Book Reviews

Acid–Base Catalysis

Edited by K. Tanabe, H. Hattori, T. Yamaguchi and T. Tanaka, published by Kodansha/Tokyo–VCH/ Weinheim, 1989, 532+xx pp.

This book contains the Proceedings of the Second International Symposium on Acid–Base Catalysis, held in Sapporo, Japan, Nov. 28 to Dec. 1. 1988, following a previous one held in Villeurbanne, France, 1984. The symposium was organized by the Department of Chemistry of Hokkaido University and chaired by a leading authority in the field of acid–base catalysis Professor K. Tanabe.

The book comprises the text of 9 plenary lectures plus 39 original scientific contributions covering diverse aspects of this very broad field and is organized into four different sections: Organic Synthesis, Characterization, Design and Preparation of Catalysts, Catalytic Features. The major emphasis is given to surface catalysis and its impact on industrial organic chemistry and petrochemistry. Almost unavoidably, because of the wide variety or arguments considered, which span from the theoretical to the most practical ones, the classification under the four sections may be odd in some cases. However, the overview is quite exhaustive and of good quality.

Section 1 (Organic Synthesis) includes 3 reviews and 5 papers dealing with the application of solids like zeolites, clay minerals, Nafion-H®, Mg oxides in a wide variety of organic transformations like dehydration reactions, reduction and oxidation reactions, regioselective ring-openings, alkylation and C–C bond formation reactions, etc.

Section 2 (Characterization) including 3 reviews and 9 papers is devoted to the surface characterization of solids and particularly to the probing of their acidic and basic properties through a variety of techniques. These range from the more traditional ones like IR, UV–Vis and ESR spectroscopies or thermal desorption to the use of molecular probes or the analysis of model reactions. It includes also two attempts to investigate through molecular orbital calculations the local structures of the acidic sites on aluminosilicates and the adsorption of H_2 and CH_4 on MgO.

Section 3 (Design and Preparation of Catalysts) is the largest one (a total of 17 papers) and provides a wide and useful insight into the multifaceted and often empirical approach leading to the design and preparation of catalysts tailored for a specific reaction. The materials considered are those employed in acid–base catalysis like zeolites, metal oxides, dispersed metals on oxides, pillared clays, sulfonated oxides and resins, superbase catalysts, etc.

Section 4 (Catalytic Features) is dedicated mostly to the reactivity of acid–base materials in reactions of industrial significance. The latter two sections are almost completely due to contributions of Japanese researchers and testify the high quality standard and interest for research in this field in Japan. The section is concluded by an excellent review paper on acid–base bifunctional catalysis by Professor Tanabe.

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Biocoordination Chemistry: Coordination Equilibria in Biologically Active Systems

Edited by Kalman Burger, published by Ellis Horwood, Chichester, U.K., 1990, 349 pp., US$90.–.

Biocoordination Chemistry is the coordination chemistry of biologically active molecules (proteins, polypeptides, carbohydrates, nucleotides, nucleosides, alkaloids, etc.) which contain electron pair donor atoms and therefore behave as potential ligands.

As K. Burger states in the introduction "Most bioactive molecules contain various numbers of donor groups, many of them having similar, but not identical, basicities and metal ion affinities. Numerous strongly overlapping protonation and metal complexation equilibria are, therefore, characteristic of such systems. These equilibria are also influenced by intramolecular interactions (e.g. H bonds) due to the ordered conformation (helical, globular etc.) of the macromolecule. All this makes an exact evaluation of the experimental equilibrium data on such systems difficult." This recognition led to a new complex discipline, which makes use of the theoretical and experimental armoury of inorganic and coordination chemistry and molecular biology: biocoordination chemistry.

After an introduction by K. Burger on the state-of-the-art, four chapters are devoted to metal complexes of aminoacids (T. Kiss), of peptides and their derivatives (I. Sòvàgò), of carbohydrates and sugar-type ligands (K. Burger and L. Nagy) (an unprecedented review to my knowledge) and of nucleic acid bases, nucleosides and nucleotides (H. Lonnberg). Two more chapters are concerned with the acid–base properties of bioligands (B. Noszàl) and the thermodynamic and kinetic aspects of four metalloproteins (carboxypeptidase A, carbonic anhydrase, Cu,Zn-superoxide dismutase and transferrin) (J. Horose and Y. Kidani). Although the chapters are mainly concerned with coordination and protonation equilibria in solution, the structures of the various species are discussed with frequent references to the structures in the solid state. The book appears therefore useful not only to the chemist interested in solution equilibria but also to the structural chemist interested in the structure of metal complexes with bioligands.

The bibliography is exhaustive (for the first time journals from East countries and from India are covered) and updated (many references to papers in press or to be published).

One final word of blame for the proof-reader who left several misprints throughout the text. In conclusion the book can be recommended to undergraduates, postgraduates and researchers in inorganic chemistry and molecular biology and it appears indispensable to the ever growing number of coordination chemists who are addressing their interest to bioligands.

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Chemical Kinetics: The Study of Reaction Rates in Solution

By Kenneth A. Connors, published by VCH, Weinheim/New York/Basel/Cambridge, 1990, XIII, 480 pp., 96 figs., 54 tables, DM168.–, £61.–.

The book gives an excellent presentation of the study of reaction rates in solution and helps students to understand the details of the mechanisms of reactions in solution phase.

This is a textbook, not a research monograph, and is probably best suited for a one-semester graduate and advanced undergraduate level course, but it could also be used for self-studies and for reference.

The book consists of eight chapters: after an introductory chapter, phenomenological kinetics is treated in three subsequent chapters. The theory of chemical kinetics, in the form most applicable to solution studies, is described in chapter five and is used in subsequent chapters.

The book contains considerable material on treatments of mechanistic interpretations of the transition state theory, structure–reactivity relationships, and solvent effects, which is not found in competing books.

A number of proposed problems have been added at the end of each chapter and answers to selected problems are presented in an appendix.

Our impression is that this book will appeal to students because each chapter is a well-written, cohesive unit in which basic principles are clearly discussed and terminology is well defined.

This book will prove most useful to chemistry scientists with interests in all fields concerned with the rates of chemical reactions in solution.

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Metal–Metal Bonds and Clusters in Chemistry and Catalysis

Edited by John P. Fackler Jr., published by Plenum, New York, 1990, 341 pp., US$75.–.

This is an interesting book which should find its place in most chemical libraries. The book contains 21 contributions presented at the 7th Industry–University Cooperative Chemistry Program Symposium held in 1989 at Texas University. The papers are grouped in four sections dealing with multiple metal–metal bonds, metal clusters in catalysis and materials, and with bonding and spectroscopic aspects. The first section is mainly devoted to the developments which followed the discovery of metal–metal triple and quadruple bonds. In Albert Cotton's introductory paper on this topic, the rate of growth of this area is shown to follow an exponential law, as more metals are found to be able to form multiple bonds. In this section the subject is covered under all angles by various authors from the synthetic to the theoretical point of view.

The cluster sections are also well developed covering various aspects of the chemistry in solution, thermochemistry, homogeneous and heterogeneous catalysis, surface chemistry and semiconductors. Solid state organometallic chemistry is also beginning to take its place in such a multiform area with the novel aspects of clusterification in zeolites, metals clusters and metal–metal bonded arrays in condensed phases, accompanied by the use of magic-angle