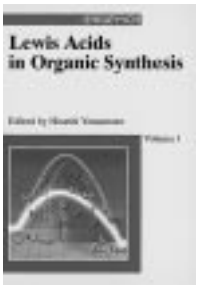
Eclectic Transformers

Lewis Acids in Organic Synthesis. Vol. 1+2. Edited by *Hisashi Yamamoto.* Wiley-VCH, Weinheim 2000. ixx + 995 pp., 750 figs., hardcover DM 748.00 (ca. 382 €).—ISBN 3-527-29579-8

The demands for efficient organic synthesis are continously increasing. Reactions are not only required to proceed in high yields and with high selectivity, they should also be carried out in an economically and ecologically favorable manner. A recent active area of research meeting these demands is the utilization of Lewis acids in organic synthesis. In this two-volume work a team of internationally renowned authors has succeeded in demonstrating the usefulness of many metal complexes as Lewis acids in a plethora of synthetically important reactions



The first volume deals with "classical" Lewis acidic compounds such as lithium, magnesium, boron, aluminum, silicon, and tin complexes. After a short discussion of the historical background, including for example the use of Friedel–Crafts catalysts, special emphasis is given to investigations leading to highly active and selective species. Separate chapters are devoted to the preparatively highly important chiral aluminum and boron Lewis acids, to emphasize the usefulness of enantioselective transformations in modern research. The frequently employed Lewis acid catalyzed reactions of allylic tin and indium reagents are also treated adequately.

The second volume deals with Lewis acids derived from transition metals. Today these compounds constitute an integral part of modern organic synthesis. Although the main focus is on the use of achiral and chiral titanium Lewis acids, other reagents, including some more "exotic" examples such as antimony and hafnium complexes, are not neglected. As well as enantioselective reactions, the volume also covers diastereoselective processes, which are at least as important from a preparative standpoint. A rather interesting chapter discusses transition metal complexes from vanadium to platinum. It is nicely pointed out that the electronic characteristics of the ligand, as well as of the metal itself, are important in influencing selectivity and reactivity.

In principle the subject of Lewis acids in organic synthesis can be organized either according to the metals (as it is here) or according to the types of reactions. Although the chapters treat the subject under the various types of metal complexes, the well sorted index allows one to quickly find information about a given reaction, such as the Diels–Alder reaction or the Mukaiyama aldol reaction.

The work is well worth buying for the wealth of information that it contains, and for the extensive literature coverage. The clear discussion of modern concepts leads the way for exciting novel developments. It is fun to read this extensive coverage of an exciting field.

Andreas Gansäuer
Kekulé-Institut für
Organische Chemie und Biochemie
Universität Bonn (Germany)

Contemporary Boron Chemistry. Edited by *Matthew G. Davidson, Andrew K. Hughes, Todd B. Marder* and *Ken Wade.* Royal Society of Chemistry, Cambridge 2000. xvi + 538 pp., hardcover £ 92.50.—ISBN 0-85404-835-9

Contemporary Boron Chemistry is a typical "proceedings" volume, and contains the texts of papers discussed at the 10th International Conference on Boron Chemistry (IMEBORON X), held at the University of Durham. (The previous volume, reporting on IMEBORON IX, was published in 1997.) The present volume contains 80 contributions, which vary in length from 3 to 8 pages and give interim reports on progress in the various research topics. In most cases the publications cited are not confined to the authors' earlier work, but also include other key references, so that the reader can dig more deeply into the topic concerned. As well as a detailed list of contents, there is an index of authors and a comprehensive subject index. The individual articles mainly follow a uniform clear layout, although occasionally

the readability suffers from figures that are too small, lines too closely spaced, or formula schemes cluttered with too much fine detail.

The editors have succeeded well in presenting the very heterogeneous subject matter in as clear a form as possible, grouping the contributions in nine chapters. There is a good balance between articles on fundamental research topics and those where the main emphasis is on applications. Comparable amounts of space are devoted to electronically well-defined boron compounds and to cluster molecules.

Chapter 1 is concerned with the use of boron compounds in catalytic olefin polymerization, and provides a useful survey of the latest developments in this highly topical area. The aspects treated range from the design of boron-containing ligands as a way of controlling the electronic properties of the central metal, through self-activating systems based on Lewis acid boryl substituents, to novel noncoordinating anions based on carboranes or adducts of B(C6F5)3.

Chapter 2 is devoted to materials and polymers. The topics covered include optimized precursors for producing BN or SiBCN ceramics, and arylene-carborane polymers, which show great promise as high temperature resistant plastics. Polymers in which boron centers form part of a π-conjugated system offer interesting possibilities for nonlinear optics and the development of (blue) light-emitting diodes.

Chapter 3 describes the newest generation of boron carriers for treating tumors by neutron capture therapy. Some of the material here overlaps with the following chapters, which deal with the general chemistry of boron clusters, carboranes, metallaboranes, and metallaheteroboranes. Even after many years of research, the chemistry and photochemistry of these classes of compounds continues to produce a wealth of unexpected results, which are clearly and comprehensively summarized in this book. One also learns about improved methods for preparing small clusters or large conjuncto-boranes.

Compounds containing M–B 2e2c bonds (where M is a transition metal), which were scarcely known ten years ago, have now been thoroughly catalogued, and have already found applications in homogeneously catalyzed organic transformations. These discoveries are certainly a highlight of the chapter on the organic and inorganic chemistry of mono- and diborane systems. It also becomes evident that there are still some unsolved fundamental problems in the molecular chemistry of boron (for example, the problem of synthesizing a B = Si double bond), and these provide many ideas for future research projects. The last chapter of the book presents examples of the valuable information yielded by theoretical methods, both for molecular boron compounds and in relation to solid-state structures.

To summarize, *Contemporary Boron Chemistry* is an indispensable reference source for specialists in the field, and it will also be a valuable guide for the synthetic chemist with a taste for experimenting in areas away from the well-trodden paths. The book is not very suitable for students. On the other hand, it will certainly be a valuable addition to libraries.

Matthias Wagner
Institut für Anorganische Chemie
Universität Frankfurt am Main
(Germany)

Flat Panel Displays. Advanced Organic Materials. (Materials Monographs. Series editor: J. A. Connor.) By *Stephen M. Kelly.* Royal Society of Chemistry, Cambridge 2000. 232 pp., hardcover £ 59.50.—ISBN 0-85404-567-8

In the late 1990s flat imaging screens, as space-saving display devices with a low energy consumption, became a very important part of almost every area of our daily life. The most familiar of these are liquid crystal displays (of which more than two billion units were produced worldwide in the year 2000), but recently various types of electroluminescent displays have also played an increasing role. Many of the display systems now on the market use technologies based on advanced organic materials. In this book S. M. Kelly presents the first concise survey explaining the principles of the most important types of flat panel displays, and describing the relevant properties of the organic materials used.

The first chapter briefly reviews the most important display technologies, and discusses the advantages and disadvantages of the different types from an applications viewpoint. All the following chapters are devoted to the two organic-materials-based technologies that are of greatest commercial importance, namely liquid crystal displays (LCDs) and electroluminescent devices based on organic light-emitting diodes (OLEDs). Each chapter includes an extensive bibliography, providing a solid basis for more in-depth reading.

First the author gives a short introduction to the physical properties of thermotropic liquid crystals and the general principles of LCDs. This is followed by a more thorough discussion of the technologies involved in the different detailed aspects of LCDs, in an informative and carefully presented account which emphasizes the logic of their historical development. Kelly devotes special attention to structure–properties relationships in the various organic materials—a highly topical theme, the theoretical aspects of which are only just beginning to be understood.

For chemists especially, it would have been helpful to include here at least a few examples of reaction schemes for synthesizing the most important classes of liquid crystals. It is also rather unfortunate that the discussion of materials for active matrix liquid crystal displays (AM-LCDs), in which there has been an enormous upsurge of development activity in the last five years, does not give enough information relating to real systems. In particular, although Tables 3.11 and 3.12 list various materials used as components in liquid crystal mixtures for commercial AM-LCDs, they do not include a single one of the fluorinated phenylbicyclohexyl derivatives that have been by far the most common single constituents, in terms of quantity, in recent years. On the other hand, it is pleasing to note that even some very new technologies, such as the IPS (in-plane switching) mode of operation, are discussed from both the materials and the mechanistic viewpoints.

  1433-7851/01/4014-2718 $ 17.50+.50/0

The section on OLED technology, which was only in its infancy until quite recently, is arranged in two parts. The first begins with a concise explanation of the physical fundamentals of organic light-emitting diodes, then goes on to describe display systems using small-molecule organic materials. The second part deals with LEDs based on organic polymers. In both parts the author devotes particular attention to describing special types of display configurations, and discusses the different requirements for the materials to be used in such systems. The chapters include accounts of progress with different approaches to solving the technical problems that have hindered the advance of OLED technology from the R & D phase into commercial production, and these make very absorbing reading.

In discussing the outlook for organic materials in flat displays, Kelly returns to considering the products in which they finally reach the end-user: notebook computers, PCs, mobile telephones, television receivers, etc. Starting from the perspectives of the technology and the commercial needs, he develops what seems to be a very realistic forecast of advances in the next few years.

Although the book has some small faults (too many printing errors, some of which are seriously misleading, and a not very attractive page layout), the overall verdict is positive. The book is well structured from a learning standpoint, concentrates on the most important technologies, and provides sound explanations of the physical principles in a clear way that will also be understood by nonspecialists. It also conveys a feeling for the characteristics of research on materials for flat displays that make it especially attractive: the interdisciplinary collaboration between chemistry, physics, and engineering, and the unusually close connection between fundamental research and technological applications. Therefore the book can be recommended unreservedly for interested chemists and physicists as a sound introduction to this fascinating and very active field of research.

Peer Kirsch
Merck KGaA, Liquid Crystals Division
Darmstadt (Germany)

High-Resolution NMR Techniques in Organic Chemistry. By *Timothy D. W. Claridge*. Pergamon Press, Oxford 1999. vix + 382 pp., softcover $ 49.50.—ISBN 0-08-042798-7

Modern NMR spectroscopy has had an enormous analytical impact on structural questions in nearly all fields of chemistry, and that is still evolving. Today's combination of modern instrumental equipment and established, as well as newer, NMR methods puts a vast number of important analytical experiments at the chemist's disposal. However, in order to be able to use the whole analytical range of NMR spectroscopy most effectively, and to tailor it to specific problems, there is a price to pay. Anyone wishing to use it with reasonable efficiency needs to acquire a solid knowledge of the basic principles, as well as an overview of the most important experimental techniques and their analytical meaning. That is exactly the purpose of this book by T. D. W. Claridge, which aims to provide a firm basis of fundamental knowledge as applied to small and mid-sized molecules. In a nonmathematical approach, based firmly on using pictorial descriptions and numerous instructive figures, the author presents a selection of more recently developed methods as well as already established experiments, which are chosen for their wide applicability. More than ten years after Andy Derome's famous book *Modern NMR Techniques for Chemistry Research,* this book is published in the same series and can be seen as its modern successor.

After a short introduction in Chapter 1, the theoretical basis for recording NMR spectra is given in Chapter 2. The various theoretical aspects are described in conjunction with the relevant pulse sequences and illustrative examples in a very informative way, thus showing their direct connection. In Chapter 3 all practical requirements to run an NMR experiment are described in detail, together with their theoretical background. The various acquisition and processing parameters are explained, and general aspects such as phase cycling, quadrature detection, digital filtering, and automatic gradient shimming are discussed. Sample preparation, spectrometer calibration, and performance tests are described in thorough detail, even including the calibration of pulsed field gradients.

Chapter 4 is dedicated to homo- and heteronuclear one-dimensional techniques. The advantages and drawbacks of the most important decoupling, editing, and polarization transfer methods are described, and alternative techniques are compared.

As an example of two-dimensional spectroscopy, the theoretical and experimental basis of the COSY (correlation spectroscopy) experiment, as well as the interpretation of the spectra thus obtained, is explained in detail in Chapter 5. After introducing signal selection using pulsed field gradients, the author discusses different COSY approaches and common types of homonuclear spectra. The propagation of magnetization within a spin system during a TOCSY (total correlation spectroscopy) experiment is described in a very instructive way with the help of numerous figures and examples.

Chapter 6 presents two-dimensional heteronuclear experiments, and compares the two classical pulse sequences HSQC (heteronuclear single-quantum correlation) and HMQC (heteronuclear multiple-quantum correlation). Together with their gradient-selected phase-sensitive versions, hybrid experiments with multiplicity editing, additional TOCSY or COSY transfer, and long-range correlation are also described.

After a short discussion of *J*-resolved spectroscopy in Chapter 7, Chapter 8 deals with the NOE (nuclear Overhauser effect) and its applications, describing it with many graphic examples. The behavior of multispin systems in both steady-state and transient NOE experiments is described, with many applications. Experimental aspects are also discussed.

Lastly, Chapter 9 provides an overview of recent experimental developments. Different types of pulses, pulse sequences, and new pulse shapes are discussed. Other aspects include comparisons of the different selective pulse shapes and the various water-signal suppression methods. Furthermore, the principles of measuring diffusion constants and experiments on heterogeneous samples with magic angle spinning are touched on.

  1433-7851/01/4014-2719 $ 17.50+.50/0

This book offers a detailed overview of the theoretical basis and the practical aspects of NMR spectroscopy, and successfully presents a selection of the most important and commonly used NMR experiments as applied to small and mid-sized molecules. With only very few mathematical formulas and in a pictorial language, theory and practice are explained using many well-selected examples and numerous excellent and instructive figures. Thus, for each experiment the advantages and drawbacks, as well as possible sources of artefacts, are discussed, and much practical advice is given. For the budding NMR spectroscopist, for the synthetic chemist with an interest in and contact with NMR spectroscopy, and also as a foundation for graduate-level courses on NMR techniques, this book is highly recommended, providing a broad basis of background knowledge. Additionally, with its detailed explanations of all practical aspects, but mainly without giving values of experimental parameters, this book is ideal if used in combination with the book *150 and More Basic NMR Experiments,* by Braun, Berger, and Kalinowski. It is essential for every NMR laboratory dealing with small and mid-sized molecules.

Ruth Gschwind
Fachbereich Chemie
Universität Marburg (Germany)

  1433-7851/01/4014-2720 $ 17.50+.50/0 *Angew. Chem. Int. Ed.* **2001**, *40*, No. 14