved. Under this reorganization, all commissions and their subcommittees (with a very few exceptions) disappeared at the end of 2001, to be replaced by working groups for specific projects under the direct control of the appropriate divisions. The plan for the Solubility Data Project was to combine the work of the Solubility Data and Equilibrium Data Commissions into a new subcommittee of the Analytical Chemistry Division called the Subcommittee on Solubility and Equilibrium Data. Thus, the Solubility Data Project has come full circle from subcommittee through commission and back again, albeit with very different terms of reference.

The terms of reference of the Subcommittee on Solubility and Equilibrium Data, henceforth called SSED, are, to quote from the agreement, "to coordinate projects in the area of compilation and critical evaluation of published experimental data on the chemical solubility of well-defined substances and other equilibrium systems. The SSED also coordinates the dissemination of evaluated solubility data

through traditional (journal) and electronic (internet-accessible database) means. The SSED works with the Analytical Chemistry Division and the U.S. National Institute of Standards and Technology (NIST, the Solubility Data Series publisher) in the selection of chemical systems for treatment, encourages the formation of Task Groups to perform compilation and evaluation, and assists Task Groups in carrying out their projects."

The initial membership of the SSED consisted of H. Gamsjäger (Austria) as Chair, P. May (Australia), M. Salomon (U.S.), P. Scharlin (Finland), D. Shaw (U.S.), S. Sjöberg (Sweden), and W. Voigt (Germany).

Publication

Plans for a publisher were undertaken in 1975, even though it was realized that it might be several years before a volume of solubility data was ready for publication. At the 1975 meeting, discussions were started with a representative of the IUPAC publisher concerning the publication of the Solubility Data Series. Robert Maxwell and a group from Pergamon Press appeared at the meeting. It was a dramatic moment. The representative of the first publisher got up without a word and left the meeting. Captain Maxwell, as he liked to be called, shook hands with all present and sat down. Maxwell said little. His subordinates, including one of his sons, carried on the discussion. A tentative agreement was worked out almost on the spot, although it would take until 1978 to formalize this into a contract between Pergamon Press and IUPAC.

Stevan Kertes insisted on several points in the Pergamon Press–IUPAC agreement, which set precedents. In IUPAC projects up to this time, the participants had received no money for their work. It was assumed to be sufficient that the project was part of their research and enhanced their reputation. This worked fine when the projects were not too large, but the Solubility Data Project planned large time-consuming projects. The Pergamon–IUPAC plan called for a page fee to be paid to each compiler and evaluator and for a page typing fee to be paid to each volume editor.

There were points of contention. The Solubility Data Commission thought Pergamon Press set the volume price too high and did not do enough to publicize the output of the project. Pergamon Press did advertise that for an initial investment of USD 10,000 a library would be guaranteed for the entire output of the project, which was initially priced at USD 120 per volume. Did any libraries take up that offer? There was a rumor, never confirmed, that as many as 40 libraries took up the offer. If the rumor was true, no list was ever provided by Pergamon to the Solubility Data Commission or to IUPAC.

Pergamon Press published the first 53 volumes of the Solubility Data Series between 1979 and 1992. The points of contention mentioned above continued to exist, and at the end of 1988, the Commission canceled the publication agreement with Pergamon. However, Pergamon had rights of first refusal on a renewal of the contract. The Commission Chair, Jack Lorimer, and IUPAC Executive Secretary, Mo Williams, agreed on a revised contract. Its eventual acceptance by Pergamon in 1989 provided even better terms for compilers and evaluators. About 1990, Maxwell sold Pergamon Press to Elsevier Publishing Co. After two years, Elsevier decided to drop the Solubility Series. A publishing year, 1993, was lost before an agreement was reached with Oxford University Press (again negotiated by Jack Lorimer and Mo Williams), which published volumes 54 through 65 between 1994 and 1996 until that publisher

decided (on the basis of what was considered by the Commission to be insufficient evidence) to cancel the contract. The Solubility Data Series did not have a publisher in 1997–1998. In the fall of 1998, a new agreement was reached between IUPAC and NIST (National Institute of Standards and Technology), thanks to the efforts of Mark Salomon and David Shaw. The agreement provided for the publication of the Solubility Data Series for at least 4 years as a part of the Journal of Physical and Chemical Reference Data, whereupon the series became known as the IUPAC–NIST Solubility Data Series.

Compilers and Evaluators

For such an extensive and lengthy project, the recruitment of experts in many areas of both theory and practice of solubility measurements was needed. The list of participants in the project is rather difficult to estimate accurately, but certainly it has exceeded 100. Along with Stevan Kertes, Larry Clever and Mark Salomon were very successful in attracting capable people to take part in the project.

One challenge in recruitment was to involve the large number of scientists in the then USSR in the project. Exploratory visits to the USSR under IUPAC auspices were made by Stevan Kertes and C. Kalidas (India), with promising results. An unexpected problem arose. The copyright agency of the USSR, VAAP, insisted that any payments to contributors from the USSR should be made through and by them. A strong stand by Mo Williams and Jack Lorimer, with negotiations carried out by IUPAC Secretary-General Tom West, succeeded in retaining IUPAC's right to make payments directly to contributors.

Commission

A. Stevan Kertes took on the responsibilities of both Chair of the Solubility Data Commission and Editor-in-Chief of the IUPAC Solubility Data Series until 1987, when his 8 years as the Chair concluded. Stevan Kertes was a wonderful organizer and recruiter of personnel for the project. However, he was not always interested in the details of the editing process. Kertes continued as Editor-in-Chief, and J. W. Lorimer became Chair in 1987. Unfortunately, Kertes died suddenly in July 1988. Fortunately, Jack Lorimer quickly and firmly took control and worked to see that the project moved ahead. As both Editor-in-Chief and Chair of Commission V.8, he brought needed order to the production of the Solubility Data Project volumes.

J. W. Lorimer served 4 years as Commission V.8 chairman and 8 years as Editor-in-Chief. In 1996, Mark Salomon, U.S. Army Electronics Command, took on the Editor-in-Chief position. One of his early tasks was finding a new publisher. He succeeded, resulting in the agreement with NIST and the Journal of Physical and Chemical Reference Data. In 1992, the Chairperson and Editor-in-Chief positions were divided, with Jack Lorimer continuing as Editor-in-Chief and Mark Salomon continuing as the Chair. In 1996, David Shaw, University of Alaska (U.S.), became Chair, and Mark Salomon became Editor-in-Chief.

Stevan Kertes acted as secretary of the Solubility Data Project from the beginning until 1979, when L. H. Gevantman, Office of Standard Reference Data, NBS (now NIST), was elected to the position. Lew Gevantman served the project well with good advice and attention to detail and set a good example for the commission secretaries that were to follow. They were R. P. T. Tomkins, New Jersey Institute of Technology (U.S.) and then H. Gamsjäger,

Montanuniversität Leoben (Austria), both of whom have done outstanding work.

From the first meeting, the Solubility Data Project was organized into three subcommittees with the responsibility of seeing that volumes in particular subdisciplines were prepared, properly edited, and reviewed before publication. Upon attaining commission status, these subcommittees were designated

V.8.1 Gases in Liquids. Chair H. L. Clever (U.S.), 1976–1992; P. G. T. Fogg (U.K.), 1992–2000; Pirketta Scharlin (Finland), 2000–2001.

V.8.2 Liquids with Liquids. Chair A. F. M. Barton (Australia), 1976–1984; F. W. Getzen (U.S.), 1984–98; A. Skrzecz (Poland), 1998–2001.

V.8.3 Solids in Liquids. Chair Mark Salomon (U.S.), 1976–1992; M.-Th. Saugier-Cohen Adad (France), 1992–2000; W. Voigt (Germany), 2000–2001.

In addition to his involvement with the subcommittees, Colin Young acted as a committee of one to prepare and edit the three cumulative indexes of the volumes (volumes 19, 39, and 53) for the 53 volumes published by Pergamon Press. No index volumes have yet been prepared for the 12 volumes published by Oxford University Press and the volumes published by NIST.

Each data sheet and most evaluation sheets identify every solution component by name, formula and Chemical Abstract registry number. This information is indexed in each volume, as well as the cumulative indexes, in a system index, a registry number index and an author index. Chemical Abstract names are used in the system index with a number of cross-references to common names.

Organization

Pergamon Press devised large laysheets for compilations and evaluations, on which material was typed. By volume 47, computer techniques had advanced sufficiently that many manuscripts were being submitted using computer-prepared copy on $8\frac{1}{2} \times H11$ in. sheets or the nearest metric equivalent. In addition, measures were taken to decrease the amount of "white space" on the pages by several techniques, in contrast to the original scheme where the rule was one system or part of a complex system per page.

Adam Skrzecz (Poland) finally urged the Commission to simplify the data sheets even more by eliminating the boxes in columns and using a simple scheme that had the potential to be computer-readable. This is the current format for data sheets, and as noted below, the Series has been available on-line since 2000 using text generated and submitted electronically through the Journal of Physical and Chemical Reference Data.

Another aspect of organization of the volumes of data has been the strategy for covering the very large number of systems for which data are available, a subject addressed in references 5 and 9. With the advent of the project-driven system by IUPAC, more emphasis has been placed on choosing systems that are of interest in applied as well as in fundamental chemistry.

Guidelines

Guidelines were an important and recurring theme in the project's early years. Alan Barton, Murdoch University (Australia), successfully took on the task of formalizing the guidelines into a useful document. The final version of the document was approved in 1984. Pergamon Press printed several hundred copies, and it was distributed to editors, evaluators, and compilers. The document was useful in

recruiting new compilers and evaluators and also noticeably helped to establish a more uniform format for the volumes. In 1987 and 1989, guideline supplements were prepared, and again Pergamon Press printed and helped distribute the updates.

Data Bases and Electronic Publishing

The possibility of electronic publishing and databases had been a consideration since the first meeting. About 1985, the IUPAC Committee on Chemical Data Bases (CCDB) gave the Commission USD 2,500 to construct a model program using DBase-III. Larry Clever, with the help of Marian Iwamoto, prepared a test program that was demonstrated at the 1987 Boston General Assembly. The program worked, but it was slow and it was obvious that it would not be practical with a large database. Andrzej Maczynski, Academy of Sciences (Poland), developed his "floppy book" concept for liquid–vapor equilibrium data and then applied it to data from the hydrocarbon + water SDP volume 37. His first effort was rough, but the second version, which included only the evaluated data and not the database, was successful. Again, it was difficult to visualize the program working well for a very large database. In 1993, David Shaw (U.S.) suggested a way to encode the data sheet information. The encoded information could be used both to print the data sheet and to read it into a database.

With publication in the *Journal of Physical and Chemical Reference Data*, the problem of electronic publishing and database preparation has been solved. Manuscripts are now submitted electronically, for the most part, and since 2000, this journal has been available on-line.

International Symposium on Solubility Phenomena (ISSP)

Stevan Kertes initiated discussions about a possible solubility symposium and a possible journal devoted to solubility phenomena as early as 1980. He had several goals in mind for the symposium. First, he believed that the scientific theory of solubility phenomena deserved a place of importance. Second, he wanted to help the many compilers and evaluators to attend the Commission meetings, and he had the practical thought that they would have a better chance of raising money to attend a meeting and present a paper than just to attend a commission meeting. The idea of holding a symposium was popular and quickly gained strong support, and a decision on venue was made at the Commission meeting in Leuven, Belgium, in 1981. The first symposium was organized and held at the University of Western Ontario in London, Ontario, Canada, under the able direction of Professor J. W. Lorimer. There have now been a total of 10 symposia—3 in North America (London, Ontario, Canada; Newark, NJ; Troy, NY), 4 in Europe (Guildford, U.K.; Moscow, Russia; Leoben, Austria; Varna, Bulgaria), 1 in South America (Buenos Aires, Argentina), 1 in Asia (Niigata, Japan), and 1 in North Africa (Hammamet, Tunisia). More details are summarized in Appendix 2.

The idea of a journal on solubility did not gain support, and there has been no real effort to found such a journal. A minority group within the SDP has complained that there are too many meetings and that the symposium is not needed. In 1990, some discussions were held with the group that sponsors the Symposium on Solution Chemistry to combine the two to one symposium. However, scheduling difficulties for the foreseeable future overwhelmed the idea, and nothing came from the discussions.

Solubility Data Center

Another idea of Stevan Kertes was to establish the Solubility Data Center. This was done in a semiformal way at Emory University in the late 1970s under the direction of Larry Clever. Emory University contributed USD 15,000, and the Office of Standard Reference Data made available several grants for projects evaluating heavy-metal solubility data in aqueous solutions. Professor Hiroshi Miyamoto (Niigata University, Japan) was financed by an ICSU grant to spend a year at the Center working on his metal halate volumes. Solubility Data Series volumes 14, 40, and 52 were edited and typed at the Center, and a number of papers were collected for the editors of volume 65. A comprehensive collection of gas solubility papers was catalogued for use by the Gases in Liquids Subcommittee. A number of inquiries for solubility data were received by the Center. These were either answered directly or contact was made with solubility experts in the SDP for advice. The Center quietly expired with the retirement of Larry Clever in August 1992.

Book: The Experimental Determination of Solubilities

Acting on a suggestion of G. T. Hefter (Australia), the Commission set up a task group in 1989 to look into the preparation of an up-to-date book on the experimental determination of solubilities. In 1990, G. T. Hefter, C. L. Young, and J.-J. Counieux (France) were appointed co-editors of the book. A number of manuscripts were submitted. The editors prepared guidelines and detailed criticisms of the submitted chapters and these were sent to the authors in 1994–1995, but progress was slow. Two of the co-editors resigned for personal reasons, Counieux in 1993 and Young in 1998. R. P. T. Tomkins was appointed co-editor; progress resumed—new chapters were added and old chapters were updated—and the book was completed in 2002. P. G. T. Fogg suggested submitting the book to John Wiley and Sons for inclusion in the Wiley Series in Solution Chemistry. This was done, and in 2000, the book¹⁰ was accepted by Wiley for publication as volume 6 of the series in 2003. Twenty-four authors submitted 16 chapters under 5 sections: Fundamentals of Solubility; Gases; Liquids; Solids; and Special Systems.

Franzosini Award

Paolo Franzosini, Professor of Physical Chemistry at the University of Pavia (Italy), was an enthusiastic supporter of the Project. He had almost completed volume 33 of the Solubility Data Series (see list of published volumes, Appendix 5) when he died suddenly on January 24, 1985.¹¹ Completion of the volume was carried out by his colleagues Paolo Ferloni, Alberto Schiraldi, and Giorgio Spinolo. Franzosini's wife, with the encouragement of his colleagues, very generously donated the payments for this volume to the Commission to establish the Franzosini Award, to be given to assist a promising young contributor to the Project to attend the ISSP. Nominations for the award are received (as of 2001) by the Chair of the new Solubility and Equilibrium Data Subcommittee. The winners of the award are listed in Appendix 4. The capital is held by IUPAC, and accounting is done by the IUPAC Secretariat.

Concluding Remarks

The Solubility Data Commission existed for 22 years. During this time, it organized a group of scientists who have collected and evaluated solubility data to fill 80

volumes. We hope that this work will set a new standard for the collection and evaluation of not only solubility data but also all data and that future groups will continue and improve on this start. The Solubility Data Series will continue under the guidance of the Subcommittee for Solubility and Equilibrium Data (SSED).

Acknowledgment

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Appendix 1: Meetings of the Solubility Data Group

1973 Frankfurt, Germany. IUPAC Comm. V.6 Working Party.

1974 Montreal, Canada McGill University. IUPAC Comm. V.6 Working Party, Organization meeting called by A. S. Kertes. First meeting for R. Battino (U.S.), H. L. Clever (U.S.), and C. L. Young (Australia).

1975 Madrid, Spain. IUPAC General Assembly. IUPAC Comm. V.6 George Nancollas, Chair. A. S. Kertes, H. L. Clever, A. Clifford, and C. L. Young among attendees.

1976 Blacksburg, VA. IUPAC Comm V.6.1 Subcommittee on Solubility. Host: Alan F. Clifford.

1977 Warsaw, Poland. IUPAC General Assembly. Comm V.6.1 Subcommittee on Solubility. Chair: A. Stevan Kertes.

1978 Atlanta, GA. Emory University. Comm V.6.1 Subcommittee on Solubility. Host: H. Lawrence Clever. First two volumes submitted to Pergamon Press.

1979 Davos, Switzerland. IUPAC General Assembly. Comm V.6.1 Subcommittee on Solubility. Chair: A. S. Kertes. IUPAC approved formation of Comm. V.8, Solubility Data.

1980 No meeting.

1981 Leuven, Belgium. IUPAC General Assembly. Comm. V.8 Solubility Data. Chair: A. S. Kertes.

1982 Raleigh, NC. North Carolina State University. Comm. V. 8 Solubility Data. Host: Forest W. Getzen.

1983 Lyngby, Denmark. IUPAC General Assembly. Comm. V.8. Chair: A. S. Kertes

1984 London, Ontario, Canada. University of Western Ontario. Comm. V.8 and First ISSP. Host: J. W. Lorimer

1985 Lyon, France. IUPAC General Assembly. Comm. V.8 Solubility Data. Chair: A. S. Kertes.

1986 Newark, NJ. NJ Institute of Technology. Comm. V.8 and Second ISSP. Host: R. P. T. Tomkins.

1987 Boston, MA. IUPAC General Assembly. Comm. V.8 Demonstration of Data Base. Chair: J. W. Lorimer.

1988 Guildford, U.K. University of Surrey. Comm. V.8 and Third ISSP. Host: A. F. Danil de Namor.

1989 Lund, Sweden. IUPAC General Assembly. Comm. V.8 Solubility Data. Chair: J. W. Lorimer.

1990 Troy, NY. Rensselaer Polytechnic Institute. Comm. V.8 and Fourth ISSP. Host: S. Krause.

1991 Hamburg, Germany. IUPAC General Assembly. Comm. V.8. Chair: Mark Salomon.

1992 Moscow, Russia. Russian Academy of Sciences. Comm. V.8 and Fifth ISSP. Host: V. M. Valyashko.

1993 Lisbon, Portugal. IUPAC General Assembly. Comm. V.8. Chair: Mark Salomon.

1994 Buenos Aires, Argentina. Comm. V.8 and Sixth ISSP. Hosts: A. F. Danil de Namor, R. Fernandez-Prini.

1995 Guildford, U.K. IUPAC General Assembly. Comm. V.8. Chair: D. G. Shaw.

1996 Leoben, Austria. Montannuniversität. Comm. V.8 and Seventh ISSP. Host: H. Gamsjäger.

1997 Geneva, Switzerland. IUPAC General Assembly. Comm. V.8. Chair: D. G. Shaw.

1998 Niigata, Japan. Niigata University. Comm. V.8 and Eighth ISSP. Hosts: H. Akaiwa, K. Sawada.

1999 Berlin, Germany. IUPAC General Assembly. Comm. V.8. Chair: D. G. Shaw.

2000 Hammamet, Tunisia. Comm. V.8 and Ninth ISSP. Hosts: N. Kbir-Arighuib, R. Chtara.

2001 Brisbane, Australia. IUPAC General Assembly. Comm. V.8. Chair: D. G. Shaw.

2002 Varna, Bulgaria. Subcommittee on Solubility and Equilibrium Data (SSED) and Tenth ISSP. Host: Christo Balarew.

2004 11th ISSP. Aveiro, Portugal, 25–29 July. Chair: Clara Magalhães.

Appendix 2: International Symposium of Solubility Phenomena (ISSP)

Not all plenary or invited lectures were published. Those that were are identified with *.

1984 1st ISSP, London, Ontario, Canada, 21–23 August. The University of Western Ontario. Co-sponsors: IUPAC, The University of Western Ontario; Chair: J. W. Lorimer (Canada); Symposium Editor: M. Tomlinson (Canada). Symposium record: Lorimer, J. W. *Can. Chem. News* **1984**, *December*, 21–22, 24. Plenary and invited lectures: *Pure Appl. Chem.* **1985**, *57*, 254–336. *R. Cohen-Adad (France); *B. E. Conway (Canada); *S. Goldman (Canada); *W. L. Marshall (U.S.); *E. Wilhelm (Austria); *B. A. Wolf (Germany); I. L. Khodakovskiy (USSR).

1986 2nd ISSP, Newark, NJ, 12–15 August. New Jersey Institute of Technology; Co-chairs: R. P. T. Tomkins (U.S.), M. Salomon (U.S.); Symposium Editor: R. I. Haines (Canada). Symposium record: Tomkins, R. P. T. *Chem. Int.* **1987**, *9*, 194–195. Plenary and invited lectures: *Pure Appl. Chem.* **1986**, *58*, 1547–1610. T. Yokokawa (Japan); S. Krause (U.S.); C. L. Young (Australia); E. Tomlinson, W. Riebesehl, H. J. U. Grünbauer (Netherlands); J. V. Walther (U.S.); K. S. Pitzer (U.S.).

1988 3rd ISSP, Guildford, Surrey, U.K., 23–26 August. University of Surrey. Sponsor: IUPAC. Co-chairs: A. F. Danil de Namor (U.K.), P. G. T. Fogg (U.K.); Symposium Editor: H. D. B. Jenkins (U.K.). Symposium record: Danil de Namor, A. F. *Pure Appl. Chem.* **1989**, *61*, iv.

Plenary and invited lectures: *Pure Appl., Chem.* **1989**, *61*, 121–185. *D. Hallén and I. Wadsö (Sweden); *D. Feakins, F. M. Canning, J. J. Mullaly, and W. E. Waghorne (Ireland); W. B. Streett (U.S.); A. E. Beezer (U.K.); *R. Van der Haegen, L. A. Kleinjens, L. van Opstal, and R. Konigsveld (The Netherlands); *B. G. Cox (U.K.) and H. Schneider (Germany); *H. Ohtaki and N. Fukusima (Japan). Published in *Pure Appl. Chem.* **1989**, *61*, 121–185.

1990 4th ISSP, Troy, NY, 1–3 August. Rensselaer Polytechnic Institute. Co-chairs: S. Krause (U.S.); M. Salomon (U.S.); Symposium Editor: D. G. Shaw (U.S.). Symposium record: (none). Plenary and invited lectures: *Pure Appl. Chem.* **1990**, *62*, 2069–2138. Y. Marcus (Israel); S. Ahrland (Sweden); R. Fernandez-Prini (Argentina); F. A. Lewis (Ireland); L. Andreoli-Ball, S. J. Sun, L. Trejo, M. Costas, and D. Patterson (Canada); I. C. Sanchez and P. A. Rogers (U.S.); J.-P. E. Grolier (France); A. F. Danil de Namor (U.K.); V. M. Valyashko (Russia).

1992 5th ISSP Moscow, Russia, 8–10 July. Russian Academy of Sciences. Co-sponsors: IUPAC, UNESCO, Russian Academy of Sciences. Co-chairs: Yu. A. Zolotov (Russia), V. M. Valyashko (Russia); Symposium Editors: D. G. Shaw (U.S.), J. W. Lorimer (Canada). Symposium record: (none). Plenary and invited lectures: *Pure Appl. Chem.* **1993**, *65*, 173–220. *G. M. Schneider (Germany); *J. W. Lorimer (Canada); *A. F. Danil de Namor (U.K.); *H. Ohtaki (Japan); *Chr. Balarew (Bulgaria); *J. H. Petropoulos (Greece).

1994 6th ISSP Buenos Aires, Argentina, 22–26 August. Hotel Bauen. Co-sponsors: IUPAC, University of Buenos Aires, University of Surrey. Chair: A. F. Danil de Namor (U.K.); Symposium Editors: A. F. Danil de Namor (U.K.), J. I. Bullock (U.K.). Symposium record: Danil de Namor, A. F. *Pure Appl. Chem.* **1995**, *67*, iv. Plenary and invited lectures: *Pure Appl. Chem.* **1995**, *67*, 519–592. *R. Fernandez-Prini (Argentina); *F. W. Getzen (U.S.); *H. Gamsjäger (Austria); *R. M. Izatt, J. L. Oscarson, S. E. Gillespie, X. Chen, P. Wang, and G. D. Watt (U.S.); *E. Pramauro and A. B. Prevot (Italy); *A. Cesaro (Italy); *V. M. Valyashko (Russia); *H. R. Corti (Argentina); *Z. Zedlinski and M. Sokol (Poland).

1996 7th ISSP Leoben, Austria, 22–25 July. Montanuniversität Leoben. Chair: H. Gamsjäger (Austria); Symposium Editors: P. G. T. Fogg (U.K.), W. E. Waghorne (Ireland). Symposium record: Gamsjäger, H. *Pure Appl. Chem.* **1996**, *69*, iv. Plenary and invited lectures: *Pure Appl. Chem.* **1996**, *69*, 905–978. R. E. Mesmer, D. A. Palmer, J. M. Simonson, H. F. Holmes, P. C. Ho, D. J. Wesolowski, and M. S. Gruszkiewicz (U.S.); F. Franks (U.K.); K. Sawada (Japan) and B. A. Wolf (Germany); J. P. Amend (Italy) and H. C. Helgeson (U.S.); I. Grenthe (Sweden) and A. Plyasunov (Russia); A. Skrzecz (Poland); C. E. Kolb, J. T. Jayne, P. Davidovits, and D. R. Worsnop (U.S.); A. D. Pelton (Canada).

1998 8th ISSP Niigata, Japan, July. Co-sponsors: IUPAC, Niigata University, Bandai Civic Hall, Niigata. Chair: H. Akaiwa (Japan); Symposium Editor: P. G. T. Fogg. Symposium record: Lorimer, J. W. *Chem. Int.* **1998**, *20*, 173–174. Plenary and invited lectures: *Pure Appl. Chem.* **1998**, *70*, *1867–1932. G. H. Nancollas and W. Wu (U.S.); *M. T. Beck (Hungary); *H. Watarai (Japan); *B. Ya. Spivakov (Russia); *P. Scharlin (Finland), R. Battino (U.S.), E. Silla, I. Tuñon, J. L. Pascual-Ahuir (Spain); *K. Izutzu (Japan); *M. Salomon (U.S.); *H. Gamsjäger and E. Königsberger (Austria); *J.-C. Bollinger (France); *M. Tabata (Japan).

2000 9th ISSP Hammamet, Tunisia, 25–28 July. Co-sponsors: IUPAC, Tunisian Chemical Society. Grand Palais des Congrès. Co-chairs: N. Kbir-Arighuib, R. Chtara; Symposium Editors: P. G. T. Fogg, H. Gamsjäger, and M. Gaune-Escard. Symposium records: Lorimer, J. W. *Chem. Int.* **2001**, *23*, 81, 82; Fogg, P. G. T. *Pure Appl. Chem.* **2001**, *73*, ii–iv. Plenary and invited lectures: *Pure Appl. Chem.* **2001**, *73*, 761–843. *N. Kbir-Arighuib, D. B. H. Chehimi, and L. Zayani (Tunisia); *M.-Th. Cohen-Adad (France); *E. Königsberger and L.-C. Königsberger (Austria); *T. Ogawa and K. Minato (Japan); *H. A. J. Oonk (The Netherlands); *J. Rumble, Jr., A. Y. Lee, D. Blakeslee, and S. Young (U.S.); *W. Voigt (Germany); J.-E. Dubois (France); M. Gaune-Escard (France).

2002 10th ISSP. Varna, Bulgaria, 22–26 July. St. Constantine and Helen resort. Chair: Chr. Balarew (Bulgaria); Symposium Editor: D. G. Shaw. Symposium records: Lorimer, J. W. *Chem. Int.* **2002**, *24*, 31, 32; Shaw, D. G. *Pure Appl. Chem.* **2002**, *74*, iii. Plenary and invited lectures: *Pure Appl. Chem.* **2002**, *74*, 1785–1920. I. Gut-

zow, S. Atanassova, and K. Neykov (Bulgaria); Chr. Balarew (Bulgaria); Chr. Bojadiev (Bulgaria); R. Choen-Adad (France) with Chr. Balarew, S. Tepavitcharova, and D. Rabadjieva (Bulgaria); S. D. Dimitrov and N. C. Dimitrova (Bulgaria) with J. D. Walker, G. D. Veith, and O. G. Mekenyan (U.S.); E. Königsberger (Australia); M. C. F. Magalhaes (Portugal); T. Tang and G. H. Nancollas (U.S.); F. Rull (Spain); V. M. Valyashko (Russia); E. Zhecheva and R. Stoyanova (Bulgaria) with R. Alcántara, P. Lavela, and J.-L. Tirado (Spain); Th. Fanghänel and V. Neck (Germany); W. Voigt and D. Zeng (Germany).

2004 11th ISSP Aveiro, Portugal, 25–29 July, Chair: C. Magalhães.

Appendix 3: Commission V.8. Titular Members

1979–1981 A. S. Kertes (Israel), Chair; R. Battino (U.S.); H. L. Clever (U.S.); R. Cohen-Adad (France); L. H. Gevantman (U.S.) (Co-secretary); J. W. Lorimer (Canada) (Co-secretary); M. Salomon (U.S.); C. L. Young (Australia).

1981–1983 A. S. Kertes (Israel), Chair; R. Battino (U.S.); H. L. Clever (U.S.); R. Cohen-Adad (France); L. H. Gevantman (U.S.) (Co-secretary); J. W. Lorimer (Canada) (Co-secretary); Salomon (U.S.); C. L. Young (Australia).

1983–1985 A. S. Kertes (Israel), Chair; L. H. Gevantman (U.S.), Secretary; R. Battino (U.S.); H. L. Clever (U.S.); R. Cohen-Adad (France); D. G. Shaw (U.S.); C. L. Young (Australia).

1985–1987 A. S. Kertes (Israel), Chair; L. H. Gevantman (U.S.), Secretary; R. Battino (U.S.); H. L. Clever (U.S.); R. Cohen-Adad (France); D. G. Shaw (U.S.); C. L. Young (Australia).

1987–1989 J. W. Lorimer (Canada), Chair; L. H. Gevantman (U.S.), Secretary; P. G. T. Fogg (U.K.); W. Hayduk (Canada); G. T. Hefter (Australia); R. P. T. Tomkins (U.S.).

1989–1991 J. W. Lorimer (Canada), Chair; L. H. Gevantman (U.S.), Secretary; R. P. T. Tomkins (U.S.); G. T. Hefter (Australia); J. Eysseltová (Czech Republic).

1991–1993 M. Salomon (U.S.), Chair; R. P. T. Tomkins (U.S.), Secretary; J. Eysseltová (Czech Republic); F. W. Getzen (U.S.); G. T. Hefter (Australia).

1993–1995 M. Salomon (U.S.), Chair; R. P. T. Tomkins (U.S.), Secretary; J. Eysseltová (Czech Republic); G. T. Hefter (Australia); F. W. Getzen (U.S.); A. Maczynski (Poland).

1995–1997 D. G. Shaw (U.S.), Chair; H. Gamsjäger (Austria), Secretary; P. T. G. Fogg (U.K.); M.-Th. Saugier-Cohen Adad (France); V. M. Valyashko (Russia).

1997–1999 D. G. Shaw (U.S.), Chair; H. Gamsjäger (Austria), Secretary; M.-Th. Saugier-Cohen Adad (France); A. Skrzecz (Poland); V. M. Valyashko (Russia).

1999–2001 D. G. Shaw (U.S.), Chair; H. Gamsjäger (Austria), Secretary; P. Scharlin (Finland); A. Skrzecz (Poland); V. M. Valyashko (Russia).

Appendix 4: Franzosini Award Winners

1989 15th meeting, Lund, Sweden, Rumen Duhlev (Bulgaria).

1990 16th meeting, Troy, N.Y., Pirketta Scharlin (Finland), 4th ISSP.

1991 17th meeting, Hamburg, Germany, A. Pacheco Tanaka (Peru).

1992 18th meeting, Moscow, Russia. Stefan Gradinarov (Bulgaria), 5th ISSP.

1993 19th meeting, Lisbon, Portugal, Michel Ferriol (France), Teresa Calvet (Spain).

1994 20th meeting, Buenos Aires, Eric Königsberger (Austria), 6th ISSP.

- 1995 21st meeting, Guildford, England, Felix Jose Sueros (Peru).
 1996 22nd meeting, Leoben, Austria, no award.
 1997 23rd meeting, Geneva, Switzerland, no award.
 1998 24th meeting, Niigata, Japan, Lan-Chi Tran-Ho (Austria), 8th ISSP.
 1999 25th meeting, Berlin, Germany, Chiara Milanese (Italy).
 2000 26th meeting, Hammamet, Tunisia, Vladimir Zbrank (Czech Republic), 9th ISSP.
 2001 27th meeting, Brisbane, Australia, Justin Salminen (Finland).
 2002 1st meeting SSED, Varna, Bulgaria, Dana E. Know (U.S.), 10th ISSP.
 2003 2nd meeting SSED, Ottawa, Canada, Pirketta Scharlin (Finland).

Appendix 5: Volumes in the Solubility Data Series (Volume Editors, Title, Date of Publication)

		Editors-in-Chief	
A. S. Kertes	1977–1989	volumes 1–38	Pergamon Press
J. W. Lorimer	1989–1996	volumes 39–53	Pergamon Press
		volumes 54–62	Oxford University Press
M. Salomon	1996–	volumes 63–65	Oxford University Press
		volumes 66–	IUPAC–NIST in <i>J. Phys. Chem. Ref. Data</i>

Published by Pergamon Press, Oxford, U.K.: Editor-in-Chief A. S. Kertes

- Vol. 1 H. L. Clever, *Helium and Neon* (1979), *xxi* + 393 pp.
 Vol. 2 H. L. Clever, *Krypton, Xenon and Radon* (1979), *xx* + 357 pp.
 Vol. 3 M. Salomon, *Silver Azide, Cyanide, Cyanamides, Cyanate, Selenocyanate and Thiocyanate* (1979), *xix* + 247 pp.
 Vol. 4 H. L. Clever, *Argon* (1980), *xviii* + 331 pp.
 Vol. 5/6 C. L. Young, *Hydrogen and Deuterium* (1981), *xviii* + 646 pp.
 Vol. 7 R. Battino, *Oxygen and Ozone* (1981), *xviii* + 519 pp.
 Vol. 8 C. L. Young, *Oxides of Nitrogen* (1981), *xviii* + 369 pp.
 Vol. 9 W. Hayduk, *Ethane* (1982), *xxi* + 263 pp.
 Vol. 10 R. Battino, *Nitrogen and Air* (1982), *xiv* + 570 pp.
 Vol. 11 B. Scrosati and C. A. Vincent, *Alkali Metal, Alkaline Earth Metal and Ammonium Halides, Amide Solvents* (1980), *xx* + 364 pp.
 Vol. 12 C. L. Young, *Sulfur Dioxide, Chlorine, Fluorine and Chlorine Oxides* (1983), *xvii* + 477 pp.
 Vol. 13 S. Siekierski, T. Mioduski, and M. Salomon, Eds., *Scandium, Yttrium, Lanthanum and Lanthanide Nitrates* (1983), *xxiv* + 490 pp.
 Vol. 14 H. Miyamoto, M. Salomon, and H. L. Clever, Eds., *Alkaline Earth Metal Halates* (1983), *xx* + 332 pp.
 Vol. 15 A. F. M. Barton, Ed., *Alcohols with Water* (1984), *xix* + 438 pp.
 Vol. 16/17 E. Tomlinson and A. Regosz, Eds., *Antibiotics: 1,β-Lactam Antibiotics* (1985), *xxii* + 790 pp.

- Vol. 18 O. Popovych, *Tetraphenylborates* (1981), *xxiii* + 242 pp.
 Vol. 19 C. L. Young, *Cumulative Index: Volumes 1–18* (1985), *x* + 300 pp.
 Vol. 20 A. L. Horvath and F. W. Getzen, *Halogenated Benzenes, Toluenes and Phenols with Water* (1985), *xxiv* + 266 pp.
 Vol. 21 C. L. Young and P. G. T. Fogg, *Ammonia, Amines, Phosphine, Arsine, Stibine, Silane, Germane and Stannane in Organic Solvents* (1985), *xvi* + 344 pp.
 Vol. 22 T. Mioduski and M. Salomon, *Scandium, Yttrium, Lanthanum and Lanthanide Halides in Nonaqueous Solvents* (1985), *xx* + 398 pp.
 Vol. 23 T. P. Dirkse, *Copper, Silver, Gold and Zinc, Cadmium, Mercury Oxides and Hydroxides* (1986), *xix* + 360 pp.
 Vol. 24 W. Hayduk, *Propane, Butane and 2-Methylpropane* (1986), *xxi* + 447 pp.
 Vol. 25 C. Hirayama, Z. Galus and C. Guminski, *Metals in Mercury* (1986), *xx* + 451 pp.
 Vol. 26 M. R. Masson, H. D. Lutz and B. Engelen, *Sulfites, Selenites and Tellurites* (1986), *xxiv* + 451 pp.
 Vol. 27/28 H. L. Clever and C. L. Young, *Methane* (1987), *xviii* + 783 pp.
 Vol. 29 H. L. Clever, *Mercury in Liquids, Compressed Gases, Molten Salts and Other Elements* (1987), *xii* + 255 pp.
 Vol. 30 H. Miyamoto and M. Salomon, *Alkali Metal Halates, Ammonium Iodate and Iodic Acid* (1987), *xxiv* + 510 pp.
 Vol. 31 J. Eysseltová and T. P. Dirkse, *Alkali Metal Orthophosphates* (1988), *xx* + 347 pp.
 Vol. 32 P. G. T. Fogg and C. L. Young, *Hydrogen Sulfide, Deuterium Sulfide and Hydrogen Selenide* (1988), *xvi* + 352 pp.
 Vol. 33 P. Franzosini, *Molten Alkali Metal Alkanoates* (1988), *xxxiv* + 348 pp.
 Vol. 34 A. N. Paruta and R. Piekos, *4-Aminobenzenesulfonamides. Part I: Noncyclic Substituents* (1988), *xxvi* + 347 pp.
 Vol. 35 A. N. Paruta and R. Piekos, *4-Aminobenzenesulfonamides. Part II: five-membered Heterocyclic Substituents* (1988), *xxvii* + 343 pp.
 Vol. 36 A. N. Paruta and R. Piekos, *4-Aminobenzenesulfonamides. Part III: six-membered Heterocyclic Substituents and Miscellaneous Systems* (1988), *xxx* + 523 pp.
 Vol. 37 D. G. Shaw, *Hydrocarbons with Water and Seawater. Part I: Hydrocarbons C₅ to C₇* (1989), *xx* + 528 pp.
 Vol. 38 D. G. Shaw, *Hydrocarbons with Water and Seawater. Part II: Hydrocarbons C₈ to C₃₆* (1989), *xxii* + 371 pp.

Published by Pergamon Press, Oxford, U.K.: Editor-in-Chief J. W. Lorimer

- Vol. 39 C. L. Young, *Cumulative Index: Volumes 20–38* (1989), *x* + 371 pp.

- Vol. 40 J. Hála, *Halides, Oxyhalides and Salts of Halogen Complexes of Titanium, Zirconium, Hafnium, Vanadium, Niobium and Tantalum* (1989), xxxvi + 327 pp.
- Vol. 41 C.-Y. Chan, I. N. Lepeshkov and K. H. Khoo, *Alkaline Earth Metal Perchlorates* (1989), xxii + 281 pp.
- Vol. 42 P. G. T. Fogg and W. Gerrard, *Hydrogen Halides in Nonaqueous Solvents* (1990), xvi + 480 pp.
- Vol. 43 R. W. Cargill, *Carbon Monoxide* (1990), xvi + 314 pp.
- Vol. 44 H. Miyamoto, E. M. Woolley and M. Salomon, *Copper and Silver Halates* (1990), xx + 246 pp.
- Vol. 45/46 R. P. T. Tomkins and N. P. Bansal, *Gases in Molten Salts* (1991), xviii + 555 pp.
- Vol. 47 R. Cohen-Adad and J. W. Lorimer, *Alkali Metal and Ammonium Halides in Water and Heavy Water (Binary Systems)* (1991), xxx + 533.
- Vol. 48 F. Getzen, G. Hefter and A. Maczynski, *Esters with Water. Part I: Esters 2-C to 6-C* (1992), xiv + 242 pp.
- Vol. 49 F. Getzen, G. Hefter and A. Maczynski, *Esters with Water. Part II: Esters 7-C to 32-C* (1992), xiv + 251 pp.
- Vol. 50 P. G. T. Fogg, *Carbon Dioxide in Nonaqueous Solvents at Pressures Less Than 200 kPa* (1992), xvi + 485 pp.
- Vol. 51 J. G. Osteryoung, M. M. Schneider, C. Guminski and Z. Galus, *Intermetallic Compounds in Mercury* (1992), xxxii + 257 pp.
- Vol. 52 I. Lambert and H. L. Clever, *Alkaline Earth Hydroxides in Water and Aqueous Solutions* (1992), xxiv + 365 pp.
- Vol. 53 C. L. Young, *Cumulative Index: Volumes 40–52* (1993), x + 180 pp.

Published by Oxford University Press, Oxford, U.K., Editor-in-Chief J. W. Lorimer

- Vol. 54 W. E. Acree, Jr., *Polycyclic Aromatic Hydrocarbons in Pure and Binary Solvents* (1994), xlvi + 337 pp.
- Vol. 55 S. Siekierski and S. L. Phillips, *Actinide Nitrates* (1994), xiv + 368 pp.
- Vol. 56 D. Shaw, A. Skrzecz, J. W. Lorimer and A. Maczynski, *Alcohols with Hydrocarbons* (1994), xxiv + 296 pp.
- Vol. 57 W. Hayduk, *Ethene* (1994), xviii + 358 pp.
- Vol. 58 W. E. Acree, Jr., *Polycyclic Aromatic Hydrocarbons: Binary Nonaqueous Systems, Part I: Solvents A–E* (1995), xlvi + 338 pp.
- Vol. 59 W. E. Acree, Jr., *Polycyclic Aromatic Hydrocarbons: Binary Nonaqueous Systems, Part II: Solvents F–Z* (1995), xxx + 348 pp.
- Vol. 60 A. L. Horváth and F. W. Getzen, *Halogenated Methanes with Water* (1995), xx + 197 pp.
- Vol. 61 C.-Y. Chan, K. H. Khoo, E. S. Gryzlova and M.-T. Saugier-Cohen Adad, *Alkali Metal and Ammonium Perchlorates. Part I: Lithium and Sodium Perchlorates* (1995), xviii + 268 pp.
- Vol. 62 P. Scharlin, *Carbon Dioxide in Water and Aqueous Electrolyte Solutions* (1995), xviii + 383 pp.

Published by Oxford University Press, Oxford, U.K., Editor-in-Chief M. Salomon

- Vol. 63 H. U. Borgstedt and C. Guminski, *Metals in Liquid Alkali Metals. Part I: Be to Os* (1996), xiv + 310 pp.
- Vol. 64 H. U. Borgstedt and C. Guminski, *Metals in Liquid Alkali Metals. Part II: Co to Bi* (1996), xiv + 346 pp.
- Vol. 65 J. J. Fritz and E. Königsberger, *Copper(I) Halides and Pseudohalides* (1996), xxii + 291 pp.

Published by the Journal of Physical and Chemical Reference Data, Editor-in-Chief M. Salomon

- Vol. 66 J. Eysseľtová and T. P. Dirkse, *Ammonium Phosphates*, *J. Phys. Chem. Ref. Data* **27**, 1289–1470 (1998); Erratum: *ibid.*, **29**, 1643–1644 (2000).
- Vol. 67 A. L. Horvath, F. W. Getzen and Z. Maczynska, *Halogenated Ethanes and Ethenes with Water*, *J. Phys. Chem. Ref. Data* **28**, 395–627 (1999).
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- Vol. 69 A. Skrzecz, D. Shaw and A. Maczynski, *Ternary Alcohol-Hydrocarbon–Water Systems*, *J. Phys. Chem. Ref. Data* **28**, 983–1236 (1999).
- Vol. 70 R. Paterson, Y. Yampol'skii, P. G. T. Fogg, *The Solubility of Gases in Glassy Polymers*, *J. Phys. Chem. Ref. Data* **28**, 1255–1451 (1999).
- Vol. 71 V. P. Sazonov, K. N. Marsh and G. T. Hefter, *Nitromethane with Water or Organic Solvents*, *J. Phys. Chem. Ref. Data* **29**, 1165–1354 (2000).
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- Vol. 73 C. Balarew, T. P. Dirkse, O. A. Golubchikov and M. Salomon, *Metal and Ammonium Formate Systems*, *J. Phys. Chem. Ref. Data* **30**, 1–163 (2001).
- Vol. 74 J. Hála, *Actinide Carbonates and Carbon-Containing Compounds*, *J. Phys. Chem. Ref. Data* **30**, 531–698 (2001).
- Vol. 75 H. U. Borgstedt and C. Guminski, *Nonmetals in Liquid Alkali Metals*, *J. Phys. Chem. Ref. Data* **30**, 835–1158 (2001).
- Vol. 76 P. G. T. Fogg, S. A. Bligh, M. E. Derrick, Y. P. Yampol'skii, H. L. Clever, A. Skrzecz and C. L. Young, *Solubility of Ethyne in Liquids*, *J. Phys. Chem. Ref. Data* **30**, 1693–1875 (2001).
- Vol. 77 V. P. Sazonov, D. G. Shaw and K. N. Marsh, *Nitroalkanes with Water or Organic Solvents: Binary and Multicomponent Systems*, *J. Phys. Chem. Ref. Data* **31**, 1–121 (2002).
- Vol. 78 V. P. Sazonov and D. G. Shaw, *Acetonitrile Binary Systems*, *J. Phys. Chem. Ref. Data* **31**, 989–1133 (2002).

- Vol. 79 J. Hala, *Alkali and Alkaline Earth Metal Pseudohalides*, J. Phys. Chem. Ref Data **33**, 1–176 (2004).
- Vol 80 H. L. Clever, *Gaseous and Volatile Fluorides: XeF₂, XeF₄, XeF₆, BF₃, NF₃, N₂F₄, SF₆, CF₄, CHF₃, CH₂F₂, CH₃F, C₂F₆, C₂HF₅, C₂H₂F₄, C₂H₃F₃, C₂H₄F₂, C₂H₅F, C₃F₈, c-C₄F₈, C₂F₄, C₂H₂F₂, C₂H₃F, C₃F₆, C₃F₃O and SiF₄*, J. Phys. Chem. Ref. Data **33**, In press.

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