Book Reviews

Carbonylation. Direct Synthesis of Carbonyl Compounds

By H. M. Colquhoun, D. J. Thompson and M. V. Twigg, published by Plenum, New York, 1991, 296+xi pp.

This excellent book, written by three members of ICI or associated companies, reviews the recent developments in transition metal catalyzed carbonylation chemistry and emphasizes the importance of catalytic carbonylation as a general tool in synthetic organic chemistry.

As stated by the authors in the Preface, the book is practically oriented and is organized accordingly, devoting the individual chapters to the different classes of organic compounds that can be prepared by carbonylation.

After an introductory chapter, mainly of historical significance, the book begins with a concise, yet comprehensive, review (Chapter 2) of the reaction mechanisms though which carbonylation reactions can occur. The following chapter (Chapter 3) includes an excellent description of the practical aspects related to the set up of carbonylation reactions in the laboratory, including the often overlooked safety aspects. These range from the purification and handling of carbon monoxide, to the properties of the most common catalysts, to the description of laboratory equipments.

The following eight chapters deal with the different classes of compounds that can be prepared by transition metal catalyzed carbonylation (aldehydes, ketones, carboxylic acids, esters, amides, lactones, etc.) and are organized according to the starting reactants from which the individual compounds can be obtained. Stress is placed on the mechanistic aspects of the reactions that are presented clearly and concisely. Throughout the book clearness is helped by a wide and selected choice of examples illustrated in well organized schemes. Interestingly, in all chapters appropriate examples of the experimental procedure necessary for the preparation of specific molecules are presented.

The final chapter contains a wide selection of experimental procedures for the preparation of catalysts and precious metal recovery. The book ends with a useful appendix on suppliers of catalysts and equipments for carbonylation reactions.

In conclusion, a practical and easy to consult yet authoritative book which will be helpful both to experts and to newcomers to the field.

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Molten Salt Techniques, Vol. 4

Edited by Robert J. Gale and David G. Lovering, published by Plenum, New York and London, 1991, 275+xx pp., US$ 75 in USA and Canada.

This fourth book in the series on techniques and specialities of the growing field of molten salt chemistry contains seven chapters, each covering diverse aspects, written by active and competent researchers. Together with the previous volumes in the series, this volume of good quality contributes to a further overview of the field.

Chapter 1 deals with "Amides and Amide Mixtures, with Special References to Electrochemical Properties", written by R. Narayan and K. L. N. Phani from the Indian Institute of Technology, Madras. In 40 pages, subjects like preparation, purification, stability, safety, acid–base behaviour, electrochemical properties, and applications of these interesting melts are reviewed, and 160 references cited.

Chapter 2 is on "Physicochemical Properties of Liquid Organic Salts Using Chromatographic Techniques", written by C. F. Poole, K. G. Furton, R. M. Pomaville, S. K. Poole and B. R. Kersten from Wayne State University, Detroit, MI. In 40 pages, this interesting new field is discussed, and 59 references are included. The liquid organic salts encomprise various alkylammonium, 4-toluenesulfonate and thiocyanate salts, for example. It is concluded that gas chromatography is a useful tool for characterization of the unique class of polar selective solvents formed by these liquid organic salts, in a temperature range not exceeding 200 °C.

The subject of Chapter 3 is "Thermal Conductivity and Diffusivity Measurements", written by Hiromichi Ohta and Yoshio Waseda from Ibaraki and Tohoku Universities in Hitachi and Sendai, Japan. In 27 pages, heat transfer properties of liquids at high temperatures (about 1000 °C) are treated, putting major emphasis

on experimental procedures needed for measurements and on data analysis. 34 references are included.

"Magnetic Measurement Techniques" are treated in Chapter 4, written by W. W. Warren, Jr. from AT&T Bell Laboratories, Murray Hill, NJ. The emphasis here is on techniques developed for measurements well above room temperature (furnace construction) on highly reactive materials (implying containment problems). Magnetic susceptibility as well as nuclear magnetic resonance (steady state and transient) and electron spin resonance determinations are covered in 39 pages, including 34 references. The system In–InI_3 (containing the salts InI, InI_2 and InI_3) is used as an illustrative example.

Chapter 5 deals with "Calorimetric Methods", written by M. Gaune-Escard from S.E.T.T., Université de Provence, Marseille, France. The various calorimetric techniques, indispensable for obtaining thermodynamic data, are reviewed. Reaction, as well as non-reaction calorimetry, and determination of phase diagrams are considered on 42 well-written pages, including 70 references to important previous work.

The 27 pages long Chapter 6 covers "Ultra-High-Pressure Experimental Techniques". It is written by Q. Williams and R. Jeanloz from University of California, Santa Cruz and Berkeley. It is well-known that ultrahigh pressures (upto *c.* 100 GPa) can induce dramatic changes in the bonding character of ionic materials. A famous example is the insulator-metal transition in alkali halides. Accessible methods include dynamic shock-wave techniques (projectile-target interactions) and static techniques (diamond anvil, large volume or piston-cylinder cells), each method having its own limitations and temperature range. Applications of the techniques are reviewed; for example the phase diagram of NaCl is now known to pressures and temperatures exceeding 60 GPa and 3500 K. 149 references are included.

Chapter 7 is on "Battery Construction, Testing and Materials", written by Paul A. Nelson and Thomas D. Kaun from Argonne National Laboratory, IL. The focus is on the well-developed Li-alloy/FeS and Li-alloy/FeS_2 cells and batteries, the Li-alloys containing Al and Si. The electrolyte of choice, e.g. for the disulfide cell, is a eutectic mixture of 25mol%LiCl–37mol%LiBe –38mol%KBr (melting point *c.* 310 °C, operating temperature *c.* 400 °C). The progress in this kind of battery technology within the last decade is concisely reviewed on 37 pages, giving due references to 55 previous articles.

As expected, the volume ends by a handy index and a short listing of the content of the previous three volumes.

In the foreword, one of the most competent molten salt researchers, R. A. Osteryoung from State University of New York at Buffalo, writes the following notable remark, "The availability of concise, collected literature detailing experimental lore from experts in the areas encompassed by these volumes is invaluable. A single use of one of the practicalities presented in these volumes can, to put it in the crassest possible terms, repay the user for the cost of the entire set."

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