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Book Reviews

Chemical Reaction Hazards, 2nd Edition. Edited by J. Barton and R. Rogers. Institute of Chemical Engineers: Rugby, U.K. 1996. 225 pp. ISBN 0-85295-341-0. £35.00.

The first edition, which was very well received, was commissioned by the Institute of Chemical Engineers, who set up a working party comprising chemists and engineers from the fine chemicals/pharmaceuticals industries, to produce the book. Inevitably, the bulk of the effort fell on the two editors, and they have now revised the 1993 edition. The editors are consultants in chemical reaction hazards (and other safety related areas) and have wide experience of safety assessments in industry. This book is a useful guide for the non safety specialist, particularly for newcomers to process R&D and even for students, providing that it is recognised that "assessing" chemical reaction hazards is the scope of the book. No effort is made to talk about design of safe chemical processes, but much of this can be inferred from what is in the book, i.e., examples of when things go wrong!

The book contains sections on process assessment and process definition, techniques for evaluating chemical reaction hazards (including DSC, Dewar calorimetry heat flow and power compensation calorimetry, ARC, VSP etc.) and a major, excellent chapter on interpreting data with respect to process operation and plant design. This is followed by a well-written introduction to process risk analysis, including hazard and operability (HAZOP) and hazard analysis (HAZAN).

The other chapters are concerned with selection and specifying a basis for safety, general hazards of plant operation (e.g., fire and explosion) and operating procedures and instructions. The latter would have best been illustrated by a detailed example of good process working directions, possibly in an appendix.

The second edition has been considerably enhanced by the addition of appendices, in particular, one covering summaries of 100 case histories of incidents in the past. Process R&D chemists will welcome a chance to browse through these case studies, but will be disappointed that (1) there are no references to the original literature other than to earlier works by the editors, so it is difficult to track down more information about the incident; and (2) the individual incidents are not referenced in the index (e.g., the chemicals used are not listed), making it difficult to search for a particular incident.

Some of the summaries are a little superficial; for example, case history number 10 (in which I was involved!) does not include the vital information that sodium hydride and DMF react exothermically at moderate temperature, in the absence of other more reactive components. Since the reader cannot chase up the original literature easily, this serves only to whet the appetite, still leaving the reader hungry afterwards.

The text of the new edition has changed little from the 1993 edition, and the appendices are the major addition to the book. Unfortunately, the references have not been updated. Whilst the principles outlined in the book have not changed radically in the last three to four years, there has been a changing emphasis towards inherent safety. Some references to case studies in the 1993−1997 period would also have enhanced the text.

In conclusion, whilst I have some reservations, as discussed earlier, the book is clearly written with an easy-to-read style and can be recommended as an introductory guide to assessing chemical reaction hazards. For those chemists and engineers requiring more detailed information, the book *Thermal Hazards of Chemical Reactions* by T. Grewer (not referred to by Barton and Rogers) published by Elsevier (1994) is perhaps more comprehensive.

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Industrial Organic Chemicals. By H. A. Wittcoff and B. G. Reuben. Wiley-Interscience: New York. 1996. 531 pp. ISBN 0-471-54036-6. £60.00.

One of the major decisions which process R&D chemists make in designing a new synthetic route is the choice of appropriate starting material, trying to find the molecule with the maximum complexity, appropriate for the synthesis, but at the lowest price and with availability on a kilogram to tonne scale from more than one supplier. However information on potential raw materials is not easy to come by, and chemists rely on their knowledge of the organic chemicals industry to assist with the decision making. Any book which helps chemists to understand the interrelationships between chemicals and the interdependence of various parts of the organic chemicals industry (petrochemicals, polymers, speciality chemicals, colour chemicals, flavour and fragrances, agrochemicals and pharmaceuticals) is therefore of value.

Wittcoff and Reuben's latest volume is an update of their earlier two-volume work, *Industrial Organic Chemicals in Perspective*, published in 1980 (Wiley-Interscience). Essentially the same approach is taken: a discussion of the basic building blocks of the organic chemicals industry, where they arise from and how they are used. The coverage is mostly bulk chemicals, made by continuous processes, rather than the fine chemicals, batch-processing, sector. So petrochemicals, polymers and speciality chemicals are covered in detail, with only one or two chapters, for example, those on carbohydrates, fats and oils and industrial catalysis, being of interest to those working with higher added-value chemicals. A key emphasis is towards economics and cost-effective production processes, minimising waste and pollution.

The introductory section contains a valuable bibliography of books and encyclopedias on industrial organic chemistry, with critical assessment of the utility of each volume. Each of the following chapters, however, has only a "notes and references" section, and many of the processes described in the text are not fully referenced, which makes it difficult to track down the source of some of the information.

Industrial organic chemists and students of applied chemistry will find much of value in this text, but will probably enjoy it as general reading, rather than as a reference work of encyclopedic nature. The style of writing makes it enjoyable to read, and it can therefore be recommended as an undergraduate text to supplement academic organic chemistry courses.

For the process chemist, the key sections are those where alternative routes and processes to basic building blocks are presented, with the advantages and disadvantages of each discussed. If more details on the processes are required, the work by K. Weissermel and H.-J. Arpe (*Industrial Organic Chemistry*; VCH: 1993) gives much more information on base chemical processes for C_1-C_{10} building blocks.

For those working in the fine chemicals industry, the coverage of intermediates (particularly heterocyclic chemistry) is sparse, and agrochemicals and pharmaceuticals are hardly mentioned, but perhaps this is too much to ask for in a single volume. Pharmaceuticals were, however, covered in the authors' earlier volume, *Pharmaceutical Chemicals in Perspective* (Wiley-Interscience: 1989).

Perhaps this reflects the viewpoint, promulgated in government as well as in industry, that the chemicals and pharmaceuticals sectors are considered separately. For the organic chemist and engineer working in fine chemicals, needing contacts in both chemicals and pharmaceuticals, books and literature should reflect that pharmaceutical chemicals are a key economic factor in the chemical industry as a whole, even though tonnages are low. The bulk chemical industry seems to be obsessed with tonnage and turnover rather than profitability!

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