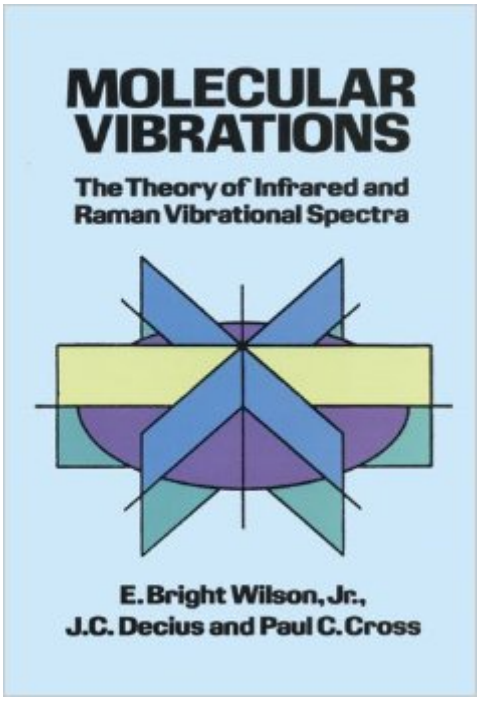
Molecular Vibrations: The Theory Of Infrared And Raman Vibrational Spectra (Dover Books On Chemistry)



Synopsis

Because of its connection with laser technology, the theory of infrared and Raman vibrational spectra is even more important now than when this book was first published. As the pioneering text in the field and as the text still preferred today, Molecular Vibrations is the undeniable choice of anyone teaching or studying molecular spectroscopy at the graduate level. It is the only book of its kind in the area written by well-known scientists, and besides its value as a pedagogical classic, it is an essential reference for anyone engaged in research. The genius of the book is its rigorous, elegant treatment of the mathematics involved in detailed vibrational analyses of polyatomic molecules. The reader is led carefully and gradually through the main features of the theory and its methods: starting from a valuable introduction to the theory of molecular vibrations and the application of wave mechanics to this subject; leading into the mathematical methods devised by Professor Wilson and his students for handling the mathematical problems and for making use of symmetry and group theory; proceeding through vibrational selection rules and intensities, potential functions and methods of solving the secular determinant; and concluding with a sample vibrational analysis of the molecule of benzene. Sixteen appendices, comprising nearly one hundred pages, offer much extremely useful information that is more clearly understood outside the body of the text. Well-known for their distinguished contributions to the field, the authors â ” in addition to Professor Wilson of Harvard University â ” are J. C. Decius of Oregon State University and Paul C. Cross, late President of Mellon Institute. Younger students interested in the field of molecular spectroscopy will especially welcome this inexpensive reprint edition of an exceptional book. "An authoritative and complete presentation written on a very high level." â ” G. Herzberg, Science"The easiest and quickest route to acquiring skill in handling the mathematics of molecular vibrations." â ” Nature

Book Information

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Customer Reviews

In this one, Wilson writes definitively, math/scientifically, and with sincerity of purpose. Don’t get confused by the word ’theory.’ There’s as much math in here as Born and Wolf’s P of O. The only diffenrence is Wilson’s is much more algebra-based. The mathematics (i.e. isomorphs) is ’taught’, without breaking the flow, and is not assumed that you know the stuff already--- or can find it somewhere else. This book stands out because there is more science in here than names of scientists, and his references are for real. I would also say it was unique because books with titles like ’Molecular Vibrations’ are usually skipped over for titles like ’mechanics’ or ’quantum theory.’ Spectroscopy was a major advancement in science, and it is good to see it skillfully treated with enlightening clarity.

Reissue of original, which was published in 1955, in the pre-computer age. Solid QM description of vibrating polyatomic molecules, and their interaction with EM radiation. The authors exploit group theory (molecular symmetry) to reduce the calculational work as much as possible. Good introduction to the use of finite groups, e.g. how to exploit the hexagonal symmetry of the benzene molecule.

This is the original work by E.B.Wilson where the G and F matrix formalism is presented. The G matrix, related to kinetic vibrational energy is built uppon the elements of the B matrix defined from "internal coordinates". Many quantum chemistry software packages use this exact methodology to build normal coordinates. For those working on Quantum Chem Molecular Orbital calculations, this book is a must.

It seems that molecular vibrations is a topic which is treated on two levels these days: simple harmonic oscillators in undergraduate P-chem, and then maybe some calculations in a quantum chemistry program. Ended up in a research group where you need to know this stuff? Want to know what is going on "under the hood" of Gaussian? What’s a normal coordinate? You mean I can determine frequencies without DFT? All your burning questions answered! The study of molecular vibrations is one of the pillars modern chemistry, and there is no substitute for this book.Yes, it is a

little old fashioned (it has instructions for making analog integration circuits!), but really there is no better source. One thing though: set aside some time and really READ it. All the words. There are many gems scattered throughout, and if you just equation-hop you'll miss out on a lot. It has the same excellent price and nice (not fancy but hey, its not meant to sit on your shelf...read it!) printing you expect from Dover. They should get a Nobel prize for being the only non-criminal science publishers out there these days.

When I was a university student I learned about both vibrational spectroscopy and group theory applied to molecules from this book written in 1955 by Wilson, Decius, and Cross. Believe me, this is a classic reference that, although outdated in some place, it remains one of the best books ever written on the subject. The language used by the authors is of such an elegance that you will be surprised when reading this book. For example, on page 240 (ch.10) the authors describe the structure of benzene as follows: "The structure for benzene....is one in which all atoms are coplanar with the carbon atoms and the hydrogen atoms at the corners of concentric, regular hexagons." Five stars to this book and to Dover for keeping it alive!

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