Book Reviews

Bonding and Structure. Structural Principles in Inorganic and Organic Chemistry

Edited by N. W. Alcock (University of Warwick), published by Ellis Horwood, New York, 1990, 321 pp., US$ 50.95.

This book is part of the 'Ellis Horwood Series in Inorganic Chemistry' and, like the other excellent volumes of this series, is principally dedicated to undergraduate chemistry students.

In the first two chapters, N. W. Alcock, who has had considerable teaching experience, tries to explain, in a simple manner, many aspects of the chemical bond that his students have had difficulty grasping. In particular, the author discusses at length the concept that the different species of chemical bonds should be considered, as far as is possible, a unity.

He is firmly convinced that the most important property of bonded atoms in determining their bond is electronegativity; great importance is therefore given to the so-called bond triangle. To give more strength to this concept, after some discussion of ideal bonds, the dependence of the real bonds on the electronegativity of the constituent atoms is examined and discussed for a large array of compounds.

Because many types of bonds exist only in solids, bonding in the solid state dominates the third part of this book. The bond is examined with particular regard to its relationship to chemical character, structure and properties. This section gives a comprehensive treatment of metallic bonding (including metal alloys and interstitial carbides), the hydrogen bond, complex covalent bonds (including aromatic systems and xenon halides), transition metal complexes and compounds with intermediate-type bonding (e.g. layered compounds, zeolites and other silicates).

Furthermore, many solids of great technological interest (e.g. semiconductors, solid electrolytes, ferroelectrics and non-linear optical materials) are also included. Even the most recent materials such as Zintl phases and superconducting metal oxides are examined in the last part of the book. Predictions of the chemical bond from the constituent atoms, and then of the chemical structure from the chemical bond and finally of the chemical reactivity from the structure, although still a dream, remain a prime goal in chemistry.

Although too much importance may have been given to the electronegativity of the atoms as the main property in determining their bonding, this book provides a simple yet broad overview of the bond of an obviously broad area of compounds.

This volume, as the author himself says, has to be considered principally a book on inorganic chemistry simply because inorganic compounds have a wider range of bonding than most organic compounds. Therefore, the book may be very useful to the organic chemists as well.

In order to maintain the simple and qualitative character of the book, a non-mathematical approach was used, some derivations are given in chapter appendices. For the same reason, certain fundamental topics that should be well-known to many readers are described only in self-contained boxed units, so that they are easily seen during reading. This makes the book simpler and more unified.

The book is well-written, well-organised, and the terminology is well-defined.

In conclusion this is a readable book and although dedicated mainly to students, it should find its place in the libraries of most Chemistry Departments or on the bookshelves of young researchers and lecturers devoted to undergraduate teaching in chemistry.

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Guidelines for Mastering the Properties of Molecular Sieves. Relationship between the Physicochemical Properties of Zeolitic Systems and their Low Dimensionality

Edited by D. Barthomeuf, E. G. Derouane and W. Hölderich, NATO ASI Series B: Physics, Vol. 221, published by Plenum, New York, 1990, 426 pp., bound, US$ 95.00.

The book is a collection of papers presented at the NATO Advanced Study Institute Workshop held in Chantilly, France, in 1990 on the title topic.

Chantilly was the 21st meeting of the special program on condensed systems of low dimensionality sponsored by NATO Scientific Affair Division which

began in 1983 and this is symptomatic of the wide and still actual interest of the theme.

As mentioned in the preface "low dimensionality is a multiforious concept which applies to very diversified materials", those formed of clusters, of monolayers, packets of a few layers, of single fibres or of patterns of fibres. These low dimensional structural features are associated with the peculiar properties in the fields of semi-conductivity, ion transport, intercalation, etc. and have important applications in thin film technology, the development of microbatteries, electrooptics, etc.

Low dimensionality in zeolitic systems arises from the presence within the structure of small channels and cages (from 0.3 to 1.3 nm) extending in one, two or three dimensions. The goal of the workshop was to delineate the relationship between this low-dimensional feature and the physicochemical properties of zeolites and zeolite-like materials.

The Editors divided the 22 contributions into five principal themes.

The first theme, "Orientation of chemical properties by direct synthesis of molecular sieves" contains five works dealing with the template synthesis of zeolites, aluminophosphates and silicaluminophosphates. The contribution by Fajula focuses on two aspects of 'intelligent' zeolite synthesis: the control of the morphology and the generation of composition gradients in the crystallites. This approach has been successfully applied to the crystallization of zeolite omega. Other interesting papers deal with the use of fluoride media to obtain large crystals of ZSM 5 and SAPO molecular sieves and on the role of tetra-alkylammonium cations in the template synthesis interpreted on the basis of ^{13}C and ^{129}Xe MAS-MNR.

The second theme "Characterization of structural and physicochemical properties of zeolitic systems" contains four works. The first one (Vaughan *et al.*) is a good review of the recent advances in techniques for characterizing zeolite structures (MAS-NMR, X-ray and neutron diffraction methods, use of synchrotron light, SEM, TEM and the combined scanning transmission electron microscopy technique). The paper (22 pp.) is enriched with beautiful structure images of zeolites. The other papers present the use of chemical probes and various specialistic techniques (Mössbauer spectroscopy, XPS, ESR) for characterizing surface sites (Vedrine); the use of XRD measurements of the unit cell expansion or contraction to determine Al-siting in zeolites (Alberti); the use of solid-state ion-exchange in zeolite Y to obtain a higher degree of exchange than can be obtained with conventional techniques, and also to obtain more efficient catalysts.

The third theme "Static and dynamic parameters in adsorption and catalysis in zeolites" is made up of three works. That of Cohen De Lara and Khan deals with the effect of temperature on the mobility of diatomic and polyatomic molecules adsorbed in type A zeolites. The study was carried out with combined IR and incoherent neutron scattering techniques. NMR relaxation times were used to obtain information on the molecular motion of aliphatic and aromatic hydrocarbons adsorbed in Faujasite (Lechert *et al.*). J. B. Moffat *et al.* studied the porosity properties of zeolite-like heteropolyoxometallates (12-molybdophosphate, tungstosilicate, etc.) in several cationic forms, by means of N_2-adsorption isotherms.

The fourth theme "Localized and overall properties related to the nature and structural organization of the framework atoms", contains six works dealing mainly with the acid function of zeolites. It was shown that the acid activity of zeolites depends on the nature, concentration, density and environment of the acid sites (Derouane) and that theoretical calculations may help in our understanding of the acid function of zeolites (Von Setten, Dwyer, Rabo). Lastly the soft and hard acid and base theory was applied to obtain a description of the acid behaviour of zeolites (Corma).

The fifth theme "Orientation of the path of reactions (catalysis, adsorption) by chemical or other geometric or not geometric effects" with four works, treats the application of zeolites as catalysts and shape-selective catalysts. Hoelderich presents a wide and interesting review (with 135 references) of the reactions types catalysed by zeolites (alkylation, acylation, halogenation, isomerization, etc.), pointing out that the shape-selectivity of the zeolite plays a role in these reactions. The mechanistic pathways of hydrocracking and hydroisomerization with bifunctional zeolite catalysts, as well as the role of Al-siting, are described in the papers by Weitkamp and Ernst, Giannetto *et al.* and Peters *et al.*

The book is essentially a collection of original papers and reviews and as such it has the usual drawbacks of multi-authored books: some information is repeated in different papers, while other information, important for a newcomer, may have been omitted. At the end of the book the Editors have attempted to integrate the different contributions by presenting an overview of the workshop, commenting on the five themes treated. These comments reflect the discussion sessions held during the workshop and describe the state of the art as derived from the presentations, the new ideas and the projections for future developments.

The book also contains a list of participants and a good subject index with numerous key-words. On the whole, it contains valuable information and good discussions and takes into account the fast growing interest in zeolites and microporous solids. It will be of value not only for specialists but also for researchers involved in solid state chemistry and physics.

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Conference Calendar

Title of meeting	Location	Date	Further information from:
NATO Advanced Research Workshop on Molecular Electrochemistry of Inorganic, Bioinorganic and Organometallic Compounds	Sintra, Lisbon, Portugal	March 25–29, 1992	Prof. A. J. L. Pombeiro, Complexo I, Instituto Superior Técnico, Av. Rovisco Paris, 1096 Lisbon Codex, Portugal Tel: 351-1-35 24303 Fax: 351-1-35 24372
Nitrogen Ligands in Organometallic Chemistry and Homogeneous Catalysis	Alghero, Italy	May 10–15, 1992	S. Gladiali, Euchem Conference, Dipartimento di Chimica, via Vienna 2, I-07100 Sassari, Italy Tel: (0)79-229546/229531/229492 Fax: (0)79-229559/218497
Modern Prospectives in Inorganic Crystal Chemistry	Erice, Italy	May 30–June 7, 1992	L. Riva di Sanseverino, Dipartimento di Scienze Mineralogiche, Piazza Porta San Donata 1, 40126 Bologna, Italy
ICHAC-3 Third International Conference on Heteroatom Chemistry	Adriatic Riviera, Italy	June 6–11, 1992	Prof. A. Fava, CNR – I Co. CEA, via della Chimica 8, I-40064 Ozzano Emilia (BO), Italy
First European Bioinorganic Conference, EUROBIC I (incorporating SAMBAS IV and SIMBIC VI)	Newcastle upon Tyne, U.K.	July 8–12, 1992	Dr. John F. Gibson, The Royal Society of Chemistry, Burlington House, London W1V 0BN, U.K. Tel: 071 437 8656 Telex: 268001 Fax: 071 437 8883
Third International Conference on Alzheimer's Disease and Related Disorders	Padua, Italy	July 12–17, 1992	P. Zatta, CNR-UNIT, Dipartimento di Biologia, via Trieste 75, 35131 Padua, Italy Tel: 39+49+8286361 Fax: 39+49+8286359
29th International Conference on Coordination Chemistry (29th ICCC)	Lausanne, Switzerland	July 19–24, 1992	29th ICCC, c/o AKM Congress Service, Clarastrasse 57, P.O. Box, CH-4005 Basel, Switzerland Tel: (41) 61 691 51 11 Fax: (41) 61 691 81 89
10th International Congress on Catalysis	Budapest, Hungary	July 19–24, 1992	Prof. L. Guczi, Chairman, Institute of Isotopes, P.O. Box 77, H-1525 Budapest, Hungary Tel: 36-1-156-4815 Telex: 22-5360 Fax: 36-1-156-5045

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