

BOOK REVIEWS

Electronic Absorption Spectroscopy and Related Techniques. D. N. Sathyanarayana. Universities Press (India) Ltd, 3-5-819 Hyderguda, Hyderabad. 2001. 532 pp. Price: Rs 395.

Spectroscopy requires knowledge of related quantum mechanical theory and various instruments. Those who teach and study electronic spectroscopy constantly complain that there is not a single good textbook which covers every aspect of electronic spectroscopy. The book under review is an ambitious attempt to provide both the basic theoretical principles and associated instrumentation. It is broadly divided into two parts. The first part deals with absorption spectroscopy and is subdivided into eight chapters. The second part has four chapters, respectively, on emission spectroscopy, optical rotatory dispersion and circular dichroism, photoelectron and X-ray absorption spectroscopy. As the titles of the various chapters suggest, the author has attempted to cover an extremely broad area. I myself do not know of a single volume which spans such a wide area of spectroscopy. The author must be commended for this. Because of the vast area the author has tried to cover, obviously some topics have been missed in this volume. I will be happy if the author publishes a sequel to this nice volume. In the following, I will list some of the topics which have not been included in this volume and which may be included in a future volume.

The eight chapters in the first part deal with general introduction to absorption and emission of photons, atomic orbitals, symmetry, crystal field theory, molecular orbital theory, band intensity, spectra of transition metal complexes and organic molecules. The author's aim is to familiarize the readers with the terminology and prepare them adequately to analyse spectra of mainly inorganic systems and of organic molecules, to a lesser extent. A very good feature of this book is that it contains the diagrams of the basic design of spectrophotometers and fluorimeters. This should help students to know what is inside such instruments. It would have been even better if the author had included the basic principles of different kinds of lamps, gratings, photomultiplier tubes, as in Sharp, Willard, Merrit, Dean and Settle's book (*Instrumental Methods of Analysis*, 7th edn, CBS Publishers).

Obviously, spectroscopy being a vast subject, many topics could not be included in this book. I am a bit unhappy about the omission of lasers. The author has not mentioned any nonlinear optical processes, e.g. two-photon absorption and second harmonic generation.

The author has discussed in considerable detail several theoretical methods for calculating energy, e.g. Huckel theory for organic systems, crystal field theory and ligand field theory for inorganic systems. But the basic theory of electronic transitions, namely time-dependent perturbation theory and interaction of radiation with electron, has not been discussed. As a result, students would have no idea about the origin of terms such as electric dipole or magnetic dipole transitions. The author has not discussed how spin-forbidden transitions become allowed by mixing of states by spin-orbit coupling. Discussion on spectroscopy of lanthanide complexes is rather short, except for a brief remark on hypersensitive transitions.

In the emission part, theory of non-radiative processes and many important processes such as energy transfer, excimer or exciplex could have been included. Recently, there have been many reports on sensors whose emission properties change dramatically on complexation with a transition metal ion. I think this a rather interesting area where organic and inorganic chemistry converge.

But the book already contains over 500 pages. It would be much longer if the topics suggested above, had been included. But as I noted at the beginning, readers of this book will expect from the author a future volume on these topics.

I enjoyed reading this book. The style of writing is in general, extremely lucid. I personally feel 'Spectroscopy of Organic Molecules' would have been a better title than the one (*Organic Spectra*) used for chapter eight. I am sure this book will be very useful to research students, particularly those who are dealing with transition metal complexes. I, therefore, strongly recommend this book to all research workers using electronic spectroscopy and all libraries.

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Emerging Eco-friendly Alternatives for the Fine Chemicals Industry. S. Rajappa. Sevak Publications, 306 Shri Hanuman Industrial Estate, Wadala, Mumbai 400 031. 2000. 197 pp. Price: Rs 750/ US \$ 75.

The 20th century has seen vast developments in chemistry. Thus, society has come to depend on products of the chemical industry to maintain high standards of living and improve the quality of life. However, this widespread manufacturing and disposal of waste has resulted in an adverse impact on the environment causing depletion of ozone layer, pollution of rivers and lakes, even groundwater, pesticide residues in food, damage to ecosystems, etc. As a result, chemistry and the chemical industry have tarnished images. Thus, in the current scenario of environment pollution, the book under review will be of much importance.

The book is presented in seven chapters, with a general introduction in chapter 1, discussing catalysis, solvent, energy source and renewable raw materials in subsequent chapters.

A few examples may be highlighted from this book to show the importance of eco-friendly procedures. Friedel-Crafts acylation is a very useful reaction and has received wide applications in the industry. However, the classical procedure involving acyl chloride/acyl anhydride and more than stoichiometric amount of aluminium chloride entails severe environment pollution with hydrogen chloride gas. An alternative procedure using direct carboxylic acid in the presence of hafnium triflate or zeolite avoids such pollution and presents a green procedure (p. 14).

Biotechnology has achieved tremendous success during the last couple of decades and will possibly govern the chemical processes in the coming years. Reactions catalysed by enzymes and microbes are not only very efficient, but also environment-friendly. This has been focused nicely in this book (pp. 146-148) for the synthesis of vitamin C, adipic acid and vaniline from D-glucose, a cheap, commercially available material from plant sources. These processes are already in use in the industry.

The book has discussed almost all aspects related to green technology. All these chapters highlight important and major achievements with appropriate refer-