production of a species (for example, the pH in a biochemical system). Since the electric potentials of phases in a multi-phase system are not natural variables of the Gibbs energy, it is useful to define a transformed Gibbs energy, for which electric potentials of phases are natural variables. The use of Legendre transform brings in a new set of thermodynamic properties, new Maxwell equations, Gibbs–Duhem equations and Gibbs-Helmholtz equations.

Environmental biotechnology

The November issue also contains selected proceedings of an International Conference on Environmental Biotechnology '96 held in Palmerston North, New Zealand, 1–4 September 1996. The published conference papers offer a wide-ranging analysis of the potential of biotechnology to waste treatment, specific perspectives on environmental damage and remediation, industrial research on pollutant mitigation, research into the area of upflow anaerobic sludge blanket reactors, the biological treatment of food industry wastes and two examples of cleaner technology for developments from the pharmaceutical and paper industries.

The cleaner technology examples included production of phenylacetylcarbinol by yeast through productivity improvements and waste minimisation. L-Phenylacetylcarbinol is a precursor for the synthesis of L-ephedrine and D-pseudoephedrine, two pharmaceuticals with nasal decongestant properties. L-Phenylacetylcarbinol is generated biologically through the pyruvate decarboxylase-mediated condensation of added benzaldehyde with acetaldehyde generated metabolically from feed stock sugars via pyruvate. Some of the added benzaldehyde is converted through the action of alcohol dehydrogenase(s) to benzyl alcohol, an undesired by-product. L-Phenylacetylcarbinol extracted from the fermentation broth is converted chemically by hydroamination in the presence of methyamine and hydrogen to L-ephedrine, and then by isomerization to D-pseudoephedrine. Bruce Anderson and colleagues at the Royal Melbourne Institute of Technology present a dual approach strategy to enhance the ratio of product to by-product generated and to minimize the waste treatment burden of the spent fermentation broth. He explains that benzaldehyde delivery to the fermentation has been modified to ensure that sufficient raw material is available, together with pyruvate, during peak periods of pyruvate decarboxylase activity, and that benzaldehyde is less available during periods of high alcohol dehydrogenase activity. The inorganic content of the spent fermentation broth has been reduced substantially by the partial substitution of raw sugar for molasses in the medium, with a reduction of molasses content by 60% resulting in an increase of phenylacetylcarbinol production. Further work on the optimization of the concentration of carbohydrate, nitrogen and phosphate in the fermentation has been conducted and has led, he claims, to further productivity increases, together with reduced waste generation, resulting in an L-phenylacetylcarbinol process which is considerably ‘cleaner’ than the parent process.

New Publications

Compendium of Chemical Terminology: IUPAC Recommendations, 2nd Edn

Since publication of the first edition in 1987, the IUPAC Compendium of Chemical Terminology, popularly referred to as the ‘Gold Book’ in recognition of the contribution of the late Victor Gold who initiated the work, has been the standard work on chemical terminology. Definitions published by IUPAC are drafted by international committees of experts in the appropriate chemistry subdisciplines and ratified by IUPAC’s Interdivisional Committee on Nomenclature and Symbols. In this second edition, the IUPAC-approved definitions are supplemented with some definitions from ISO and from the International Vocabulary of Basic and General Terms in Metrology. Since the first edition was published 11 years ago, the majority of the material in the ‘Gold Book’ has been revised and updated by IUPAC; thus many of the first-edition definitions have been modified or replaced. Furthermore, since 1986 IUPAC has published new terminology documents covering many areas of chemistry not previously treated, and definitions from these documents are now included. Among new areas covered are polymer science, photochemistry, stereochemistry, clinical chemistry, biotechnology, toxicology, class names for organic chemicals and
atmospheric chemistry. The result is a collection of nearly 7000 terms, with authoritative definitions, spanning the whole range of chemistry. All IUPAC recommendations published up to the end of 1995 were considered for inclusion, together with some particularly significant material published in 1996. A selection was made on the basis of general utility; some terms were omitted as being of interest only to a highly specialist audience.


**Interfacial Science**

The ability to design a solid surface with specific properties has been a central theme in research in physical chemistry over the past 20 years. The aims may be as diverse as production of an efficient and selective catalyst and the creation of a new optical device. Over the past decade the emergence of sophisticated surface-sensitive techniques and innovative computational methods has opened up new avenues for exploration in surface science. **Interfacial Science** sees a blurring of the traditional approaches to the condensed phase and surface chemistry, and reflects the broad perspective of the subject. It examines advances and new directions in both experimental and computational approaches and in both fundamental and applied research. Undoubtedly, the book will make an important contribution to one of the most exciting areas of physical chemistry.


**Environmental Chemistry in Classroom Experiments**

_Environmental Chemistry in Classroom Experiments,_ an English translation of the 1990 German edition of the book _Umweltchemie im Experiment_, is published by IUPAC’s Committee on Teaching of Chemistry. The book focuses on the task of teaching environmental chemistry through a hands-on approach by describing 130 close-to-reality experiments. Also described are details of the required equipment, chemicals, procedures, precautions and safety instructions needed for conducting the experiments. This volume is intended as a resource book for teachers of chemistry and biology.

The experiments can be integrated in the formal laboratory curricula (for example, as small projects) or used in an informal manner for creating environmental awareness. In addition, several experiments can be used as the basis of classroom demonstrations.

**Environmental Chemistry in Classroom Experiments.** By Rüdiger Blume and Hans Joachim Bader in collaboration with Manfred Kuballa. Translated by Johannes ‘Hans’ Bouma. Published for IUPAC Committee on Teaching of Chemistry by S.M.V. Traders and Printers, Delhi 110 009, India, with the permission of Cornelsen Verlag Scriptor, Berlin, Germany. ISBN 81-86968-00-8. Further information can be obtained from Peter Towse, Centre for Studies in Science and Mathematics Education, University of Leeds, Leeds LS2 9JT, UK. Fax: +44 1132 334683. E-mail: p.j.towse@education.leeds.ac.uk

**A Proceedings on Cost-Effective Chemistry: Ideas for Hands-on Activities**

The proceedings of a workshop hosted by the Institute for Chemical Education at the University of Wisconsin, Madison, 15–26 July 1996, on cost-effective instrumentation and ideas for teaching chemistry are reproduced in the form of a source book. The aim is to stimulate the teaching of chemistry, make the subject more enlightening, and give students a greater experience of hands-on activities. The main topics covered are: low-cost instrumentation; low-cost apparatus; small-scale chemistry and low-cost reagents; chemical and bio-sensors; and low cost microprocessor-based data loggers and instrument controllers.


**Macromolecular Symposia, Vol. 118: IUPAC Macro Seoul '96**

Volume 118 of _Macromolecular Symposia_ presents 96 manuscripts of plenary and invited lectures presented at the 36th International Symposium on Macromolecules held in Seoul, Korea, 4–9 August 1996. The symposium was sponsored by IUPAC, and organized by the Polymer Society of Korea. The volume follows the scientific programme in being divided into a plenary session followed by 11 topic sessions: polymer synthesis and re-
Conferences


The conference will deal with all important aspects of modern organic synthesis. The scientific programme will consist of:

- ten plenary lectures (60 minutes including discussion) and a Thieme IUPAC prize lecture
- six lectures (30 minutes including discussion) in a mini symposium on combinatorial chemistry in drug