

## Book Reviews \*

**Explosives. 5th Edition.** By R. Meyer, J. Kvhler, and A. Homburg. Wiley VCH: Weinheim. 2002. £95. ISBN 3-527-30267-0.

*Explosives* is a concise handbook in encyclopaedic format. It is not intended as a systematic presentation of the science of explosives. It includes data on individual compounds used in the explosives industry, presented in alphabetical order. Process chemists will be disappointed that there is not more information on preparative methods, particularly on large scale, and on the special precautions needed in the manufacture of explosive materials. There is no mention of the importance of the correct crystal form of some explosives (polymorphism), except for the compound HNIW.

For safety professionals, useful data on energy of formation is presented for each compound listed. They will also be interested in two long sections on "Detonation" and "Thermodynamic Calculation of Decomposition Reactions".

The volume does not give references directly in the main text but lists comprehensively the literature on explosives. This means it is not easy to find the original references, for example, those for how to synthesise a particular molecule.

A comprehensive index is provided but is somewhat redundant in view of the alphabetical listing of topics on the main text.

OP020086B

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**Transition Metal Reagents and Catalysts.** By Jiro Tsuji. Wiley: Weinheim. 2002. 496 pp. 99 Euro, 146 SFR. ISBN 0-471-56027-8.

The field of transition-metal reagents and catalysts is vast and continues to expand unabated. New organometallic reactions and cascade processes continue to be developed and applied in elegant ways to increase efficiency in organic synthesis. Consequently, can a book of just 470 pages, written by a single author, do justice to the bewildering array of different metal-mediated reactions and their applications in synthesis? The answer is **yes**, when the author is Professor (now Emeritus, but long may he continue!) Jiro Tsuji, one of the pioneers in many palladium-catalysed processes. From the vast array of new processes, Profess Tsuji has chosen the most important ones from the last 35 years and has cited the most impressive applications in synthesis. For example, important features in DUPHOS-mediated hydrogenations are given: tetra-substituted enamides can be employed, *E/Z* mixtures can be used without an impact on enantioselectivity, and improved routes to enamides are described. Rawal's

classic synthesis of strychnine is given a good airing in which a Heck reaction not only is used to construct the C ring of the pentacyclic alkaloid but also controls double bond geometry of an exocyclic olefin. However, the book is not simply a catalogue of a range of reactions; explanations aimed at improving understanding are very briefly provided. For example, the use of  $\text{Co}_2(\text{CO})_6$  complexes of acetylenes is described together with the mechanism of how the metal complex is able to stabilise a carbocation adjacent to it. This clearly helps in the subsequent discussion on the applications of this complex in organic synthesis.

The examples I have chosen have been selected to illustrate the breadth of this book. Of course, commonly used organometallic reactions, for example, cross-coupling reactions, are very well described and include couplings with alcohols and amines. The literature is covered up to 1998.

This book is a must for every organisation engaged in assembling organic molecules and is strongly recommended for personal collections, because those who are able to invest the time to go through it will discover, or be reminded of (as happened to me!), new reactions which illustrate the power of organometallics for organic synthesis. And you will have learnt from one of the grand masters of the subject!

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OP0200726

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**Handbook of Pharmaceutical Salts: Properties Selection and Use.** Edited by P. H. Stahl and C. G. Wermuth. Verlag Helvetica Chimica Acta/Wiley-VCH: Zurich. 2002. 374 + XII pp. £85. ISBN 3-906-390-26-8.

The editors have gathered together industrial and academic authors from a variety of disciplines to produce this unique and valuable book. It should be in the library of every pharmaceutical company, and it should be read by all process R&D chemists and preferably by medicinal chemists, too.

The topics covered include physicochemical aspects of salt formation, solubility and dissolution of salts, and evaluation of solid-state properties of salts. The latter chapter by Danielle Giron of Novartis focuses on DSC of polymorphs and solvates of salts and is an excellent up-to-date mini-review.

Further chapters on pharmaceutical aspects and biological effects of salt forms are followed by excellent chapters on salt-selection strategies and a procedure for salt selection and optimisation. The latter by Michael Bowker, formerly of Rhone Poulenc Rorer, which became Aventis, is an expanded version of his contribution that was published in the OPRD

\*Unsigned book reviews are by the Editor.

special issue on Crystallization and Polymorphism in 2000 (*Org. Process Res. Dev.* **2000**, *4*, 427).

A chapter of practical value to process chemists is on large-scale aspects of salt formation and is followed by summaries of patent issues and regulatory aspects of drug salts.

Some practical procedures and appendices listing the properties of the major salt-forming acids and bases complete the volume.

As with any multi-author work, there is a certain inconsistency in style, but the editors have ensured that the coverage of the subject is wide, with no significant gaps. The book is very well produced with only the occasional mistake or typographical error.

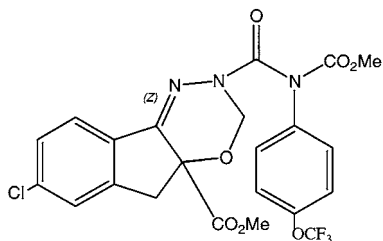
In conclusion, the volume is highly recommended to process chemists and to those involved in other disciplines in the pharmaceutical industry. It fills a vital gap in the literature, and the references in the chapters will point process chemists to interesting works, particularly in the pharmacy journals, which they may not otherwise pick up.

OP0200975

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**Synthesis and Chemistry of Agrochemicals VI.** Edited by D. R. Baker, J. G. Fenyves, G. P. Lahm, T. P. Selby, and T. M. Stevenson. ACS Symposium Series 800. American Chemical Society: Washington, DC (Distributed by Oxford University Press). 2002. xii + 364 pp. £95/\$135.00. ISBN 0-8412-3783-2.

The 6th volume in the series maintains the high standards of previous volumes with the emphasis on discovery synthetic routes to new agrochemicals. As such there is nothing of direct value to process chemists although the book is interesting since agrochemicals are more complex and the syntheses more challenging than in the past. One chapter which will be of great use to process R&D chemists is "Towards The Manufacture of Indoxacarb" by the DuPont Process Development group at Newark, DE. They describe



Racemic Indoxacarb

the changes made to the synthesis of the insecticide to enable cost-effective manufacture, and the chapter contrasts with the previous chapter describing the discovery chemistry routes.

In summary, this is a well-produced volume that makes excellent reading.

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**The Pilot Plant Real Book - A Unique Handbook for the Chemical Process Industry.** By Francis X. McConville. FXM Engineering and Design: Worcester, MA (<http://www.pprbook.com>). 2002. 312 pp. Price \$89.95. ISBN 0-9721769-1-8.

This book brings together a large body of information of practical use to all pilot-plant users and people involved in scale-up. The early chapters (The Pilot Plant, Equipment and Operations) give an excellent introduction to pilot plants and how they operate with descriptions and diagrams of various pieces of equipment, whilst the later chapters (Chemical Data, Chemical Hygiene and Safety, Materials Selection, and Miscellaneous) bring together a huge amount of data, such as  $pK_a$ 's of common acids, bases and buffers, tables on glove selection, pressure conversion tables, and a huge compatibility table listing over 500 common chemicals/reagents and their compatibility with 48 different materials of construction (12 metals, 16 plastics, 19 elastomers and glass). In between are chapters with very useful practical advice on the key physical aspects of pilot-plant operation (Liquid Handling, Heat Transfer, Electricity and Instrumentation, Solvents, and Compressed Gases), which also contain tables of relevant data. There are useful tips and hints in most of the chapters and the lists of 12 Things To Do and 12 Things To Avoid during process scale-up should be part of the induction process for all new recruits in to Process Research and Development. In addition there are many useful recommendations for systems and protocols that will be of great value to anyone planning to install a pilot plant. The only area not covered sufficiently is continuous distillation, but this is a minor fault in an otherwise excellent book. The book is well indexed and has a comprehensive list of references, which is usefully listed alphabetically by author. It is highly recommended to all chemists and engineers working in Process Research and Development. Quite simply, every pilot plant should have one. Accepted January 16, 2003.

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**Ionic Liquids in Synthesis.** Edited by P. Wasserscheid and T. Welton. Wiley-VCH: Weinheim. 2003. xvi + 364 pp. £80. ISBN 3-527-30515-7.

This volume is designed to take the reader from little or no knowledge of ionic liquids to an understanding of the current state of the art. The two editors are very well-known

in the field, and they have assembled a formidable list of chapter authors from the important centres of excellence in this important topic.

After a brief introduction, synthesis and purification of ionic liquids is discussed in depth, followed by chapters on physicochemical properties, molecular structure and dynamics, and organic synthesis. The latter will be of most interest to readers of *Organic Process Research & Development*, and this is a comprehensive survey. Further chapters on inorganic synthesis, polymer synthesis, and biocatalysis complete the volume.

I should also mention the preface, which is written by Professor K. Seddon, an acknowledged pioneer in ionic liquids, in a provocative style. It is the most interesting preface I have read for many years, discussing issues such as “Are ionic liquids really green?” This is an important issue for industry and highlights some of the concerns for further industrial use. How toxic are ionic liquids (particularly if impure), and how are the liquids to be reused, recycled, upgraded, or finally disposed of? The book could have done with a separate chapter on these issues—the lack of one probably reflects how little has been done—but needs to be done in the future—if industrial take-up of the excellent academic chemistry in the area is to be achieved.

A key issue mentioned in several chapters is cost. In a section written by those who are making ionic liquids on kilogram scale, it is suggested that a future price of around 25–50 euros or dollars per kilogram (on a tonne scale) might be achieved in the medium term. Of course this is going to be too high a cost for most commercial uses, unless efficient reuse or recycling can be achieved.

The key question of the quality of ionic liquids as solvents is covered in depth, as is purification, but it seems that this may be a stumbling block for industrial use. The currently available purification methods may not be adequate to ensure

the consistent quality of solvents which do not lead to impurity build-up in products (e.g., pharmaceuticals). These potential problems need to be addressed in the future.

Progress is being made in industrial processes, and scale-up is mentioned in two places in the book. An interesting section written by authors from the Institut Francais de Petrol describes work on continuous pilot-plant operation of a process for dimerisation of alkenes using a nickel complex catalyst. The process has been run continuously for 5500 h, and the ionic liquid process had a number of advantages over the current Dimersol technology (e.g., reduced nickel consumption and higher selectivity). In this example the product is easily separated from ionic liquid and catalyst, and the latter are recycled to the reactor. Since the starting butanes are much more soluble in the ionic liquid than are the octane products, further reaction to produce trimers is much reduced compared to that in the conventional homogeneous process.

This example shows what can be achieved technically, but the costs of the process were not divulged—very much will depend on the continued recycle of the ionic liquid and whether any catalyst poisoning occurs; thus far it does not seem to be a problem in this process but may be in other syntheses.

The chapters are well written, and the editors have done an excellent job in ensuring a consistency of coverage with little duplication. This is a very impressive and up-to-date first book on ionic liquids, invaluable to newcomers and to those active in the field. What a pity the index is not up to the same standard (omissions and errors!).

In conclusion, this excellent work should be read by industrial chemists and should be in every industrial chemistry library. Highly recommended.

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