

## Book review

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"Vibrational Spectra of Organometallic Compounds", E. Maslowsky, Jr., John Wiley and Sons, New York/London/Sydney/Toronto, 1977, xii + 528 pages, \$ 31.70, £ 18.75.

This book was written to compile a review of the published literature dealing with the application of infrared and Raman spectroscopy to the study of structure and bonding of organometallic compounds. Style of presentation is very similar to that of the Specialist Periodical Reports of the Chemical Society of London. This report is different than these, however, because it is not restricted to a limited period but an attempt has been made to be comprehensive. It can be said that the author, undoubtedly with much toil and great diligence, has achieved this goal. The result of his efforts is a catalog of more than 2100 references which were available in the US at the end of April 1976, edited with many summarizing comments, graphs and tables.

The material is presented in three parts. Part I deals with alkyl organometallic derivatives. Part II presents a review of metal complexes with non-cyclic unsaturated ligands. Part III discusses compounds with unsaturated and cyclic organic ligands. All systems with direct metal-carbon interactions are considered in this text, except pure carbonyl or cyanide complexes. In each part, in addition to the pure organometallic compounds, also their halides, hydrides, pseudohalides, carboxylates and similar derivatives are discussed. Definition of metal is relatively broad. It includes the elements boron, silicon, germanium, phosphorus, arsenic, antimony, selenium and tellurium in addition to the traditionally accepted metals.

The power of vibrational spectroscopy to provide clear and unequivocal information concerning the structural features of organometallic compounds has often been overestimated by uncritical users. For example, it has often

been overlooked that selection rules in condensed states can be affected by other than intramolecular factors. Conclusions concerning molecular symmetries based on condensed state data, in particular conclusions concerning molecular distortions, were therefore frequently misleading. In other cases frequency shifts, for example those observed for free and complexed ligands, were often automatically related to potential energy effects. This approach has led to dubious interpretations whenever kinetic energy and coupling phenomena should have been considered, too. Uncritical use has also often been made of the force fields derived from vibrational analyses. The authors of many studies have neglected the fact that, in all but the simplest systems, force constants do not necessarily have a real physical meaning, but are artificially defined parameters whose magnitudes are usually based on many assumptions and incomplete information. As a consequence, conclusions based on the magnitudes of force field parameters have often been made with less caution than would have been desirable. It is a merit of Maslowsky's book that, in the discussions of many studies, reference is made to these and similar imperfections of applied vibrational spectroscopy.

In many sections it is quite exciting to follow Maslowsky's presentation of some of the controversies which arose in the interpretation of the vibrational spectra of a number of interesting structures. His evaluation of such cases always appears to be impartial and sufficiently accurate. In this context one also appreciates very much the fact that the author included in this book some references on other physical techniques (such as X-ray diffraction, electron diffraction and NMR spectroscopy) which have provided important data to many controversies involving organometallic structures.

The text has been prepared with much care and suffers from only a few trivial errors such as a missing reference 92 in Part III. If one could have a wish, he would probably desire, in view of the abundance of presented data, to have a formula register for quick reference to particular molecules. An index of groups of compounds and of characteristic frequencies is offered but it does not quite serve the same purpose. In any case,

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this book is an efficient and thorough compendium of an important and highly active research area. I recommend it as a very useful reference book to anyone whose research is in some way involved with organometallic chemistry.

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