

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS 2 9 JT, England). As far as practicable books will be reviewed in a country different from that of publication.

Molecular spectroscopy. Vol. 2. Senior Reporters: R. F. BARROW, D. A. LONG and D. J. MILLEN. Pp. xii + 579, Figs. 130, Tables 110. London: The Chemical Society, 1974. Price £18.00.

If a number of outstanding authorities in several fields of molecular spectroscopy are requested to review the progress that has been made during the last two years, the result will doubtless be a collection of reports containing a wealth of information, well ordered and well balanced. Such a collection is this volume, which covers the literature of 1972 – and partly of 1973 – that has been published on topics of molecular spectroscopy which in general are less familiar to the average chemist.

If specialist reports were written by specialists for specialists in the same branches, they would be brief and poorly accessible to outsiders. Apparently, the authors have intended to reach a wider circle of readers, as the theoretical sections generally start at a point the general reader may be supposed to be better acquainted with and as the experimental results are mostly presented in a form that shows their importance to other branches of research. Whether they have succeeded in this effort is hard to say, as one can sometimes only guess which categories of readers they had in mind.

In Chap. 1, *Microwave Spectroscopy*, A. C. Legon and D. J. Millen not only give a clear account of the progress and the state of the art, but also make the results very well accessible to all those who are interested in molecular structures and conformations. It would be a pity if, for instance, organic chemists were not to take notice of this chapter, in which tables and figures and a clear text transfer so much information to the reader and give a good impression of the insights which may be gained from this branch of spectroscopy.

Chap. 2, *Theories of Resonance Raman Scattering*, by J. Behringer, starts with a clarification of the confusing terminology in the literature and reviews the developments in classical as well as in quantum-mechanical theories. The section on the classical theories might well serve as an introduction to this area, though perhaps too much stress is laid on mathematical rigour. The quantum-mechanical part requires an education on the level of Dirac's and Schiff's famous books.

Chap. 3, *Infrared and Raman Studies of Molecular Motion*, by R. T. Bailey, discusses a rapidly developing area. After a review of the background theory (mainly based on the correlation function approach) of reorientational motions and band shape, the developments of experimental techniques and their applications (47 pages) are reported on. Calculations of correlation functions and intermolecular torques in the condensed phase form the main part of this section.

R. T. Baily and F. R. Cruickshank deal with *Infrared Fluorescence Studies* in Chap. 4. The theory of vibrational energy transfer (not in intramolecular processes) is treated in a rather condensed form, but experimental techniques

are amply discussed, with many references to the literature. There is a 53-page review on experimental measurements.

Chap. 5, *Infrared Intensities*, by W. B. Person and D. Steele, deals with the changes in the electronic charge distribution of a molecule during a vibrational motion. The development of the relevant theory (polar tensor formulation for dipole moment derivatives) is presented in a very clear way and the quoted results from simple CNDO calculations open bright perspectives. On the other hand, the section on experimental measurements makes quite clear how many serious difficulties must be overcome before reliable absolute intensities can be obtained.

Chap. 6, *Raman Intensities*, by R. E. Hester, is relatively short. The progress of the theory is dealt with in a rather condensed form (much reference is made to Szymanski's book), and as a consequence the delta-function model, for instance, will not at once be clear to the interested reader. From a chemical point of view, the section on bond-order determinations from Raman intensities of stretching vibrations is certainly the most interesting.

M. S. Child gives a review on *Diatom Predissociation Linewidths* in Chap. 7. The theoretical development in this area leans heavily on advanced quantum-mechanical methods, and the reading of this chapter requires a great amount of pre-knowledge. Calculations of the potential-energy curves from experimental line-width patterns and determinations of the type of predissociation (either by rotation or by curve crossing) are amply discussed, with many references to the literature.

Chap. 8, *Rotational Structure in the Rydberg Series of Diatomic Molecules*, by J. W. C. Johns, gives a fine impression of the work in this field in which new interest is growing. Only investigations of molecules with sigma cores are reviewed. Many cases are discussed including the NO molecule, which is considered in great detail, and the work involved in the unravelling of complicated spectra and the determination of ionization potentials and other physical properties is clearly illustrated by this example.

The closing chapter, *Molecular Spectra in Stars*, by E. A. Mallia, can be recommended to all spectroscopists. It is fascinating to see how much information can be obtained even if the sample is beyond reach (as the light source is), and useful to learn that much badly needed laboratory information (*e.g.* the positions of the higher vibrational bands of CH) is still lacking.

This volume certainly deserves a place on the shelf in every spectroscopy department. Misprints are few (I found some of minor importance in the formulae on pp. 177 and 448) and binding and printing are of the high quality we are accustomed to from this publisher.

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