



# Lower-Dimensional Systems and Molecular Electronics

Edited by  
**Robert M. Metzger**  
**Peter Day** and  
**George C. Papavassiliou**

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# Lower Dimensional Systems And Molecular Electronics

**Daniel Errandonea**



## **Lower Dimensional Systems And Molecular Electronics:**

### **Lower-Dimensional Systems and Molecular Electronics** Robert M. Metzger, Peter R. Day, George C.

Papavassiliou, 2013-11-11 This volume represents the written account of the NATO Advanced Study Institute Lower Dimensional Systems and Molecular Electronics held at Hotel Spetses Spetses Island Greece from 12 June to 23 June 1989. The goal of the Institute was to demonstrate the breadth of chemical and physical knowledge that has been acquired in the last 20 years in inorganic and organic crystals, polymers and thin films which exhibit phenomena of reduced dimensionality. The interest in these systems started in the late 1960s with lower dimensional inorganic conductors in the early 1970s with quasi one dimensional crystalline organic conductors which by 1979 led to the first organic superconductors and in 1977 to the first conducting polymers. The study of monolayer films, Langmuir-Blodgett films had progressed since the 1930s but reached a great upsurge in the early 1980s. The pursuit of non linear optical phenomena became increasingly popular in the early 1980s as the attention turned from inorganic crystals to organic films and polymers. And in the last few years the term molecular electronics has gained ever increasing acceptance although it is used in several contexts. We now have organic superconductors with critical temperatures in excess of 10 K, conducting polymers that are soluble and processable and used commercially, we have films of a few monolayers that have high in plane electrical conductivity and polymers that show great promise in photonics, we even have a few devices that function almost at the molecular level.

*Lower-Dimensional Systems and Molecular Electronics* Robert M. Metzger, Peter R. Day, George C. Papavassiliou, 1990. Proceedings of a NATO ASI held at Hotel Spetses Spetses Island Greece June 12-23 1989.

### **Unimolecular and Supramolecular Electronics I** Robert M. Metzger, 2012-01-10

Charge Transport in Organic Semiconductors by Heinz Bässler and Anna Köhler, Frontiers of Organic Conductors and Superconductors by Gunzi Saito and Yukihiro Yoshida, Fullerenes, Carbon Nanotubes and Graphene for Molecular Electronics by Julio R. Pinzon, Adrián Villalta Cerdas and Luis Echegoyen, Current Challenges in Organic Photovoltaic Solar Energy Conversion by Cody W. Schlenker and Mark E. Thompson, Molecular Monolayers as Semiconducting Channels in Field Effect Transistors by Cherie R. Kagan, Issues and Challenges in Vapor Deposited Top Metal Contacts for Molecule Based Electronic Devices by Masato M. Maitani and David L. Allara, Spin Polarized Electron Tunneling and Magnetoresistance in Molecular Junctions by Greg Szulczewski.

### **Materials and Measurements in Molecular Electronics** Koji Kajimura, Shin-ichi Kuroda, 2012-12-06

Materials and Measurements in Molecular Electronics presents new developments in one of the most promising areas of electronics technology for the 21st century. Conjugated polymers, carbon clusters and many other new molecular materials have been synthesized or discovered in recent years and some now are on the threshold of commercial application. In the development of molecular materials, detailed knowledge of the structures and electronic states of molecular aggregates is essential. The focus of this book is on the development of new molecular materials and measuring techniques based on modern spectroscopy. Included are such topics as Langmuir-Blodgett films, cluster materials,

organic conductors and conjugated electroluminescent polymers      *Nano and Molecular Electronics Handbook* Sergey Edward Lyshevski, 2018-10-03 There are fundamental and technological limits of conventional microfabrication and microelectronics Scaling down conventional devices and attempts to develop novel topologies and architectures will soon be ineffective or unachievable at the device and system levels to ensure desired performance Forward looking experts continue to search for new paradigms to carry the field beyond the age of microelectronics and molecular electronics is one of the most promising candidates The Nano and Molecular Electronics Handbook surveys the current state of this exciting emerging field and looks toward future developments and opportunities Molecular and Nano Electronics Explained Explore the fundamentals of device physics synthesis and design of molecular processing platforms and molecular integrated circuits within three dimensional topologies organizations and architectures as well as bottom up fabrication utilizing quantum effects and unique phenomena Technology in Progress Stay current with the latest results and practical solutions realized for nanoscale and molecular electronics as well as biomolecular electronics and memories Learn design concepts device level modeling simulation methods and fabrication technologies used for today s applications and beyond Reports from the Front Lines of Research Expert innovators discuss the results of cutting edge research and provide informed and insightful commentary on where this new paradigm will lead The Nano and Molecular Electronics Handbook ranks among the most complete and authoritative guides to the past present and future of this revolutionary area of theory and technology

**Unimolecular and Supramolecular Electronics II** Robert M. Metzger, 2012-01-10 G C Solomon C Herrmann M A Ratner Molecular Electronic Junction Transport Some Pathways and Some Ideas R M Metzger D L Mattern Unimolecular Electronic Devices B Branchi F C Simeone M A Rampi Active and Non Active Large Area Metal Molecules Metal Junctions C Li A Mishchenko T Wandlowski Charge Transport in Single Molecular Junctions at the Solid Liquid Interface K W Hipps Tunneling Spectroscopy of Organic Monolayers and Single Molecules N Renaud M Hliwa C Joachim Single Molecule Logical Devices

**Organic and Molecular Electronics** Michael C. Petty, 2019-01-04 An introduction to the interdisciplinary subject of molecular electronics revised and updated The revised second edition of Organic and Molecular Electronics offers a guide to the fabrication and application of a wide range of electronic devices based around organic materials and low cost technologies Since the publication of the first edition organic electronics has greatly progressed as evidenced by the myriad companies that have been established to explore the new possibilities The text contains an introduction into the physics and chemistry of organic materials and includes a discussion of the means to process the materials into a form in most cases a thin film where they can be exploited in electronic and optoelectronic devices The text covers the areas of application and potential application that range from chemical and biochemical sensors to plastic light emitting displays The updated second edition reflects the recent progress in both organic and molecular electronics and Offers an accessible resource for a wide range of readers Contains a comprehensive text that covers topics including electrical conductivity optical phenomena

electroactive organic compounds tools for molecular electronics and much more Includes illustrative examples based on the most recent research Presents problems at the end of each chapter to help reinforce key points Written mainly for engineering students Organic and Molecular Electronics From Principles to Practice provides an updated introduction to the interdisciplinary subjects of organic electronics and molecular electronics with detailed examples of applications Organic Conductors, Superconductors and Magnets: From Synthesis to Molecular Electronics Lahcène Ouahab, Eduard

Yagubskii, 2012-12-06 The book covers different aspects of the chemistry and physics of molecular materials including organic synthesis of specific organic donors and ligands organic metals and superconductors molecule based magnets multiproperty materials and organic inorganic hybrids The 17 chapters are written by some of the most authoritative authors in their field The two last chapters are devoted to molecular electronics and devices in particular the achievements and potential for applications An excellent work for all students and researchers in organic conductors superconductors and molecule based magnets **Mixed Valency Systems: Applications in Chemistry, Physics and Biology** K.

Prassides, 2012-12-06 Mixed valency is one of various names used to describe compounds which contain ions of the same element in two different formal states of oxidation The existence of mixed valency systems goes far back into the geological evolutionary history of the earth and other planets while a plethora of mixed valency minerals has attracted attention since antiquity Indeed control of the oxidation states of Fe in its oxides FeO Fe<sub>3</sub>O<sub>4</sub> Fe<sub>2</sub>O<sub>3</sub> was elegantly used in vase painting by the ancient Greeks to produce the characteristic black and red Attic ceramics Z Goffer Archaeological Chemistry Wiley New York 1980 It was however only 25 years ago that two reviews of mixed valency appeared in the literature almost simultaneously signalling the first attempt to treat mixed valency systems as a separate class of compounds whose properties can be correlated with the molecular and the electronic structure of their members Then mixed valency phenomena attracted the interest of disparate classes of scientists ranging from synthetic chemists to solid state physicists and from biologists to geologists This activity culminated with the NATO ASI meeting in Oxford in 1979 The 1980 s saw again a continuing upsurge of interest in mixed valency Its presence is a necessary factor in the search for highly conducting materials including molecular metals and superconductors The highly celebrated high T<sub>c</sub> ceramic superconducting oxides are indeed mixed valency compounds **Molecular Electronics and Molecular Electronic Devices** Kristof Sienicki, 1994-03-22 Molecular

Electronics and Molecular Electronic Devices is a new book series that reflects the state of the art in the science and technology of molecular electronic devices It provides a comprehensive review of current problems and the latest information regarding all aspects of molecular electronics and molecular electronic devices Experimental and theoretical aspects of molecular electronics and molecular electronic devices are reviewed by distinguished researchers working in chemistry physics computer science and various areas of biology Intelligent Materials Mohsen Shahinpoor, Hans-Jörg Schneider, 2008 From the nanoscale to the macroscopic scale intelligent materials are triggering a response across both

dimensions and scientific disciplines World class leading experts in the fields of chemistry physics and engineering have contributed to Intelligent Materials highlighting the importance of smart material science in the 21st century In this exceptional text the expertise of specialists across the globe is drawn upon to present a truly interdisciplinary outline of the topic Covering both a bottom up chemical and top down engineering approach to the design of intelligent materials the Editors of the book are bridging a vital gap between various scientific authorities The influence of current research in this field on future technology is undisputed and potential applications of intelligent materials span nanoscience nano technology medicine engineering biotechnology pharmaceutical and many other industries This is an authoritative introduction to the most recent developments in the area which will provide the reader with a better understanding of the almost unlimited opportunities in the progress and design of new intelligent materials An indispensable reference for anyone contemplating working in the field The Editors Mohsen Shahinpoor is the Chief Scientist and Director of Biomedical Products at Environmental Robots Inc and a Regents Professor at the University of New Mexico His work in the field of Robotic Systems and Smart Intelligent Materials covers over some 22 years and includes numerous publications and patents Prof Dr Hans Joerg Schneider is Professor of organic chemistry at the Universitaet des Saarlandes Germany He has played a pivotal role in transferring the principles of molecular recognition into supramolecular polymers and has published a multitude of books and papers in the field with several patents pending for intelligent chemomechanical materials Comments on this book This will be the starting point for all researchers looking for industrial solutions involving smart materials Congratulations to the Editors for providing such a vast and interdisciplinary book P G de Gennes France Prix Nobel de Physic 1991

**Advances in Synthetic Metals** P. Bernier, G. Bidan, S. Lefrant, 1999-12-07 This edited work contains eight extensive review type contributions by leading scientists in the field of synthetic metals The authors were invited by the organisers of the International Conference on Science and Technology of Synthetic Metals 98 ICSM 98 to review the progress of research in the past two decades in a unifying and pedagogical manner The present work highlights the state of the art of the field and assesses the prospects for future research Granular Nanoelectronics David K. Ferry, John R. Barker, Carlo Jacoboni, 2013-12-14 The technological means now exists for approaching the fundamental limiting scales of solid state electronics in which a single carrier can in principle represent a single bit in an information flow In this light the prospect of chemically or biologically engineered molecular scale structures which might support information processing functions has enticed workers for many years The one common factor in all suggested molecular switches ranging from the experimentally feasible proton tunneling structure to natural systems such as the micro tubule is that each proposed structure deals with individual information carrying entities Whereas this future molecular electronics faces enormous technical challenges the same limit is already appearing in existing semiconducting quantum wires and small tunneling structures both superconducting and normal meta devices in which the motion of a single charge through the tunneling barrier can produce

a sufficient voltage change to cut off further tunneling current We may compare the above situation with today's Si microelectronics where each bit is encoded as a very large number not necessarily fixed of electrons within a charge pulse The associated reservoirs and sinks of charge carriers may be profitably tapped and manipulated to provide macro currents which can be readily amplified or curtailed On the other hand modern semiconductor ULSI has progressed by adopting a linear scaling principle to the down sizing of individual semiconductor devices

*Advances in Nonradiative Processes in Solids* Baldassare di Bartolo, 2013-03-14 This book presents an account of the course *Advances in Nonradiative Processes in Solids* held in Erice Italy from June 15 to 29 1989 This meeting was organized by the International School of Atomic and Molecular Spectroscopy of the Ettore Majorana Centre for Scientific Culture An area of solid state research that continues to attract the attention of experimental and theoretical physicists is that of nonradiative relaxation processes of excited solids The interest in these processes stems from their technological relevance and from the difficulty in the quantitative characterization and differentiation of their various pathways The decay channels leading to the ground state include the conversion of electronic excitation energy into phonon energy nonradiative transfer of excitation energy upconversion processes etc Considerable advances have been achieved in understanding and modeling the radiative process that follow the electronic excitations of solids the progress in this field has been instrumental in the development of new solid state devices and laser materials On the other hand these advances have underscored the inadequacy in the understanding of the nonradiative relaxation processes This course dealt with the advances in physical modeling mathematical formalisms and experimental techniques relevant to the quantitative characterization of the various pathways of nonradiative relaxation of solids in excited electronic states

*The Application of Charge Density Research to Chemistry and Drug Design* G.A. Jeffrey, J.F. Piniella, 2012-12-06 In the past twenty years the X ray crystallography of organic molecules has expanded rapidly in two opposite directions One is towards larger and larger biological macromolecules and the other is towards the fine details of the electronic structure of small molecules Both advances required the development of more sophisticated methodologies Both were made possible by the rapid development of computer technology X ray diffraction equipment has responded to these demands in the one case by the ability to measure quickly many thousands of diffraction spectra in the other by providing instruments capable of very high precision Molecules interact through their electrostatic potentials and therefore their experimental and theoretical measurement and calculation is an essential component to understanding the electronic structure of chemical and biochemical reactions In this ASI we have brought together experts and their students from both the experimental and theoretical sides of this field in order that they better understand the philosophy and complexity of these two complementary approaches George A Jeffrey Department of Crystallography University of Pittsburgh Pittsburgh Pennsylvania 15260 USA

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*Superconductivity and Particle Detection* G. Waysand, 1995

Superconductors today constitute a major focus of activity in the development of high resolution detectors for many applications This volume collects the papers of an international workshop on the basic theoretical and experimental issues involved in the interaction between particles and superconductors It emphasizes the involved condensed matter aspects of non equilibrium time dependent Ginzburg Landau equations metastable superconductivity quasiparticle and phonon lifetimes and quasiparticle trapping as well as low noise pulse electronics detector fabrication and low background cryogenics

Publisher s website      **Superconductivity And Particle Detection - Proceedings Of The International Workshop** G Waysand,A Morales,T A Girard,1995-03-07 Superconductors today constitute a major focus of activity in the development of high resolution detectors for many applications This volume collects the papers of an international workshop on the basic theoretical and experimental issues involved in the interaction between particles and superconductors It emphasizes the involved condensed matter aspects of non equilibrium time dependent Ginzburg Landau equations metastable superconductivity quasiparticle and phonon lifetimes and quasiparticle trapping as well as low noise pulse electronics detector fabrication and low background cryogenics      **Energy Research Abstracts** ,1990      Advances in Organic Conductors and Superconductors Martin Dressel,2018-10-04 This book is a printed edition of the Special Issue Advances in Organic Conductors and Superconductors that was published in Crystals      *High-Pressure Studies of Crystalline Materials* Daniel Errandonea,2018-08-10 High Pressure Studies of Crystalline Materials



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