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Spectroscopy of Molecular Excitons



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Spectroscopy Of Molecular Excitons

**Vladimir L'vovich Broude, Èmmanuil
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Spectroscopy Of Molecular Excitons:

Spectroscopy of Molecular Excitons Vladimir L. Broude, Emmanuel I. Rashba, Elena F. Sheka, 1985 Low temperature spectroscopy of organic molecular crystals came into being in the late 20s just when quantum physics of solids as a whole began to develop vigorously Already in the early works two experimental facts of prime importance were discovered the presence of a multitude of narrow bands in the low temperature spectrum of a crystal and a close relationship between the spectrum of the crystal and that of the constituent molecules These findings immediately preceded the celebrated paper of Frenkel in which he went beyond the framework of Bloch's scheme and advanced the exciton concept Subsequent investigations showed that the most interesting features of the spectra of molecular crystals are associated with excitons and then the spectroscopy of molecular excitons began to form gradually on the basis of the spectroscopy of organic crystals The molecular exciton became synonymous to the Frenkel exciton in a molecular crystal In view of the difficulties involved in the analysis of rich spectra containing many tens of bands the spectroscopy of molecular crystals had long been connected most closely with the spectroscopy of molecules It had developed independently to a large extent from the other branches of solid state physics This was also emphasized by the difference in experimental techniques the specific properties of the objects etc As a result there was some lag in ideas and concepts

Spectroscopy of Molecular Excitons Vladimir L. Broude, Emmanuel I. Rashba, Elena F. Sheka, 1985-09-01 Low temperature spectroscopy of organic molecular crystals came into being in the late 20s just when quantum physics of solids as a whole began to develop vigorously Already in the early works two experimental facts of prime importance were discovered the presence of a multitude of narrow bands in the low temperature spectrum of a crystal and a close relationship between the spectrum of the crystal and that of the constituent molecules These findings immediately preceded the celebrated paper of Frenkel in which he went beyond the framework of Bloch's scheme and advanced the exciton concept Subsequent investigations showed that the most interesting features of the spectra of molecular crystals are associated with excitons and then the spectroscopy of molecular excitons began to form gradually on the basis of the spectroscopy of organic crystals The molecular exciton became synonymous to the Frenkel exciton in a molecular crystal In view of the difficulties involved in the analysis of rich spectra containing many tens of bands the spectroscopy of molecular crystals had long been connected most closely with the spectroscopy of molecules It had developed independently to a large extent from the other branches of solid state physics This was also emphasized by the difference in experimental techniques the specific properties of the objects etc As a result there was some lag in ideas and concepts

Spectroscopy of Molecular Excitons Vladimir L'vovich Broude, Èmmanuil Iosifovich Rashba, Elena Fedorovna Sheka, 1985

Dynamics of Molecular Excitons Seogjoo J. Jang, 2020-04-29 Dynamics of Molecular Excitons provides a comprehensive but concise description of major theories on the dynamics of molecular excitons intended to serve as a self contained resource on the topic Designed to help those new to this area gain proficiency in this field experts will also find the

book useful in developing a deeper understanding of the subject The starting point of the book is the standard microscopic definition of molecular Hamiltonians presented in commonly accepted modern quantum mechanical notations Major assumptions and approximations involved in constructing Frenkel type exciton Hamiltonians which are well established but are often hidden under arcane notations and approximations of old publications are presented in detail This will help quantum chemists understand the major assumptions involved in the definition of commonly used exciton models Rate theories of exciton dynamics such as Förster and Dexter theories and their modern generalizations are presented in a unified and detailed manner In addition important aspects that are often neglected such as local field effect and the role of fluctuating environments are discussed Various quantum dynamics methods allowing coherent dynamics of excitons are presented in a systematic manner in the context of quantum master equations or path integral formalisms The author also provides a detailed theoretical explanation for the major spectroscopic techniques probing exciton dynamics including modern two dimensional electronic spectroscopy with a critical assessment of the implications of these spectroscopic measurements Finally the book includes a brief overview of major applications including an explanation of organic photovoltaic materials and natural light harvesting complexes

Photosynthetic Excitons Herbert van Amerongen, Leonas Valkunas, Rienk van Grondelle, 2000 Excitons are considered as the basic concept used by describing the spectral properties of photosynthetic pigment protein complexes and excitation dynamics in photosynthetic light harvesting antenna and reaction centers Following the recently obtained structures of a variety of photosynthetic pigment protein complexes from plants and bacteria our interest in understanding the relation between structure function and spectroscopy has strongly increased These data demonstrate a short interpigment distance of the order of 1 nm or even smaller and or a highly symmetric ring like arrangement of pigment molecules in peripheral light harvesting complexes of photosynthetic bacteria Books which were devoted to the exciton problem so far mainly considered the spectral properties of molecular crystals However the small size of these pigment aggregates in the pigment protein complexes as well as the role of the protein which is responsible for the structural arrangement of the complex clearly will have a dramatic influence on the pigment spectra and exciton dynamics All these aspects of the problem are considered in this book Exciton theory is mainly considered for small molecular aggregates dimers ring like structures etc Together with the theoretical description of the classical conceptual approach which mainly deals with polarization properties of the absorption and fluorescence spectra the nonlinear femtosecond spectroscopy which is widely used for investigations now is also discussed A large part of the book demonstrates the excitonic effects in a multitude of photosynthetic pigment protein complexes and how we can understand these properties on the basis of the exciton concept

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proficiency in this field experts will also find the book useful in developing a deeper understanding of the subject The starting point of the book is the standard microscopic definition of molecular Hamiltonians presented in commonly accepted modern quantum mechanical notations Major assumptions and approximations involved in constructing Frenkel type exciton Hamiltonians which are well established but are often hidden under arcane notations and approximations of old publications are presented in detail This will help quantum chemists understand the major assumptions involved in the definition of commonly used exciton models Rate theories of exciton dynamics such as Förster and Dexter theories and their modern generalizations are presented in a unified and detailed manner In addition important aspects that are often neglected such as local field effect and the role of fluctuating environments are discussed Various quantum dynamics methods allowing coherent dynamics of excitons are presented in a systematic manner in the context of quantum master equations or path integral formalisms The author also provides a detailed theoretical explanation for the major spectroscopic techniques probing exciton dynamics including modern two dimensional electronic spectroscopy with a critical assessment of the implications of these spectroscopic measurements Finally the book includes a brief overview of major applications including an explanation of organic photovoltaic materials and natural light harvesting complexes Covers major theories of exciton dynamics in a consciously concise and easily readable way Bridges the gap between quantum dynamics working with phenomenological exciton Hamiltonian and quantum chemistry construct reliable models amenable for dynamics calculations from ab initio calculations Explores modern nonlinear electronic spectroscopy techniques to probe exciton dynamics showing how it is applied

Molecular Spectroscopy—XI O. Sild, 2017-01-31 Molecular Spectroscopy XI provides information pertinent to the fundamental aspects of molecular spectroscopy This book discusses the modifications of molecular spectra when the density varies as a function of temperature and pressure Organized into 15 chapters this book begins with an overview of the several processes concerning triplet excitons leading to magnetic field sensitive luminescence in organic crystals and related compounds This text then examines the methods of investigation of the exciton band structures in molecular crystals Other chapters consider the conditions for the equivalence of Fourier spectroscopy and of slow passage experiments in nuclear magnetic resonance This book discusses as well the application of computer technology in carbon 13 magnetic resonance spectroscopy The final chapter deals with the application of high resolution proton and carbon 13 nmr spectroscopy for the investigation of the molecular conformations in proteins This book is a valuable resource for organic chemists biologists microbiologists scientists and research workers

Spectroscopy of the Excited State Baldassare Di Bartolo, 2012-12-06 These proceedings report the lectures and seminars presented at the NATO Advanced Study Institute on The Spectroscopy of the Excited State held at Erice Italy June 9-24 1975 This Institute was an activity of the International School of Atomic and Molecular Spectroscopy of the Ettore Majorana Centre for Scientific Culture The Institute consisted of a series of lectures on the spectroscopic properties of materials in excited electronic states that starting at a fundamental

level finally reached the current level of research The sequence of lectures and the organization of the material taught were in keeping with a didactical presentation In essence the course had the two fold purpose of organizing what was known on the subject and updating the knowledge in the field The formal lectures were complemented by seminars whose abstracts are also included in these proceedings The proceedings report also the contributions sent by Professors R G W Norrish and S Claesson who unfortunately were not able to come because of illness A total of 62 participants and 7 lecturers came from the following countries Belgium Canada Czechoslovakia France Germany Israel Italy Japan Netherlands Norway Pakistan Poland Sweden Switzerland the United Kingdom the United States and Venezuela The secretaries of the course were A La Francesca for the administrative aspects of the meeting and P Papagiannakopoulos for the scientific aspects of the meeting

Two-dimensional Spectroscopy of Molecular Excitons in a Model Dimer System H. Alexei Halpin, 2014 *Theory of Molecular Excitons* A. Davydov, 2013-11-11

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