

## Preface

Chemical and physical processes in biological systems take place in an aqueous environment, and understanding of the properties of solutions is of major importance for advancements in science. Similarly, this holds true for many technologies, where solutions and liquids are in contact with various materials. All this makes the chemistry and physics of solutions one of the most important topics of physical chemistry.

The advancements in this area of science are reviewed every second year through the series of world conferences under the title International Conference on Solution Chemistry (ICSC).

The 29<sup>th</sup> International Conference on Solution Chemistry sponsored by IUPAC was held in Portorož, Slovenia, 20–25 August 2005. The conference was organized by the faculty of chemistry and chemical technology at the University of Ljubljana, Slovenia. The ICSC has been held biannually since 1967 and under the present name since 1988. The meetings, which have been held in locations ranging from Debrecen (Hungary) to Vaals (Netherlands) and from Fukuoka (Japan) to Vichy (France), are organized by a 10-member international steering committee. The present chairperson of the committee is Prof. Ingmar Persson from the University of Uppsala in Sweden. Altogether, the 29<sup>th</sup> ICSC hosted almost 300 participants from 36 countries, including approximately 50 Ph.D. students who took advantage of the conference's reduced fees for students, and more than 40 accompanying family members.

The theme of the conference was “the chemistry of solutions”, but sessions were also held on supramolecular assemblies and nanostructures, interfaces, biophysical and pharmaceutical problems, aquatic chemistry, ionic liquids, and others. An array of eminent scientists from around the world gave plenary presentations and keynote lectures, and a broad spectrum of the research is reflected in the selection of papers presented in this issue.

The first contribution entitled “Reactive intermediates in aqueous ozone decomposition: A mechanistic approach”, by Fábíán István (University of Debrecen, Debrecen, Hungary) provides a detailed account of recent developments in mechanistic interpretation of aqueous ozone decomposition. Experimental complications with collecting reliable kinetic information for this system are illustrated via selected examples. It is also demonstrated how a complex kinetic model can be validated by studying the system under the specific experimental conditions.

Ion-pairing is a classic topic of electrochemistry, and powerful tools such as the spectroscopic techniques UV/vis, NMR, and Raman are often used for the investigation of chemical speciation in solution. However, it is not widely recognized that such techniques do not always provide reliable information about ion association equilibria. Recent developments in this area of research are reviewed by Glenn Hefter (Murdoch University, Perth, Australia). In the paper entitled “When spectroscopy fails: The measurement of ion pairing”, data are presented for metal ion/sulfate systems in aqueous solution that demonstrate the inadequacy of the major spectroscopic techniques for the investigation of systems that involve non-contact ion pairs.

The next contribution, “Ionic liquids: A most promising research field in solution chemistry and thermodynamics”, written by Andreas Heintz and Christiane Wertz (University of Rostock, Rostock, Germany), reviews current research in the field of room-temperature ionic liquids. This topic had a special place at the conference—the round-table discussion about theory and application of these systems, sponsored by Merck KGaA Darmstadt and chaired by Prof. A. Heintz. In the present paper, several selected examples of the most promising chemical and technical applications of ionic liquids are presented, underlining the importance of thermophysical properties of ionic liquids and their role in catalytic and separation processes.

Solvation steric effect plays a decisive role in reaction thermodynamics and kinetics of the metal ions. This topic is analyzed by Shin-Ichi Ishiguro and his coworkers from Kyushu University in

Fukuoka, Japan in a study entitled “Solvent conformation and ion solvation: From molecular to ionic liquids”. The authors discuss their recent results on solvation steric effects in view of structure and thermodynamics, particularly, the conformational change of solvents and their effect on the metal-ion complexation.

Electrolyte solutions play major roles in nature and in technological processes, yet the understanding of their properties and interaction with other materials is far from being complete. On the contrary, the ion specific effects, experimentally determined more than 100 years ago, are still largely unexplained. Toward this end, the paper “Specific ion effects in liquids, in biological systems, and at interfaces” by Werner Kunz (University of Regensburg, Regensburg, Germany) reviews the present knowledge of ion effects in solutions, at interfaces, and in complex colloidal systems. Some important experiments and theoretical approaches are discussed, and references of most important papers are provided.

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Conference Editors