Book Reviews*

Open Tubular Column Gas Chromatography in Environmental Sciences. By F. I. Onuska (Canada Centre for Inland Waters) and F. W. Karasek (University of Waterloo). Plenum Press: New York. 1984. xiv + 281 pp. $42.50. ISBN 0-306-41589-5.

This book is a general text on the applications of open-tubular-column gas chromatography (OTCGC) to environmental analysis. It is a companion book to the recently published "Mass Spectrometry in Environmental Sciences" (Karasek, Hutzinger, and Safe, Editors; Plenum Press, 1984).

Onuska and Karasek correctly point out that OTCGC is *the* most important separation tool available to the organic environmental chemist. They set out to present the salient features of OTCGC, and they succeed in that goal. There are chapters on general GC theory, the open tabular columns themselves, inlet and detector systems, and quantitative data handling. There are also chapters on sample preparation (how does one get the organic compounds out of the air or water and into the GC) and on applications. The latter is a long (95 pages) review of the literature.

Although this book is generally a good review of the chosen topic, it has two faults. First, it is dated. There are only a few references past 1981, and there are some modern topics which are not well covered (fused silica columns, for example). Furthermore, there is a statement in the preface that "packed-column GC is rapidly being replaced with OTCGC". It is surprising to read about this transition in the present tense. Most chromatographers would agree that this transition took place 3–6 years ago.

The second fault is not one Onuska and Karasek could have prevented. A competing book on the same topic ("Open Tubular Column Gas Chromatography: Theory and Practice" by M. L. Lee, F. J. Yang, and K. D. Bartle, John Wiley Publishers, 1984) has recently been published, and their book suffers by comparison. The Lee et al. book is twice the length and covers virtually the same material in more depth and with more sophistication. Thus, the scholar on a limited budget would do better with the Lee et al. book. The environmental specialist with more money may also want the Onuska and Karasek book.

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Springer Series in Chemical Physics. Volume 41, High Resolution Spectral Atlas of Nitrogen Dioxide 559–597 nm. By K. Uehara and H. Sasada (Keio University, Yokohama, Japan) Springer-Verlag: Berlin, Heidelberg, New York, Tokyo. 1985. vii + 226 pp. $37.00. ISBN 3-540-15027-7.

The title sums up this book exactly: it is an atlas of the absorption spectrum of gaseous NO_2 in the wavelength region 559–597 nm. Essentially, it is an update of the "Spectral Atlas of Nitrogen Dioxide 5530–6480 Å" by D. K. Hsu, D. L. Monts, and R. N. Zare (Academic Press 1978). The wavelength coverage of the new atlas is not so wide, but the resolution of the spectra is higher, because they were recorded with a 20-MHz line-width dye laser rather than with a grating spectrograph. The absorption scale is quantitative, which makes a difference for those regions (such as 593 nm) where the plates used by Hsu, Monts, and Zare were almost saturated. Where I have compared the tabulated wavenumbers of strong sharp lines the two atlases are in very reasonable agreement.

The new atlas begins with 24 pages covering the experimental details and giving brief summaries of the work done on NO_2 with lasers at all frequencies. Next comes a bibliography listing 130 papers on the spectrum of NO_2 published since 1978 and then follows the atlas. Each page of the atlas covers about 6 cm^{-1} and displays the absorption spectrum together with a Stark modulation spectrum taken with a.c. modulation of a 12 kV/cm dc field. Under the two spectra are the tables of wavenumbers, typically 70 per page. There is no overlap between pages.

By its nature this book will have only a very limited appeal. It will be of interest to some of the high-resolution gas-phase spectroscopy community, because it illustrates the truly terrifying complexity of the absorption spectrum of even a simple molecule where extensive spin and vibronic coupling between electronic states is occurring: there is nowhere in the whole atlas where the absorption coefficient drops to zero. The Stark modulation spectrum is intriguing since it bears so little relation to the absorption, but this is not unexpected because the Stark effect arises in NO_2 essentially only from accidental degeneracies. The absorption spectrum presented here will of course be useful as a reference in high-resolution atmospheric work and other areas, but the lists of line frequencies will serve more to identify the lines than to act as calibration standards: iodine is a much more convenient secondary wavenumber standard than NO_2.

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Ionic Hydrogenation and Related Reactions. By D. N. Kursanov, Z. N. Parnes, M. I. Kalinkin, and N. M. Loim (A.N. Nesmeyanov Institute of Organoelement Compounds). Translated by L. Wiener. Harwood Academic Publishers: London and New York. 1984. xv + 252 pp. $112.00. ISBN 3-7186-0145-1.

This book is the first volume of the Soviet Scientific Review Supplement Series: Chemistry, a series that is intended to give "a more complete exposition, including coverage of the world literature", in areas in which the contributions of Soviet scientists have been particularly significant.

By "ionic hydrogenation" is meant the formal addition of hydrogen by the two-step process of protonation followed by abstraction of hydride from another compound, such as R_3SiH, R_3CH, etc. The authors contrast this process with the more familiar reduction by complex hydrides, which they term "nucleophilic hydrogenation". The subject is reviewed in eight chapters, arranged according to the type of structure being reduced. A useful appendix gives a variety of synthetic examples with experimental detail. Not only is the resulting review useful as such, but in addition, information and insights from the authors' own experience have been integrated into the reviews. In general, this is a commendable book. However, the lack of a subject index is a serious drawback.

Books on Mathematics of Interest to Chemists

Process Systems Engineering PSE '85: The Use of Computers in Chemical Engineering. The Institution of Chemical Engineers, Symposium Series No. 92. EFCE Publication Series No. 40. PergamonPress: New York. 1985. vii + 684 pp. $63.50. ISBN 0-08-031417-1.

Contains 54 papers dealing with design of flow sheets, aids for plant operation, synthetic processes, etc., all from a conference held in Kyoto in 1982.

Analog and Digital Electronics for Scientists. Third Edition. By Basil H. Vassos and Galen W. Ewing. John Wiley & Sons: New York. xiv + 501 pp. $39.95. ISBN 0471-81138-6.

This edition follows by five years the previous one. It is "intended ... for the use of scientists who need to understand the circuitry employed in instruments found in their laboratories and who may be called upon to design and construct some instruments of their own".

Mathematics for Chemists. By P. G. Francis. Chapman and Hall: London and New York. 1984. x + 193 pp. $33.00 (cloth); $15.95 (pb). ISBN 0-412-24980-4 (cloth); 0-412-24990-1 (pb).

This small book aims to present "those aspects of mathematics that are necessary for first-degree students". It begins with algebraic and geometrical methods and devotes most of its content to differential calculus in its various ramifications. A concluding chapter is devoted to experimental error.

Chemical Process Computations. By Raghu Raman (ICI Australia Operations Pty Ltd). Elsevier Applied Science Publishers: London and New York. 1985. x + 575 pp. $90.00. ISBN 0-85334-341-1.

This book "presents the fundamentals for preparing efficient and reliable algorithms and computer solutions of mathematical models for a broad spectrum of process engineering problems".

Special Functions for Engineers and Applied Mathematics. By Larry C. Andrews (University of Central Florida). Macmillian Publishing Company: New York. 1985. viii + 357 pp. ISBN 0-02-948650.

This book will have only a very limited appeal to chemists in general, unless their work has a close relationship to physics or engineering. In its ten chapters, it takes up infinite series, γ functions, Legendre polynomials, Bessel functions, etc. An appendix has a list of special function formulas, as well as selected answers to excercises.

*Unsigned book reviews are by the Book Review Editor.