

## Book Reviews

**Organic Reactions in Aqueous Media.** By Chao-Jun Li and Tak-Hang Chan. Wiley: Chichester. 1997. 199 pp. ISBN 0-471-16395-3. £50.00.

Water has so many advantages as an industrial solvent—cost, safety, environmental friendliness—but has always suffered from the disadvantage that few organic reactions could be carried out in aqueous media. Over the last 20 years, this myth has been exploded, and this review of aqueous chemistry is very timely. Professors Li and Chan have produced a comprehensive collection of reactions that can be carried out in water including pericyclic reactions, nucleophilic additions and substitutions, and Grignard and Barbier reactions as well as other organometallic processes and finally oxidations and reductions. The final chapter assesses industrial applications but in only nine pages, so none of the processes (adiponitrile, sebacic acid, hydroformylation, etc.) are discussed in much depth.

This is a useful compilation of the current state of the art in aqueous chemistry, rather than a stimulating read, but should be consulted by all industrial chemists, who may be surprised by the scope of successful organic processes which occur in water. In general, enzymatic and phase-transfer processes are beyond the scope of this volume. Coverage of literature is to mid-1996 (patents only to 1991); however, in the last 18 months, there have been further advances so that we should expect that, in future editions, the industrial applications will require much more than nine pages.

OP9800111

S1083-6160(98)00011-5

**Process Safety Analysis—An Introduction.** By R. Skelton. Institute of Chemical Engineers: Rugby, UK. 1997. 213 pp. ISBN 0-85295-378X. £26.00.

This IChemE volume is a good introduction to safety analysis for chemists and engineers. It has developed out of teaching material for a Cambridge University course. In general, processes discussed are mainly continuous, with a few references to batch/semibatch processes under the HAZOP section.

Key areas covered are the concept of risk, safety in design and operation, HAZOP, failure mode and effect analysis, quantitative risk assessment, logic trees, consequence modelling, and last, but possibly most important, human factors.

Skelton reckons that under low-stress conditions an operator makes an error in a routine task between 1 in 100 and 1 in 10 000 times, depending on the nature of the task. Under high-stress conditions, this can reduce to 1 in 10. Key aspects which can increase errors include anxiety, time pressure, lack of information available, becoming distracted by other events, and vigilance failure.

Batch/semibatch processes are regarded as inherently less safe than continuous processes, particularly when scaled up to high tonnages. Unfortunately, in the fine chemicals industry, the low tonnages and constant product changes mean that non-continuous processes are in the majority; therefore safety should be of higher priority. Although chemical engineers in their undergraduate and postgraduate course usually receive a considerable amount of safety education, this is sadly lacking in chemistry courses. The book therefore provides a good introduction to the concepts of process safety analysis with some examples. Perhaps most of interest—particularly to students—is the risk analysis problem of working out the probability of a pub running out of beer!

OP980013L

S1083-6160(98)00013-9

**Case Studies in Environmental Technology.** Edited by P. Sharratt and M. Sparshott. Institute of Chemical Engineers: Rugby, UK. 1997. 208 pp. ISBN 0-85295-2. £39.00.

This paperback volume, based on an IChemE symposium of the same name, describes a range of emerging technologies for process improvement and emphasises in some chapters the cost-effectiveness of environmental compliance. It contains much that is of interest to process R & D and production chemists, including waste minimisation and pollution control techniques, clean design of batch processes, solvent recovery options, and new ways of dealing with VOCs and odorous byproducts.

Since all the chapters are based on lectures by the chapter authors, the whole volume is readable but lacks depth; many chapters have no references. However, there are some excellent sections, including the following: Integrated Pollution Control at Allied Colloids; Solvent Management—avoid or reduce investment in VOC abatement (AEA Technology and March Consulting Group);  $\text{NO}_x$ —no problem: process improvement and pollution prevention with hydrogen peroxide (Solvay Interox); controlling VOC emission using low-temperature condensation (BOC); odour reduction using activated carbon (Chemviron).

One technique which should become more widely used is flameless thermal oxidation, used to control chlorinated compound emissions in agrochemical and fine chemical processes. A skid-mounted abatement system, when attached to a pre-existing scrubber, has an impressive removal efficiency of 99.99% (data from Thermatrix, who obviously sells the equipment).

Since most of the chapters/presentations are from companies who have some technology to sell, we must be wary

that competitive techniques are not given full credit. Nevertheless, this is a handy little volume.

OP980014D

S1083-6160(98)00014-0

**Research & Development Management.** By P. Bamfield. VCH: Weinheim. 1997. 178 pp. ISBN 3-527-28778-7. £50.00.

The book begins with a definition of R & D as “the invention and development of products, processes, systems and services which will provide the company with a commercial opportunity”, perhaps a broader definition than many scientists would have given. This emphasises the wide scope of the book, beginning with an opening chapter on building the scientific skills base, and defining “skills gaps” which need to be filled by recruitment or by retraining of existing personnel.

Development of people and management of performance and career development are covered, with an example from process development. Perhaps the most interesting section, though one of the shortest, is on managing creativity, requiring a balance between the chaos often surrounding creative scientists and the stability needed to run an organisation efficiently. In an R & D environment, living with failure is a constant problem that managers have to deal with.

Section B discusses organising for an innovative environment and is kept at a rather basic level whereas section C on creativity and innovation is the most interesting. For me, page 97 says it all: creativity requires stimulation at the individual level including freedom to think, an opportunity to carry out unscheduled experiments, and wide contacts; all these involve some element of “free” time. At the company level a creative culture and a commitment to medium and longer term research are required—accountants please note!

The next section covers exploitation, including intellectual property and development of ideas both within the company and through joint ventures. The final chapters relate to project management and the interfaces between R & D, manufacturing, and marketing, with emphasis on process development and the cutting of lead times.

The overall view is very much a large multinational company view of R & D management, which may not necessarily translate to smaller companies. Nevertheless this is a useful basic overview of the principles and practice of managing R & D.

OP980012T

S1083-6160(98)00012-7

**Organic Synthesis in Water.** Edited by Paul A Grieco. Blackie/Thomson Science: London, UK, 1998. 320 pp. £75. ISBN 0 7514 0410 1.

T. Laird

In London, we often say that you can wait a long time for a bus, and then two come along at the same time. Although there have been some excellent reviews in the past few years, we have waited for a book on organic synthesis in water, and in 1997/1998, there have been two,<sup>1</sup> the Grieco book being by far the best. He has assembled a multinational team of experts in the field to cover the topic in great depth, with little overlap between the chapters. Early sections on Diels–Alder, hetero Diels–Alder, and Claisen rearrangements (100 pages in all) are followed by chapters on carbonyl additions, transition metal catalysis, oxidations and reductions, aldol and Michael additions, and finally water stable rare-earth Lewis acid-catalyzed reactions in water. In a total of 300 pages, one is left with the impression that there are few reactions which cannot now be carried out in water or aqueous organic media. Most of the chapters were well written but with references only up to mid-1996 in many chapters, implying that it has taken a long time from receipt of manuscripts to publication. In this rapidly expanding area of organic chemistry, this is a weakness; since authors will have provided a manuscript on disk, why does it take so long for publishers to get the book on the market?

A further minor criticism is that industrial processes and the potential of aqueous chemistry in industry should have been discussed in a separate chapter. Beletskaya and Chepiakov cover some aspects of industrial applications in the transition-metal catalysis chapter and Kobayashi discusses issues such as recycling of expensive rare-earth catalysts and reagents in the final chapter.

There is surprising inconsistency of style in the format of references at the end of each chapter. Whereas most chapter authors use ACS style, Lubineau et al. use the author/year format without reference numbers, in addition giving the title of each reference. Beletskaya and Chepiakov use a mixture of the two. As a reader it is very useful to have the exact title of each reference as well as the author, journal, and page number, since it saves looking up potentially useless references, directing one's attention to the most important papers and reviews. Perhaps we should do this in OPRD!

In summary, this is an excellent book which should be in every industrial and academic library and should be read by all process chemists.

OP9800358

S1083-6160(98)00035-8

(1) For the other publication, see: Li, C.-J.; Chan, T. H. *Organic Reactions in Aqueous Systems*, Wiley-Interscience: New York, 1997.