

Media Reviews

Rheology for Chemists—an Introduction. By J. W. Goodwin and R. W. Hughes, Royal Society of Chemistry: Cambridge, August 2000. £27.50, x + 290 pp. ISBN: 085404-616-X.

Flow of materials is important in many practical applications. Preparation and processing of many products will rely on pumping or mixing at some stage. The end use of coatings, pastes, and foods depends crucially on the response to stress as well as the texture and deformation that results from shear. It is surprising that given the significance of these properties, there is generally rather little training of chemists in this topic of rheology. Many scientists involved in either the synthesis or the formulation of these materials can benefit from understanding the principles of this subject. This audience is addressed by the book of Goodwin and Hughes.

The field of rheology is rightly attracting increased interest in recent years. Many engineers are involved in this work as it is concerned with chemical processes or mechanical properties of products. In general the chemists who approach this area have a different background, with less formal mathematical training. This book describes the phenomena of rheology without the formalism of vectors or tensors. Calculus is used, but at a simple level. However, I should not give the impression that this book avoids quantification or analysis. There are about 600 equations spread through the six chapters. Indeed some readers might get the first impression that the book is using a lot of mathematics. Actually, the large number of equations arises because in most cases any derivation is shown carefully, step-by-step. This approach should make the results accessible to students with little experience in the manipulation of equations. It also makes the text well-suited for self-study by research workers and technologists, who, confronted with technical problems in this area, would like a straightforward introduction to the subject of rheology.

The book is well structured and leads the reader from a series of definitions and the use of dimensionless groups such as the Deborah number, Peclet number, and Reynolds number in the first chapter, to ideas of viscoelasticity in the fourth and fifth chapters. The second and third chapters provide a description of a variety of different materials with elastic and viscous properties.

The authors of this book are well known for their own research on rheology. Their work has concentrated on problems related to colloids, and this is reflected in the examples and data that illustrate the text. The book places considerable emphasis on this area of soft condensed matter. The description of the rheology of colloids clearly shows the extensive experience of the authors in teaching this subject. The book provides rather more background information on structure and interaction of colloidal particles than microscopic interpretation of polymer properties.

There are relatively few typographical errors for a book in its first edition. The figures are generally clear, although some of the line drawings are not quite sharp.

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Pollution: Causes, Effects and Control (3rd Edition). By Roy M. Harrison (Editor), Royal Society of Chemistry, December 1996, 480 pp. \$69.95. £35 (UK). ISBN 054045341.

The general area of pollution science has been of growing importance in the last ten years or so, particularly given the rise in green issues and the plethora of courses now offered in the environmental sciences at both the undergraduate and postgraduate level. The first edition of this book predates this period, and its subsequent second edition, and now this third edition, have greatly expanded the topic areas of the first book. As many of the chapter authors have been retained throughout the three editions, the book has developed through the inclusion of up-to-date science and contemporary pollution issues. The third edition sees the addition of several excellent new chapters in areas such as persistent organic pollutants, soils and contaminated land, and air pollution and public health.

Pollution: Causes, Effects and Control is an ideal general introductory text at both the undergraduate and postgraduate level, as well as an excellent reference text for the environmental scientist, chemist, and consultant. Some background knowledge of chemistry and physics is required to fully appreciate many of the chapters, although those in management and regulatory affairs could still find this book a useful addition to their shelves. This book provides a good blend of science with regulatory/management practices aimed at the nature and control of contemporary pollution issues. The subject index provided is sufficiently detailed to allow this book to effectively serve as a reference handbook.

The book is broad-based, covering pollution in the major environmental compartments as well as covering specific issues such as radioactivity, sewage sludge, and control of pollutants from road traffic. Atmospheric pollution issues are covered extensively, with some seven of the twenty chapters focused on the atmospheric compartment alone. This doesn't necessarily detract from the overall quality of the book, but does reflect the research area of the editor!

Importantly, three chapters focus on the detrimental effects of pollutants on living organisms. Two of these chapters examine the health effects of air pollutants on humans and vegetation while a third focuses on the effects of environmental chemicals on humans and animals. The inclusion of these chapters is welcome, given that many texts focusing on pollution describe only the chemistry and the physical dispersion of pollutants, but generally neglect health issues. Indeed, the chapters on the health effects of air pollution are in keeping with the broad nature of the book, because the chapter dealing with human health effects focuses on populations and epidemiology while the vegetation chapter details considerable biochemistry at the cellular level.

It is difficult to see how the third chapter on health effects of environmental chemicals meshes with the previous two chapters. This chapter is somewhat isolated and consists largely of case studies under the general subtitles of "Localised Contamination Incidents" and "Generalised Contamination Incidents." These are somewhat nebulous titles, and nowhere in this chapter are the terms acute or chronic discussed, or for that matter the concepts of reference dose/acceptable daily

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intake or toxic equivalents. These concepts, however, are considered in an earlier chapter on toxic organic chemicals.

The real strength of this book lies in the scientific approach used to explain a pollutant problem, detailing the methods behind measurement, monitoring, and assessment as well as the way in which control technologies and legislation aimed at curbing pollutant formation and release are explained. The writing is good, with what appears to be a careful and up-to-date selection of literature to support each chapter. There is clear continuity among the various chapters with careful and appropriate use of figures and tables. Unfortunately, some of the figures, notably the maps denoting modelled concentrations of air pollutants, are of very poor quality, often simply showing black patches rather than various shades of grey! Despite this minor criticism, *Pollution: Causes, Effects and Controls* is a well-defined text and will undoubtedly be a welcome addition to university libraries.

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ChemHELP. Published by Environmental Science Limited, Stukeley Meadow's Industrial Estate, Blackstone Road, Huntingdon, Cambs PE29 6EF, England. Tel: (+44) 1480 457111, Fax: (+44) 1480 457117, e-mail: esl@esl-uk.com. \$199 p.a. (U.S.A.), £149 p.a. (U.K.). The subscription package allows for updates to the data 3 to 4 times during the term of the subscription but this may vary. Discounts for multiple licences are available.

Safe working is accepted by most scientists as being essential practice. In a chemistry laboratory it should always be of concern, but in the past safety was sometimes felt to be an irritating side show to the serious business of science. I recall working in a chemistry laboratory (many years ago) with uninsulated cables carrying 2 kV, as I tried some ill-advised experiment that formed part of a "project" I had devised. I survived (to become a departmental safety officer, as it happens), but more by luck than good judgement.

Teachers are now far more aware of the importance of safe working. Those of us whose days are spent in laboratories are not only more aware of safety in general, but are also constantly challenged by the need to meet regulations and to generate documentation that proves we have met those regulations.

An industry has sprung up to help scientists deal with regulations and to promote safe working. Manuals, newsletters, and software are offered by groups ranging from nonprofit and government organizations to chemicals suppliers and industrial safety companies. Among the software tools and databases that are of greatest use to chemists are those which provide MSDS data (Material Safety Data Sheets) for the sorts of chemicals typically found in school and university laboratories. The hazards posed by a chemical must be properly understood wherever one works, and the information that these databases offer is, therefore, widely applicable.

ChemHELP is typical of such software packages. It includes data on a range of chemicals one would find in most chemical laboratories. Approximately 3400 chemicals were included in

the version made available for review, including many of those which are used on a daily basis in teaching.

ChemHELP is easy to install and set up (system requirements are outlined below). Once loaded on a PC, chemicals can be selected from within the database by entering their full name or by using a search in which one can specify a partial chemical name, the CAS or UN number, EC or EC index number, or even a risk phrase. Data that may be displayed for the selected chemical include index numbers, hazard symbols, CHIP classification and label, risk phrases, physical properties, synonyms, and more. As this suggests, for many of the chemicals in the database the data are reasonably comprehensive.

Interacting with ChemHELP is straightforward. There are four main function buttons: **Hazards, Exposures, Lists and Properties**. Three of these are used for viewing substance data; the **Lists** function is used to locate substance records. Each button has a set of tabs associated with it that provide further subcategories of information.

The data are broadly equivalent to those that one might find on a printed MSDS sheet, but are organized in a fashion that those unfamiliar with MSDS sheets, such as some students, might find a little more user-friendly. The appropriate hazard symbols are displayed as soon as a chemical is located, and these symbols provide an immediate and clear indication of the principle hazards that a chemical might present, which would be particularly useful for novice users in, for example, a school chemistry laboratory.

ChemHELP contains the complete Approved Supply, EH40, and Approved Carriage Lists, which are of particular relevance to those in the U.K., but the safety data are broadly applicable both within and outside the U.K. It is intended that ChemHELP should be of value in the preparation of the COSHH Risk assessments, which are required in the U.K., and in the generation of Safety Data Sheets, which are required in laboratories across the world.

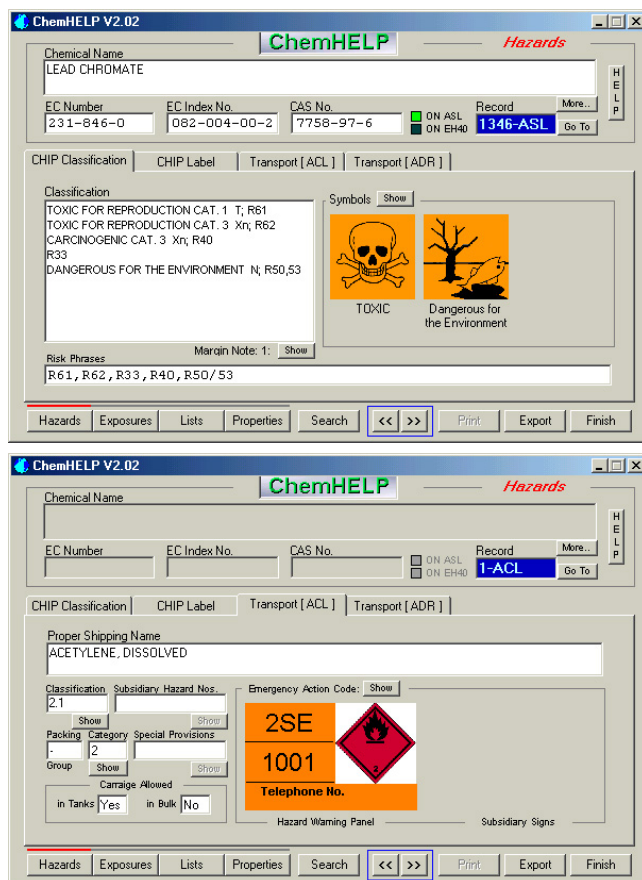
The suppliers argue that effort has gone into making this package "inexpensive, fast and truly easy to use." This is largely correct. Searches through the database are indeed rapid and simple. Search parameters may be combined. Data may be exported to other applications or printed, and there is an export function to HTML.

A friendly, but rather limited, help system is available. The help system may be too chatty for some users, but it is generally informative.

There is much useful data on this CD, and it has plenty of potential, especially in undergraduate and school laboratories where its relatively uncomplicated interface would be an advantage. Unfortunately, the software also has some serious drawbacks. The most disconcerting (and perhaps the most fundamental) is that it is a simple matter to call up data for one chemical and not notice when, subsequently, data are displayed that relate to a second chemical. If one searches for a particular chemical and displays its CHIP classification, relevant data for the chemical is displayed (Figure 1).

It seems obvious that if one now wishes to investigate transport properties for that chemical one should click on the Transport (ACL) tab, but if this is done data for a completely different chemical may be (and often are) displayed (Figure 2).

As the help system explains, the field that showed the name of the original chemical is now shaded out, but it would seem logical that, if one has searched for data about one chemical,



stepping through the tabs in the window that appears following the search should provide data for this chemical only, until another one is specifically selected by the user. This slippery transition from one chemical to another is especially confusing when one first uses the software and could easily be missed by a casual user, such as a student wanting to retrieve data on a single chemical in an undergraduate laboratory. The way this aspect of the software is designed seems counterintuitive, and it should be considered again by the software developers.

The database is also not as comprehensive as one would hope. For example, no toxicity data are available for a chemical as common as copper(II) sulfate, even though the data are readily available in the literature. If this software is intended for use in schools and colleges, it is essential that comprehensive data on common chemicals be included, otherwise the software will be left to gather dust as frustrated users fail to find the data they need.

There is little ecological data, despite the presence of a tab to display it. The help system explains that the **Ecology** tab is a recent addition and that data are being added, but one wonders why the developers did not wait until rather more data were available before adding this tab.

The suppliers quote a U.S. price, so it is evident that they expect to market ChemHELP in North America; however, it is hard to see the software making inroads in this demanding market until a fundamental problem is addressed: English spellings of chemical names are used throughout. To some, this might seem to be merely an inconvenience, but it is more serious than that. American spellings such as "aluminum" for "aluminium" are not included even as synonyms, so if one mistakenly (!) tries searching for aluminum oxide nothing is found. Worse, the spellings "sulphate," "sulphide,"

"sulphuric," and so on are used throughout. Although this used to be the normal British spelling, it no longer is; the recommended spelling in the U.K. is now sulfate rather than sulphate, as in most other countries.

This is a serious problem, which, while it might restrict the value of the software in the UK, would certainly render it very unattractive to users in the U.S.. It is essential that the suppliers address this problem if the product is to make headway in the U.K., let alone the U.S..

The data within ChemHELP are updated at least annually and more frequently if a major upgrade is available. An annual subscription service is also offered, which covers both data and updates to the ChemHELP program.

This is a simple to use, attractively designed, and potentially valuable product. It is reasonably priced, considering the volume of data contained. If the serious weaknesses outlined above are addressed, it will represent good value for money.

System Requirements. PC or workstation running Windows 95/98/ME or NT4/2000. In effect this requires at least a Pentium running at not less than 100 MHz.

Hard Disk Space: 56 MB (installation), 39 MB (operation).

Memory: 16 MB

Minimum Screen Resolution: 800 × 600 minimum, 1024 × 768 suggested

Printer: color or monochrome graphics inkjet or laser printer with a minimum print resolution of 300 dpi. A printer is required only if the user wishes to print from the Help and Export File windows.

Software: Microsoft Internet Explorer V4.0 or later is required as the ChemHELP Help system shares some of the component files of Explorer.

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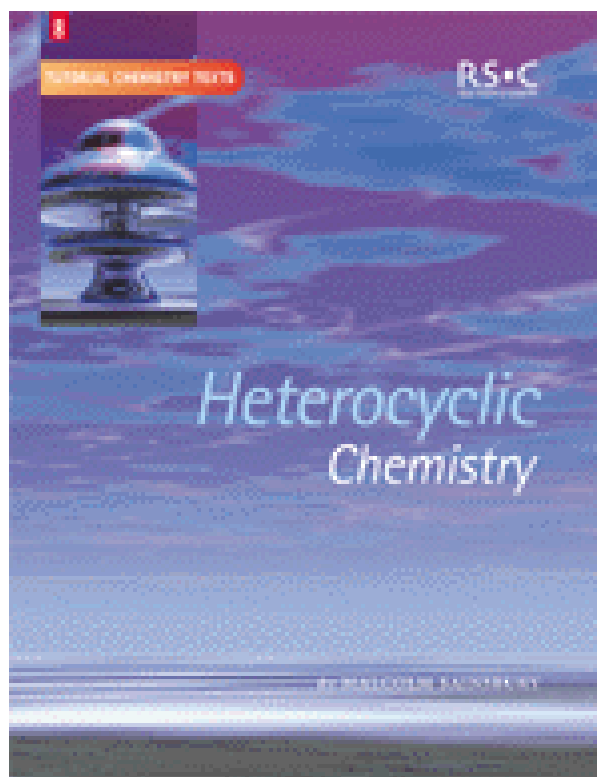
Heterocyclic Chemistry; Series: Tutorial Chemistry Texts. By M. Sainsbury, University of Bath, U.K. £9.95. ISBN 0-85404-652-6.

The objective of this series of tutorial texts is to present fundamental chemistry topics at the undergraduate level, using a format based on the teaching found in a modular degree program. Each volume is designed to include a concise account of the principles of the subject being discussed and contains worked examples and questions so the student may work through the text and gauge their level of achievement.

This particular volume, which has its origins in the 2nd-year lecture notes of the author, fits this general plan well. It deals with the fundamental chemistry of fully saturated and unsaturated 4-, 5-, and 6-membered heterocycles focusing on those compounds containing a single heteroatom.

Specific subjects covered are: pyridine; benzopyridines; pyrylium salts, pyrans and pyrones; benzopyrylium salts, coumarins, chromones, flavonoids and related compounds; pyrrole; furan; thiophene; benzo[b]pyrrole; benzo[b]furan; benzo[b]thiophene and four-membered heterocycles containing a single heteroatom.

The author is also able to put the subject in context, drawing from a range of important natural and synthetic heterocycles



that play a vital role in life and medicine. Key related topics are also covered where required.

Generally this volume is well presented, error free, reasonable priced, and is very easy to follow, flowing from topic to topic in a very logical fashion. I particularly like the summaries at the end of each chapter that enable the reader to pinpoint what they need to take from the work just discussed. This will help students increase their confidence in their ability to learn what can appear, at first glance, a quite daunting area of chemistry.

The worked examples and examination questions are also very good, as they reinforce basic principles. The inclusion of detailed answers at the end of the volume is also a very attractive feature for students. There are some omissions from the text; for example, a brief chapter on key heterocyclic compounds with two heteroatoms would have been advantageous.

The work will obviously have to compete with the more detailed texts (Joule and Mills; Gilchrist) and other tutorial style texts (Davies); however, the very competitive price might give it an advantage. I feel that this book is an excellent introduction to fundamental heterocyclic chemistry and would have no hesitation in recommending it as a core text in a chemistry degree program.

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