



THIN FILMS AND NANOSTRUCTURES

**ELECTRONIC  
EXCITATIONS IN  
ORGANIC BASED  
NANOSTRUCTURES**

edited by  
V.M. Agmonovitch  
G.F. Gerasimov

VOLUME 31

# Electronic Excitations In Organic Based Nanostructures

**Kathleen Armour**



## **Electronic Excitations In Organic Based Nanostructures:**

*Electronic Excitations in Organic Based Nanostructures*, 2003-11-13 The first book devoted to a systematic consideration of electronic excitations and electronic energy transfer in organic crystalline multilayers and organics based nanostructures quantum wells quantum wires quantum dots microcavities The ingenious combination of organic with inorganic materials in one and the same hybrid structure is shown to give qualitatively new opto electronic phenomena potentially important for applications in nonlinear optics light emitting devices photovoltaic cells lasers and so on The book will be useful not only for physicists but also for chemists and biologists To help the nonspecialist reader three Chapters which contain a tutorial and updated introduction to the physics of electronic excitations in organic and inorganic solids have been included hybrid Frenkel Wannier Mott excitons microcavities with crystalline and disordered organics electronic excitation at donor acceptor interfaces cold photoconductivity at donor acceptor interface cumulative photovoltage Feorster transfer energy in microcavity New concepts for LEDs

**Excitations in Organic Solids** Vladimir Agranovich, 2009-02-12 The book provides a detailed and uniform treatment of the science and technology of light absorbing organic materials used in nano scale optical devices LEDs solar cells flat screens cell phones etc which are increasingly investigated for use in mass market products

*Organic Field-Effect Transistors* Zhenan Bao, Jason Locklin, 2018-10-03 The remarkable development of organic thin film transistors OTFTs has led to their emerging use in active matrix flat panel displays radio frequency identification cards and sensors Exploring one class of OTFTs Organic Field Effect Transistors provides a comprehensive multidisciplinary survey of the present theory charge transport studies synthetic methodology materials characterization and current applications of organic field effect transistors OFETs Covering various aspects of OFETs the book begins with a theoretical description of charge transport in organic semiconductors at the molecular level It then discusses the current understanding of charge transport in single crystal devices small molecules and oligomers conjugated polymer devices and charge injection issues in organic transistors After describing the design rationales and synthetic methodologies used for organic semiconductors and dielectric materials the book provides an overview of a variety of characterization techniques used to probe interfacial ordering microstructure molecular packing and orientation crucial to device performance It also describes the different processing techniques for molecules deposited by vacuum and solution followed by current technological examples that employ OTFTs in their operation Featuring respected contributors from around the world this thorough up to date volume presents both the theory behind OFETs and the latest applications of this promising technology

**Organic Nanophotonics** Yong Sheng Zhao, 2014-11-05 This comprehensive text collects the progress made in recent years in the fabrication processing and performance of organic nanophotonic materials and devices The first part of the book addresses photonic nanofabrications in a chapter on multiphoton processes in nanofabrication and microscopy imaging The second part of the book is focused on nanoscale light sources for integrated nanophotonic circuits and is composed of three chapters on

organic nano microcavities organic laser materials and polymer light emitting electrochemical cells LECs The third part is focused on the interactions between light and matter and consists in three chapters including the propagation of light in organic nanostructures and photoswitches based on nonlinear optical polymer photonic crystals and photoresponsive molecules respectively The final chapter of this book introduces the integration of miniaturized photonic devices and circuits with various organic nanophotonic elements The practical case studies demonstrate how the latest applications actually work while tables throughout the book summarize key information and diagrams and figures help readers to grasp complex concepts and designs The references at the end of each chapter can be used as the gateway to the relevant literature in the field Moreover this book helps researchers to advance their own investigations to develop the next generation of miniaturized devices for information processing efficient energy conversion and highly accurate sensing Yong Sheng Zhao PhD is a Professor at the Institute of Chemistry Chinese Academy of Sciences ICCAS China

*Problems of Condensed Matter Physics* L. V. Keldysh, Alexei L. Ivanov, Sergei G. Tikhodeev, 2008 The book provides a review of some of the most important and hot topics in condensed matter physics today It includes contributions by internationally leading experts such as V M Agranovich B L Altshuler E Burstein V L Ginzburg K Von Klitzing P B Littlewood M Pepper etc and can serve as a guide book to modern condensed matter physics

**Functional Supramolecular Nanoassemblies of  $\pi$ -Conjugated Molecules** Penglei Chen, Bin Wu, 2020-01-13 conjugated systems of delocalized aromatic electrons along their backbones including conjugated small molecules oligomers polymers and carbonaceous materials etc have received considerable attention from a wide variety of scientific and technical communities Compared to inorganic materials the advantages of those based on tectons lie in their broad diversity flexibility and tunability with regard to structure geometry morphology processability composition functionality electronic band structure etc In terms of sophisticated molecular engineering these features endow them not only with excellent self assembly properties but also with unique optical electrical mechanical photophysical photochemical and biochemical attributes This renders them promising scaffolds for advanced functional materials AFMs in numerous areas of general interest such as electronics optics optoelectronics photovoltaics magnetic and piezoelectric devices sensors catalysts biomedicines and others With regard to the design synthesis of novel tectons the launch of diverse assembly fabrication protocols theoretical calculations etc the past several decades have witnessed tremendous advancements along this direction Thus far a vast array of high performance tectons based AFMs have been initiated To some extent the cooperative principle of stacking and other noncovalent interactions has been revealed and the structure property relationships have been disclosed Despite the existing progress this field still faces challenges for example

- i the need for scalable assembly manufacture under ambient conditions with low cost facile environmentally friendly protocols
- ii clearer correlations bridging the underlying intricate relationships of each successive step in assembly manufacture
- iii corresponding theoretical calculations for guiding the rational design of tectons that elucidate the

cooperative principle of stacking and other noncovalent interactions as well as the principle of structure performance correlation iv stability and durability among the most important concerns regarding their commercialization The advancements accumulated during the past decades have established a solid foundation for the further development of conjugated systems based AFMs We believe that with unrelenting efforts from both scientific and technical communities of various backgrounds their practical applications will eventually be fulfilled This Research Topic aims to address the above mentioned challenges

**Cu(In<sub>1-x</sub>Ga<sub>x</sub>)Se<sub>2</sub> Based Thin Film Solar Cells** Subba Ramaiah Kodigala, 2011-01-03 Cu In<sub>1-x</sub>Ga<sub>x</sub> Se<sub>2</sub> Based Thin Film Solar Cells provides valuable contents about the fabrication and characterization of chalcopyrite Cu In<sub>1-x</sub>Ga<sub>x</sub> Se<sub>2</sub> based thin film solar cells and modules The growth of chalcopyrite Cu In<sub>1-x</sub>Ga<sub>x</sub> S<sub>1-y</sub>Se<sub>2-y</sub> absorbers buffers window layers antireflection coatings and finally metallic grids which are the sole components of solar cells is clearly illustrated The absorber which contains multiple elements segregates secondary phases if the growth conditions are not well optimized i e the main drawback in the fabrication of solar cells More importantly the solutions for the growth of thin films are given in detail The properties of all the individual layers and single crystals including solar cells analyzed by different characterization techniques such as SEM AFM XPS AES TEM XRD optical photoluminescence and Raman spectroscopy are explicitly demonstrated The electrical analyses such as conductivities Hall mobilities deep level transient spectroscopy measurements etc provide a broad picture to understand thin films or single crystals and their solar cells The book clearly explains the working principle of energy conversion from solar to electrical with basic sciences for the chalcopyrite based thin film solar cells Also it demonstrates important criteria on how to enhance efficiency of the solar cells and modules The effect of environmental factors such as temperature humidity aging etc on the devices is mentioned by citing several examples Illustrates a number of growth techniques to prepare thin film layers for solar cells Discusses characterization techniques such as XRD TEM XPS AFM SEM PL CL Optical measurements and Electrical measurements Includes I V C V measurements illustrations Provides analysis of solar cell efficiency Presents current trends in thin film solar cells research and marketing

**Microcavities** Alexey Kavokin, Jeremy J. Baumberg, Guillaume Malpuech, Fabrice P. Laussy, 2017 Both rich fundamental physics of microcavities and their intriguing potential applications are addressed in this work oriented to undergraduate and postgraduate students as well as to physicists and engineers

Optics and Its Applications David Blaschke, Dmitry Firsov, Aram Papoyan, Hayk A. Sarkisyan, 2022-10-05 This book features selected articles based on contributions presented at the 9th International Symposium on Optics and Its Applications OPTICS 2022 in Yerevan Ashtarak Armenia The annual OPTICS symposium brings together renowned experts from all over the world working in the fields of atomic optics plasmonics optics of nanostructures as well as the optics of condensed matter and provides a perfect setting for their discussions of the most recent developments in this area The 9th iteration in this series dedicated to the 80th birthday of Academician Eduard Kazaryan focuses on topics dealing with the spectroscopy of real and artificial atoms linear and

nonlinear optical characteristics of quantum wells and two dimensional materials The book highlights recent results of few particle optical characteristics of artificial atoms in the framework of the exactly solvable Moshinsky model as well as an electro optical analog of the magneto optical Faraday effect In addition a detailed study of the nucleation process its characterization as well as electronic and optical properties of graded composition quantum dots in the Stranski Krastanov growth mode is presented Physico-Chemical Phenomena in Thin Films and at Solid Surfaces ,2007-06-07 The book is devoted to the consideration of the different processes taking place in thin films and at surfaces Since the most important physico chemical phenomena in such media are accompanied by the rearrangement of an intra and intermolecular coordinates and consequently a surrounding molecular ensemble the theory of radiationless multi vibrational transitions is used for its description The second part of the book considers the numerous surface phenomena And in the third part is described the preparation methods and characteristics of different types of thin films Both experimental and theoretical descriptions are represented Media rearrangement coupled with the reagent transformation largely determines the absolute value and temperature dependence of the rate constants and other characteristics of the considered processes These effects are described at the atomic or molecular level based on the multi phonon theory starting from the first pioneering studies through to contemporary studies A number of questions are included at the end of many chapters to further reinforce the material presented Unified approach to the description of numerous physico chemical phenomena in different materials Based on the pioneering research work of the authors Explantion of a variety of experimental observations Material is presented at two levels of complexity for specialists and non specialists Identifies existing and potential applications of the processes and phenomena Includes questions at the end of some chapters to further reinforce the material discussed

**Cavity Polaritons** Alexey Kavokin,Guillaume Malpuech,2003-11-26 Volume 32 of the series addresses one of the most rapidly developing research fields in physics microcavities Microcavities form a base for fabrication of opto electronic devices of XXI century in particular polariton lasers based on a new physical principle with respect to conventional lasers proposed by Einstein in 1917 This book overviews a theory of all major phenomena linked microcavities and exciton polaritons and is oriented to the reader having no background in solid state theory as well as to the advanced readers interested in theory of exciton polaritons in microcavities All major experimental discoveries in the field are addressed as well The book is oriented to a general reader and is easy to read for a non specialist Contains an overview of the most essential effects in physics of microcavities experimentally observed and theoretically predicted during the recent decade such as Bose Einstein condensation at room temperature Lasers without inversion of population Microcavity boom optics of the XXI century Frequently asked questions on microcavities and responses without formulas Half light half matter quasi particles base for the future optoelectronic devices **Emerging Research in Science and Engineering Based on Advanced Experimental and Computational Strategies** Felipe de Almeida La Porta,Carlton A. Taft,2020-01-02 In this book the

authors discuss some of the main challenges and new opportunities in science and engineering research which involve combining computational and experimental approaches as a promising strategy for arriving at new insights into composition structure property relations even at the nanoscale From a practical standpoint the authors show that significant improvements in the material biomolecular foresight by design including a fundamental understanding of their physical and chemical properties are vital and will undoubtedly help us to reach a new technological level in the future

**Highlights on Spectroscopies of Semiconductors and Nanostructures** ,2007      **Thin Films and Nanostructures** ,2002      **La rivista del nuovo cimento della Società italiana di fisica** Società italiana di fisica,2008      *Green Chemistry and Computational Chemistry* Liliana L. Mammino,2021-11-17

Green chemistry already draws on many techniques and approaches developed by theoretical chemists whilst simultaneously revealing a whole range of interesting new challenges for theoretical chemists to explore Highlighting how work at the intersection of these fields has already produced beneficial results *Green Chemistry and Computational Chemistry Shared Lessons in Sustainability* is a practical informative guide to combining green and theoretical chemistry principles and approaches in the development of more sustainable practices Beginning with an introduction to both theoretical chemistry and green chemistry the book goes on to explore current approaches being taken by theoretical chemists to address green and sustainable chemistry issues before moving on to highlight ways in which green chemists are employing the knowledge and techniques of theoretical chemistry to help in developing greener processes The future possibilities for theoretical chemistry in addressing sustainability issues are discussed before a selection of case studies provides good insight into how these interactions and approaches have been successfully used in practice Highlights the benefits of green and theoretical chemistry groups working together to tackle sustainability issues across both academia and industry Supports readers in easily selecting the most appropriate path through the book for their own needs Presents a range of examples examining the practical implications and outcomes of interdisciplinary approaches

Dekker Encyclopedia of Nanoscience and Nanotechnology James A. Schwarz,Cristian I. Contescu,Karol Putyera,2004      Current Research in Nuclear Reactor Technology in Brazil and Worldwide Amir Mesquita,2013-02-06

The aim of this book is to disseminate state of the art research and advances in the area of nuclear reactors technology The book was divided in two parts Topics discussed in the first part of this compilation include experimental investigation and computational validation of thermal stratification in PWR reactors piping systems new methods in doppler broadening function calculation for nuclear reactors fuel temperature isothermal phase transformation of uranium zirconium niobium alloys for advanced nuclear fuel reactivity Monte Carlo burnup simulations of enriched gadolinium burnable poison for PWR fuel utilization of thermal analysis technique for study of uranium molybdenum fuel alloy probabilistic safety assessment applied to research reactors and a review on the state of the art and current trends of next generation reactors The second part includes thermal hydraulics study for a ultra high temperature reactor with packed

sphere fuels benefits in using lead 208 coolant for fast reactors and accelerator driven systems nuclear power as a basis for future electricity production in the world Generation III and IV reactors nanostructural materials and shaped solids for improvement and energetic effectiveness of nuclear reactors safety and radioactive wastes multilateral nuclear approach to nuclear fuel cycles and a cold analysis of the Fukushima accident      *Unconventional Approaches to Nanostructures with Applications in Electronics, Photonics, Information Storage and Sensing: Volume 776* Materials Research Society. Meeting, 2003-08-14 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners      Excitations in Organic Solids Vladimir M. Agranovich, 2009-02-12 During the last decade our expertise in nanotechnology has advanced considerably The possibility of incorporating in the same nanostructure different organic and inorganic materials has opened up a promising field of research and has greatly increased the interest in the study of properties of excitations in organic materials In this book not only the fundamentals of Frenkel exciton and polariton theory are described but also the electronic excitations and electronic energy transfers in quantum wells quantum wires and quantum dots at surfaces at interfaces in thin films in multilayers and in microcavities Among the new topics in the book are those devoted to the optics of hybrid Frenkel Wannier Mott excitons in nanostructures polaritons in organic microcavities including hybrid organic inorganic microcavities new concepts for organic light emitting devices the mixing of Frenkel and charge transfer excitons in organic quasi one dimensional crystals excitons and polaritons in one and two dimensional crystals surface electronic excitations optical biphonons and Fermi resonances by polaritons All new phenomena described in the book are illustrated by available experimental observations The book will be useful for scientists working in the field of photophysics and photochemistry of organic solids for example organic light emitting devices and solar cells and for students who are entering this field It is partly based on a book by the author written in 1968 Theory of Excitons in Russian However the new book includes only 5 chapters from this version all of which have been updated The 10 new chapters contain discussions of new phenomena their theory and their experimental observations



## Unveiling the Magic of Words: A Report on "**Electronic Excitations In Organic Based Nanostructures**"

In a global defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their power to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Electronic Excitations In Organic Based Nanostructures**," a mesmerizing literary masterpiece penned by way of a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve to the book is central themes, examine its distinctive writing style, and assess its profound effect on the souls of its readers.

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