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Book Reviews *

Hazardous Chemicals Desk Reference, 5th edition. By R. J. Lewis, Sr. 2002. Wiley-Interscience: New York. £130. 1695 pp. ISBN: 0-471-44165-1.

This is a reference work of moderate size containing 5000 entries, extracted from the well-known compendium *Dangerous Properties of Industrial Materials*. Each entry gives basic properties, synonyms, with some data such as TLV or MAK (when available), U.S. Department of Transportation Classification, NIOSH and EPA listings, and so forth, followed by a discussion of the safety profile. Toxicity data such as LD 50 is not given. An extensive 350-page synonym index and a CAS number index helps to locate compounds. Structural formulae and references to original literature are not provided.

This reference book is useful for preliminary data but the lack of detailed toxicity information will be a limitation for some readers who may prefer the larger compendium. It is a useful, quick source of physical property data.

Of course "hazardous" in the title primarily refers to toxic hazards, although some brief thermal hazard data is included for certain compounds. However, *Bretherick's Handbook of Reactive Chemical Hazards* is much more useful for the organic process chemist/engineer for thermal hazards.

In conclusion, this is a reference book which chemists may consult; for a library, the full data from *Dangerous Properties of Industrial Materials* is probably more valuable.

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Chiral Intermediates. Edited by C. A. Challener. Ashgate Publishing Ltd.: Aldershot, Hampshire, U.K., and Burlington, VT. 2001. 832 pp. £195. ISBN: 0-566-08412-0.

This is a dictionary style book aimed at listing the sources of all commercially available chiral compounds that are not drugs. A total of 4700 compounds are listed in the main section of the book. For each compound the name, alternative names, structural formula, CAS registry number, Merck index number, EINECS number, and molecular formula are given, together with a listing of commercial suppliers of the compounds. Suppliers include those who produce laboratory chemicals as well as bulk manufacturers. There is no indication whether the compound is available in grams, kilograms, or tonne quantities. This main section covers more than 500 pages and is preceded by four short chapters which are an overview of chirality, drivers for the chiral market, sources of chiral compounds (i.e., chiral pool, resolution methods, enzyme processes, etc.), and methodologies for obtaining chiral compounds with examples.

The volume contains useful indexes at the end including CAS registry number, EINECS index, and name/synonym index which will enable a particular compound to be easily located. The addition of a molecular formula index would have enhanced the work.

The final part is a listing of all the manufacturers with addresses and telephone and fax numbers. The addition of e-mail addresses and web-site details would have been useful for ease of access. For some companies a 5−10 line summary of the type of work they carry out is a valuable addition. Usually, for each company only one location is given; thus, to to contact a Japanese company one would be given only the Japanese contact details, not the U.S. or European agent. Some agents, however, are listed in this section.

The book is well-produced and has few errors and omissions. It fills a gap in the market and should be purchased by all companies involved in the synthesis of chiral compounds, whether drugs, agrochemicals, electronic chemicals, flavours and fragrances, or intermediates.

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Modern Organocopper Chemistry. Edited by N. Krause. Wiley−VCH: Weinheim. 2002. 377 pp. £80. ISBN: 3-527-29773-1.

The editor has collected most of the well-known names in organocopper chemistry to write chapters in this comprehensive volume, which covers structure and reactivity, transmetalation methods for producing organocopper reagents, heteroatom cuprates, addition of organocopper reagents to multiple bonds, enantioselective conjugate additions, allylic substitutions, and copper-mediated reductions.

This latter chapter is the only one which gives actual experimental details, but in this area it is surely vital to describe the experimental procedures exactly to get reproductible results.

The book will inevitably be compared with the earlier volume edited by R. J. K. Taylor, *Organocopper Reagents*; Oxford: New York, 1994 (ISBN 0 19 855 758 2) which is less comprehensive, but contains many more practical methods.

The chapters are all well-written and well-referenced, with literature coverage to 2000 and occasional references in 2001.

Highly recommended.

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*Unsigned book reviews are by the Editor.

Fine Chemicals through Heterogeneous Catalysis. Edited by R. A. Sheldon and H. van Bekkum. Wiley−VCH: Weinheim. 2001. 636 pp. £95. ISBN: 3-527-29951-3.

This important book focuses on current methods which are used, or have the capability to be used, for the manufacture of fine chemicals. The work comprises chapters by 80 authors from academia and industry, in sections entitled Introduction, Basic Principles, Solid Acid Catalysts (General, Aromatic Substitution, Rearrangements/Isomerisations, Miscellaneous), Solid Base Catalysts, Catalytic Hydrogenation and Dehydrogenation, Oxidation, and Carbon−Carbon Bond Formation.

In general, there were some excellent chapters by the authors in industry, who reviewed progress made in key reactions, particularly in the catalytic hydrogenation section. Readers may not be familiar with the Mitsubishi process for reduction of carboxylic acids to aldehydes using hydrogen at 350−400 °C, a pressure of 0.1−0.5 MPa, and a heterogeneous Cr_2O_3 catalyst. The scope of this reaction is explored, and a brief description of the continuous process is given in the 10 pages devoted to this topic.

The chapter on Friedel−Crafts acylation by Metivier from Rhodia describes progress on replacements for aluminium chloride and includes the description of Rhodia's process for acylation of anisole with acetic anhydride using a zeolite catalyst—this demonstrates the changes that have already taken place in attitude in industry in an attempt to become more environmentally friendly and incorporate "green chemistry" principles. A comparison of the block diagrams (listing the unit operations) spells out the advantages. For the new process there is only reaction and distillation, for the old process there are eight operations. This process is operated continuously using a fixed-bed catalyst, gives high selectivity for the para isomer, is cost-effective, and minimises effluent.

There are many other similar examples in the book which illustrate the progress that has been made in fine chemicals manufacture. On page 1, the editors define what they mean by fine chemicals, that is, a chemical made in less than 10000 t/a (other industrialists use 1000 t/a) at a price of more than $10/kg. They are made on multipurpose equipment via multistep processes. However, the successful applications of heterogeneous catalysis have nearly always (catalytic hydrogenation excepted) been operated in continuous, dedicated plants using harsh conditions in single steps, that is the applications have been for the high-volume, low-molecular weight molecules at the bulk/fine chemical interface. There is a need to apply the principles outlined in the book to lower-volume products, and this handbook will promote this by educating organic chemists in the latest developments.

Of course, there are many reasons why heterogeneous catalysts are not used more widely. One reason is that organic chemists' knowledge of heterogeneous catalysts is lacking compared to their knowledge of homogeneous catalysts (this is compounded by the tendency of the heterogeneous catalyst community to have its own journals—the handbook gives thousands of useful references for organic chemists to explore). Another reason is the lack of commercial availability of many of the catalysts described, particularly in the chapters written by the academic authors. Organic chemists will not take the trouble to make their own catalysts, with all the issues of reproducibility, leaching, and so forth, when they can buy homogeneous catalysts (or the separate metals and ligands) off the shelf.

The chapters written by academic authors (which are in the majority) describe current research but are forward-looking, and each section has a conclusion which summarises the present scope and future applications. Of course the focus is on clays, zeolites, silicas, molecular sieves, sulphonated surfaces such as polysiloxanes, silica, Nafion resins, and so forth for use in basic reactions such as alkylation, acylation, halogenation, nitration, oxidation and reduction, rearrangement and isomerisation, dehydration, cyclisation, and so forth. These are the basic building blocks in the synthesis of every complex molecule, and organic chemists will find a treasure-trove of ideas in the chapters, with lots of references to reviews, monographs, and original papers.

There are some minor deficiencies. Turnover member and frequency are hardly mentioned, (reflecting the predominantly academic authorship) although catalyst poisoning and lifetime are discussed in many chapters. Chemists would like to compare heterogeneous catalysts—with all their advantages of product separation, catalyst recovery, recycling or reuse, and solvent recovery—with homogeneous catalysts designed for a similar transformation, but few authors make that comparison.

The handbook is relatively free from errors and omissions, although the omission of a key equation in the section on scale-up of stirred tank reactors/runaway reactions is a surprising lapse on the part of the publisher. References are to the end of 1999; thus, a vast amount of recent work will have to wait for a second edition in a few years' time.

Recommended reading for all industrial chemists!

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