physical basis of the method and how that technique can be applied to the analysis of solid-state materials. The coverage is not extensive but does serve as an extremely useful guide.

Chapter 5 details aspects of defects in crystals and solid solutions. Chapter 6 shows how phase diagrams can be interpreted. Both chapters are intelligently written and will serve as an excellent introduction for an undergraduate student.

Chapter 7 is concerned with electrical properties of materials. It covers a wide range of topics, from superconductivity, through organic metals, charge-transfer complexes, fullerides, semiconductors and ionic conductors, to solid electrolytes. The coverage is quite extensive and includes numerous examples of the utilization of solid-state chemistry in commercial devices. This chapter, in particular the sections detailing the use of solid-state batteries, has been completely rewritten since the first edition.

Chapter 8 details the magnetic and optical properties of solid-state materials.

Chapter 9 is a new chapter. It covers one of the main omissions of the first edition — how solid state materials are made. The traditional 'heat and beat' ceramic method and the various *chimie douce* approaches to synthesis are explained with clarity. Some of the basic aspects of forming thin films via CVD, electroplating, sputtering and laser ablation are covered. So too are aspects of combustion synthesis (SHS, SSM) and crystal growth.

The Further Reading section gives references to books, original papers and reviews related to the various chapters. This information has been updated to include 1999 publications. A set of questions and a comprehensive index round off the book.

I have only two minor criticisms of this book. The first is that answers to the set questions are not provided. Inclusion of this material, at least in part, would certainly help students and give them a form of self-assessment. It should be noted, however, that answers to the questions can be obtained by lecturers directly from the author. The second criticism concerns the quality of the photographs in the book. Whilst the photographs are interesting (particularly the one of a Japanese lady being levitated on a YBaCuO superconductor), they are somewhat blurred and not of the reproductive quality of the line diagrams.

Overall this is an outstanding textbook. The first edition of the book firmly established itself as the market leader, and indeed in some respects a pioneer in grouping together solid-state chemistry into a distinct teaching entity. The second edition is even better. This is a 'must have' book for any undergraduate studying solid-state chemistry.

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N-centered Radicals Chemistry of Free Radicals, vol. x

Z. B. Alfassi (ed.)
John Wiley & Sons, Chichester, 1998
xi + 715 pages. £185
ISBN 0 471 96186 8

This is a further volume in Alfassi's series on the *Chemistry of Free Radicals*, the other titles to date being *General Aspects of the Chemistry of Free Radicals, Peroxyl Radicals* and *S-centered Radicals*. It follows the established pattern, in that little attempt is made at a comprehensive coverage of the subject, but a selection of authors contribute chapters on their special fields of interest. The first 12 of the 23 chapters are on NO_x radicals and their involvement in atmospheric and biological chemistry, but the nitroxyl radicals, $R_2NO\cdot$, which are important in spin-trapping and spin-labeling, are not specifically included.

The topics covered concerning the nitrogen oxide radicals are: reactions of NO· (G. Dorthe), $NO_2\cdot$ (B. Weiner and K. I. Bamhard) and $NO_3\cdot$ in the gas phase (G. Le Bras) and $NO_x\cdot$ in the atmosphere (C. A. Cantrell); reaction of $NO_2\cdot$ towards organic donors in the liquid phase (E. Bosch and J. K. Kochi) and in argon matrices (M. Nakata); experimental studies of the $NO_3\cdot$ radical (R. P. Wayne) and its reactions in aqueous solution (H. Hermann and R. Zellner) and in organic solvents (O. lto); $NO_2\cdot$ and $NO_3\cdot$ radicals in the radiolysis of nitric acid solutions (Y. Katsumura); $NO_2\cdot$ in biology (P. Wardmann); and the toxicity of nitrogen oxides (N. M. Elsayed).

The other chapters cover HN· radical reactions (W. Hack), reactions of $H_2N\cdot$ radicals in the gas phase (A. M. Mebel, L. V. Moskaleva and M. C. Lin) and in aqueous solution (Z. B. Alfassi, R. E. Huie and P. Neta), homolytic addition reactions of $R_2N\cdot$ radicals (B. J. Maxwell and J. Tsanaktsidis), anilinyl radicals and radical ions (G. Merényi and J. Lind); nitroarene and aromatic *N*-oxide radicals (P. Wardmann); imidyl (J. Lind and G. Merényi) and indolyl radicals (L. P. Candeias); OCN· and SCN· radicals (J. F. Hershberger) and their reactions in aqueous solution (Z. B. Alfassi); and the thermochemistry of N-centered radicals (D A. Armstrong).

All the contributions are authoritative and up to date, most covering the literature into at least 1996, and the subject index is good. All the volumes in this series would benefit from the inclusion of a foreword to set out the aims, and from tighter editing to improve the coverage and avoid overlaps; and as the coverage of the subject is incomplete, I would have appreciated a detailed list of the contents of the chapters. I would also like to see consistent representation of the unpaired electron in molecular formulae, which would help in electron book-keeping to avoid some of the errors that have escaped proof-reading.

I think the most useful function of this volume will be to give a fairly complete and up-to-date treatment of the chemistry of the NO_x radicals in the atmosphere and the environment.

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