

groups, and bonding), before considering crystallisation itself.

Moving on to applications, the first case study chapter concentrates on molecular crystal systems. It is concerned with lattice energy calculations for these materials, and their use in crystal structure prediction. The prediction of crystal morphology using attachment energies is then described, but no mention is made of the alternative approach that uses surface energies. The chapter includes a useful section on the combination of Rietveld methods with theoretical approaches in the refinement of X-ray powder diffraction data. A chapter concerned with understanding nucleation, growth and habit of crystals follows this. However, the examples given are all molecular crystals and the techniques used are those covered in the previous chapter. While the work described is interesting, the inclusion of this chapter as well as chapter three does suggest a bias towards molecular crystals in the book as a whole.

The chapter on ionic crystals describes the use of the Hartman-Perdok PBC model to ADP and related structures, and to ammonium chloride. The theory is described in great detail, and anyone wishing to read a comprehensive description will find it here. However, the current usefulness of this approach in modelling inorganic materials must be questioned in view of the development of atomistic potential based simulation methods for the calculation of inorganic crystal structures, properties and morphologies [1,2].

The final chapter is concerned with the structure of organic chiral pharmaceuticals, and the extent that molecular modelling has been successful. It builds on chapter three, but is not concerned with crystallisation specifically.

In summary, this book describes some applications of molecular modelling to the understanding of crystallisation in a range of materials. There is an undoubted bias towards organic/molecular materials, and unfortunate omissions in the treatment of inorganic materials. This omission is notable in the theory chapter, which ignores electrostatic interactions. It is a pity that the currently available simulation techniques for inorganic materials have not been included in a book which is likely to be read by those seeking to know the current state of the subject. It might be useful for those whose main interest lies in molecular materials. However, it cannot be regarded as a general text on applications of molecular modelling in crystallisation, as suggested by the title.

References

- [1] K.J. Roberts, G.B. Telfer, R.A. Jackson, P.J. Wilde, P. Meenan, The determination of a transferable interatomic potential for alkali perchlorates and an application to morphological modelling, *J. Chem. Soc., Faraday Trans. 91* (22) (1995) 4133–4138.
- [2] G. Clydesdale, K.J. Roberts, G.B. Telfer, V.R. Saunders, D. Pugh, R.A. Jackson, P. Meenan, Prediction of the polar morphology of sodium chlorate using surface-specific attachment energy calculations, *J. Phys. Chem. B* 102 (36) (1998) 7044–7049.

R.A. Jackson
Lennard-Jones Laboratories
School of Chemistry and Physics
Keele University, Keele
Staffs ST5 5BG, UK
 Tel.: +44-1782-583042
 fax: +44-1782-712378
E-mail address: R.A.Jackson@chem.keele.ac.uk
 (R.A. Jackson).

PII: S1385-8947(00)00247-3

By Accident . . . a Life Preventing Them in Industry

Trevor Kletz, PFV Publications, 2000, 144 pp., £14.95 (paperback), ISBN: 0-9538440-0-5

To judge by the decline in applicants for engineering places at UK universities, there should be more books like this. One of the author's aims is to show potential students "that life in industry is useful, satisfying and enjoyable". I feel he comes closer to his aims in this respect than in "conveying the excitement of the time".

Dr. Kletz played an important role in the development of loss prevention, as we know it. The graph, illustrating the steady fall in the fatal accident rate during his 14 years as Technical Safety Advisor within ICI, is a clear demonstration of the usefulness of his work. On the other hand, he is less successful in transmitting the enthusiasm he must have felt and the reference in the publisher's press release to Kletz' "inimitable prose" is, perhaps, an apt description.

This autobiography falls into three parts: his early years with ICI from 1944 to 1968, the following 14 years as Technical Safety Advisor, and his work as a consultant and part-time academic at the University of Loughborough, following his retirement from ICI in 1982. Interestingly, only a single chapter covers this last, but longest and most prolific in terms of publications and lectures, part of his career. This last chapter also contains useful summaries of his previous nine books.

After a brief description of his early schooldays, his family background, and his university days, further references to his life "away from work" are restricted to three short sections distributed through the book. This may have something to do with the suggestion that:

'Men or women who go to the extreme length of marrying scientists should be clearly aware beforehand . . . that their spouses are in the grip of a powerful obsession that is likely to take first place in their lives' [1] (one of the apt quotations with which the book is peppered).

He then describes the various positions he held in research, in the technical department, and in operations before becoming Assistant Works Manager in 1961. In 1968, he had the "luxury of writing his own job description" as ICI's first Technical Safety Officer. He provides a fascinating insight into the workings and attitudes within ICI in an era when industry in general was much more people oriented

than I believe it is now. He became a master at management by persuasion and the book includes a number of useful tips as to how this may be done. He uses summaries of several case studies to illustrate points in the book and gives references to the more detailed descriptions to be found in his earlier publications.

Throughout the book he makes the point that ICI staff had (could take) considerable freedom of action, and this clearly had a major influence on the impact he was able to have on safety, both within ICI and outside. It is unfortunate that he takes a swipe at an oil company (which, like the author, I also shall not name!) "where everything seemed to be referred to HQ", as my recollections of that oil company are similar to his of ICI with respect to independence of action.

The book is illustrated with some amusing cartoons and a number of monochrome photographs of plant, colleagues and family. More cross-referencing between the illustrations and the text would be helpful, particularly since most of the pictures are in two groups, some way from the relevant text. More comprehensive captions would also help.

Despite the reservations I have expressed above, I enjoyed the book and suggest that it should be read by anyone interested in the development of loss prevention (as an example of innovation?) and in the workings of ICI during the 60s and 70s. I imagine that anyone who knows (of) Trevor Kletz is also likely to buy the book. I hope that they will then pass it on to some of the young people who the author (and the rest of us) would like to attract to the profession. If the cover looked a bit less like a Tory election poster they might even buy it for themselves!

As Sir John Harvey Jones says in his introduction to the book, "Trevor Kletz will, I am sure, always sleep soundly at night . . ."

Reference

- [1] Sir Peter Medawar, *Advice to a Young Scientist*, Pan Books, London, 1981.

Anthony D. Barber
Redwood, 92 Charles Close, Wroxham
Norwich NR 12 8TT, UK
 Tel.: +44-1603-78-44-33
 fax: +44-1603-78-44-44

E-mail address: adbarber@netcomuk.co.uk (A.D. Barber)

Accepted 12 September 2000

PII: S 1385-8947(00)00248-5

Electrophysical Phenomena in the Tribology of Polymers

A. Sviridenok, A. Klimovich and V. Kestelman, Gordon and Breach Science Publishers, 192 pp., US\$ 75.00 (hardback), ISBN 90-5699-577-4

This book is a part of the important and timely series on Polymer Science and Engineering, in which Gordon and Breach Science Publishers introduce the latest scientific and engineering achievements by the polymer scientists of the former Soviet Union to the English-speaking engineering community.

In the field of tribology, dealing with the complicated multi-faceted phenomena of friction and wear, some of the most exciting and still far not understood are triboelectric processes. A multi-component friction force, resisting a relative motion of contacting surfaces, is a result of a number of inter-related deformative, adhesive, cohesive, abrasive, chemical, physical and other processes. Among them are contact emission of electrons, photons and X-rays, emergence of the electret state, static electrification and electrostatic discharge, studied by so-called triboelectrophysics.

Though triboelectrification has been observed for many materials, it plays an especially visible role in the friction of polymers. Polymers are highly sensitive to the triboelectric phenomena. Tribology of polymers has recently evolved from pure tribomechanics, which studied plastic and elastic deformations of contacting solids, to a multi-disciplinary science, incorporating the knowledge of physical, chemical and electrical tribo-processes.

In the good traditions of Russian tribology, this book includes both theoretical considerations of triboelectrophysics and relevant experimental data, with descriptions of the experimental apparatus. While the experimental part of the book is quite detailed and practical, the theoretical one has not been developed up to the level of comprehensive mathematical models, due to the lack of precise knowledge of the physics of triboelectrification.

Quite useful are the chapters covering triboelectrification of polymer powders, block and molten polymer materials separately. The triboelectret state of polymers, polymer composites and coatings are described extensively. In addition to studying the triboelectric phenomenon at dry friction and vacuum, the book includes some interesting data on triboelectrification at various humidity levels and fluid friction.

This rich scientific material is shown to have very important practical applications in such different processes as wear in bearings, cutting diamond crystals, sand-blasting, grinding, deposition of polymer coatings, extrusion of polymer fibers, electron-ion formation of durable polymer composite materials, various types of tribodiagnostics, and condition monitoring.

Each chapter includes a large number of references, some of them unknown in the West. Only a few Japanese and American sources have been missed.

The only drawback is that the book was written in Russian and then translated; as a result, the reading is not always smooth and easy, some terms are not always the most common for the Western reader.

Overall, this is a singularly deep insight into the vastly underappreciated electrophysical phenomena of friction. I strongly recommend it for scientists, engineers and