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Science advances by leaps and bounds rather than linearly in time. It is not uncommon for a new concept or approach to generate a lot of initial interest, only to enter a quiet period of years or decades and then suddenly reemerge as

Many-Electron Densities and Reduced Density Matrices - Jerzy Cioslowski - 2012-12-06
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Science advances by leaps and bounds rather
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**Reduced-Density-Matrix Mechanics** - David A. Mazziotti - 2007-04-06
An up-to-date account of this cutting-edge research in a consistent and understandable framework, of special interest to experts in other areas of electronic structure and/or quantum many-body theory. It will serve equally well as a self-contained guide to learning about reduced density matrices either through self-study or in a classroom as well as an invaluable resource for understanding the critical advancements in the field.

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Energy Density Functional Theory of Many-Electron Systems - Eugene S. Kryachko - 2012-12-06

Reduced Density Matrices - A.J. Coleman - 2000-04-14
The authors demonstrate that the essential information about order in, and energy levels of physical systems is encapsulated in the second order reduced density matrix. They have discovered an algorithm to obtain a reasonable accurate expression for the 2-matrix of an N-particle state to make nearly all properties of matter which are of interest to chemists and physicists accessible.

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**Electron Density and Bonding in Crystals** - V.G Tsirelson - 2020-11-26

Electron Density and Bonding in Crystals: Principles, Theory and X-Ray Diffraction Experiments in Solid State Physics and Chemistry provides a comprehensive, unified account of the use of diffraction techniques to determine the distribution of electrons in crystals. The book discusses theoretical and practical techniques, the application of electron density studies to chemical bonding, and the determination of the physical properties of condensed matter. The book features the authors' own key contributions to the subject as well a thorough, critical summary of the extensive literature on electron density and bonding. Logically organized, coverage ranges
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**Electron and Magnetization Densities in Molecules and Crystals** - Pierre Becker - 2013-11-21

The interest of describing the ground state properties of a system in terms of one electron density (or its two spin components) is obvious, in particular due to the simple physical significance of this function. Recent experimental progress in diffraction made the measurement of charge and magnetization densities in crystalline solids possible, with an accuracy at least as good as theoretical accuracy. Theoretical developments of the many-body problem have proved the extreme importance of the one electron density function and presently, accurate methods of band structure determination become available. Parallel to the diffraction techniques, other domains of research (inelastic scattering, resonance, molecular spectroscopy) deal with
in particular due to the simple physical density. But the two types of studies do not interfere enough and one should obviously gain more information by interpreting all experiments that are related to the density together. It became necessary to have an International School that reviews the status of the art in the domain of "ELECTRON AND MAGNETIZATION DENSITIES IN MOLECULES AND CRYSTALS". This was made possible through the generous effort of N.A.T.O.'s Scientific Affairs Division, and I would specially thank Dr. T. KESTER, the head of this Division, for his help and competence. An Advanced Study Institute was thus held in ARLES, south France, from the 16th to the 31st of August 1978.

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Ion-Induced Electron Emission from
Crystalline Solids - Hiroshi Kudo - 2001-10-09
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Reduced Density Matrices: a Simpler Approach to Many-electron Problems? - - 2013

XXXI International Workshop on Condensed Matter Theories (CMT31) - Virulh Sa-yakanit - 2008

Electron Correlation in Molecules and Condensed Phases - Norman H. March - 2013-11-11

This book had its origins in lectures presented at EPFL, Lausanne, during two separate visits (the most recent being to IRRMA). The author is most grateful to Professors A. Baldereschi, R. Car, and A. Quattropani for making these visits possible, and for the splendidly stimulating environment provided. Professors S. Baroni and R. Resta also influenced considerably the presentation of material by constructive help and comments. Most importantly, Chapters 4 and 5 were originally prepared for a review article by Professor G. Senatore, then at Pavia and now in Trieste, and myself for Reviews of Modern Physics (1994). In the course of this collaboration, he has taught me a great deal, especially about quantum Monte Carlo procedures, and Chapter 5 is based directly on this review article. Also in Chapter 4, my original draft on Gutzwiller's method has been transformed by his deeper understanding; again this is reflected directly in Chapter 4; especially in the earlier sections. In addition to the above background, it is relevant here to point out that, as a backcloth for the present, largely "state of
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Advances in Chemical Physics - David A. Mazziotti - 2007

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Landau Level Spectroscopy - - 2012-12-02
Modern Problems in Condensed Matter Sciences, Volume 27.2: Landau Level Spectroscopy focuses on the processes, reactions, methodologies, and approaches involved in condensed matter
many-electron-densities-and-reduced-density-matrices

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Electron Density and Chemical Bonding I - Dietmar Stalke - 2012-06-05

Electron Density and Chemical Bonding I - Dietmar Stalke - 2012-06-05
are described in detail, and their application is
Density Analysis.- W. Scherer, V. Herz, Ch. Hauf:
On the Nature of β-Agostic Interactions: A
Comparison Between the Molecular Orbital and
Charge Density Picture.

Evolution of Open Many-electron Systems -
Aric Gliesche - 2007

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Topological Data Analysis for Scientific
Visualization - Julien Tierny - 2018-01-16
Combining theoretical and practical aspects of
topology, this book provides a comprehensive
and self-containted introduction to topological
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to handle electron cloud distortion in femtosecond processes.

Nonlinear Optical Materials - Jerome V. Moloney - 2012-12-06
Mathematical methods play a significant role in the rapidly growing field of nonlinear optical materials. This volume discusses a number of successful or promising contributions. The overall theme of this volume is twofold: (1) the challenges faced in computing and optimizing nonlinear optical material properties; and (2) the exploitation of these properties in important areas of application. These include the design of optical amplifiers and lasers, as well as novel optical switches. Research topics in this volume include how to exploit the magnetooptic effect, how to work with the nonlinear optical response of materials, how to predict laser-induced breakdown in efficient optical devices, and how to handle electron cloud distortion in femtosecond processes.
Recent studies on two-dimensional systems have led to new insights into the fascinating interplay between physical properties and dimensionality. Many of these ideas have emerged from work on electrons bound to the surface of a weakly polarizable substrate such as liquid helium or solid hydrogen. The research on this subject continues to be at the forefront of modern condensed matter physics because of its fundamental simplicity as well as its connection to technologically useful devices. This book is the first comprehensive overview of experimental and theoretical research in this exciting field. It is intended to provide a coherent introduction for graduate students and non-experts, while at the same time serving as a reference source for active researchers in the field. The chapters are written by individuals who made significant contributions and cover a variety of specialized topics. These include the origin of the surface states, tunneling and magneto-tunneling out of these states, the phase diagram, collective excitations, transport and magneto-transport.

**Two-Dimensional Electron Systems** - E.Y. Andrei - 2012-12-06
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Discharge processing of semiconductor materials, either as an etch process step in microelectronic fabrication, or as a deposition scheme for solar cell or copier applications, has become indispensable in modern technology. This report is focussed on discharges used for such applications. The thesis by Fleddermann was a basic study of the attachment rate of electrons in discharges involving mixtures of silane and a rare gas as represented by helium. It was found that the primary attaching species was not the silane molecule but some daughter product created by the discharge. These results are indicative of the problems encountered in an attempt to model discharges in such gases: the rates for the radicals may be larger than that of the donor gases.


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Reduced Density Matrices in Quantum Chemistry - Ernest Davidson - 2012-12-02
Reduced Density Matrices in Quantum Chemistry is from a special topics course of the author to graduate students at the Ohio State University. The focus of the book is on the structure of the density matrix as reference to the electronic structure of atoms and molecules. Chapters 1 and 2 discuss and differentiate in detail the ensemble density matrix and reduced density matrices. Ensemble density matrix is discussed in the context of different states, while the energy expressions of reduced density matrices are highlighted together with some examples. Chapter 3 accordingly follows through with a description of the properties of reduced density matrices. The succeeding chapters focus on the first-order and second-order reduced density properties. The final chapter discusses and interprets the two-body density matrix. The book is intended for graduate students and researchers in the study of quantum chemistry.
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**Silicon-Germanium (SiGe) Nanostructures** - Y. Shiraki - 2011-02-26

Nanostructured silicon-germanium (SiGe) opens up the prospects of novel and enhanced electronic device performance, especially for semiconductor devices. Silicon-germanium (SiGe) nanostructures reviews the materials science of nanostructures and their properties and applications in different electronic devices. The introductory part one covers the structural properties of SiGe nanostructures, with a further chapter discussing electronic band structures of SiGe alloys. Part two concentrates on the formation of SiGe nanostructures, with chapters on different methods of crystal growth such as molecular beam epitaxy and chemical vapour deposition. This part also includes chapters matrices in terms of their analytic and physical properties. The final chapter discusses and interprets the two-body density matrix. The book is intended for graduate students and researchers in the study of quantum chemistry.

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**Practical Electron Microscopy** - Elaine Evelyn Hunter - 1993-09-24
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The book targets a broad readership. First of all, it targets young researchers (postgraduate students) in solid state physics (both physicists and theoretical chemists) as it contains a wide and comprehensive coverage of all important survey of recent revolutionary advances in quantum mechanics which have made it possible not only to calculate many properties of molecules and solids in close agreement with experiment, but to make reliable predictions in cases when a direct experiment is not possible (e.g. the Earth core). Secondly, it should be a valuable asset to established researches in the areas of materials science, solid-state physics and chemistry due to very detailed explanations of a wide range of phenomena ranging from symmetry, lattice vibrations, electronic structure and superconductivity to magnetic and dielectric properties. Rigour and detail in explaining complicated mathematical techniques and in providing derivations when talking of various physical concepts are essential for those who would like to really understand things they have never had a chance to. Because of that and of the fact that the book contains a lot of material from different areas of solid-state physics retold from
leading researchers, this book is ideal for lecturers. Not only a number of courses, both general and specialised, should be possible to set up, but these courses may also be of a different level of difficulty ranging from undergraduate, postgraduate and then to highly advanced ones. This is because of a clear marking system adopted in the book. Hence, it should also be useful for advanced third- and fourth-year undergraduate students.

X-Ray Free Electron Lasers - Uwe Bergmann - 2017-08-11
The ultra-bright femtosecond X-ray pulses provided by X-ray free electron lasers (XFELs) open up opportunities to study the structure and dynamics of a wide variety of systems beyond what is possible with synchrotron sources. This book introduces the principles and properties of currently operating and future XFELs, before outlining applications in materials science, chemistry and biology. Edited by pioneers in this exciting field, and featuring contributions from leading researchers, this book is ideal for researchers working with XFELs, synchrotron radiation, ultrafast and femtosecond crystallography and femtosecond spectroscopy.

The Physics of the Two-Dimensional
Program Committee and the members of the
The 1986 Advanced Study Institute on "The
Physics of the two-Dimensional Electron Gas"
took place at the Conference Centre liTer
Helme", close to Oostende (Belgium), from June 2
till 16, 1986. We were motivated to organize this
Advanced Study Institute in view of the recent
experimental and theoretical progress in the
study of the two-dimensional electron gas. An
additional motivation was our own theoretical
interest in cyclotron resonance in two-
dimensional electron systems at our institute. It
is my pleasure to thank several instances and
people who made this Advanced Study Institute
possible. First of all, the sponsor of the Advanced
Study Institute, the NATO Scientific Committee.
Furthermore, the co sponsors: Agfa Gevaert, Bell
Control Data. Digital Equipment Corporation,
Esso Belgium. European Research Office (USA).
Kredietbank. National Science Foundation (USA).
Special thanks are due to the members of the
Organizing Committee. I would also like to thank
Mrs. H. Evans for typing assistance.

The Physics of the Two-Dimensional
Electron Gas - J.T. Devreese - 2012-12-06
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Physics of the two-Dimensional Electron Gas"
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who need to understand the theory of atomic and molecular structure and processes, and who wish to apply the theory to practical problems. As far as practicable, the book provides a self-contained account of the theory of relativistic atomic and molecular structure, based on the accepted formalism of bound-state Quantum Electrodynamics. The author was elected a Fellow of the Royal Society of London in 1992.

**Relativistic Quantum Theory of Atoms and Molecules** - Ian P Grant - 2007-04-15
This book is intended for physicists and chemists who need to understand the theory of atomic and molecular structure and processes, and who wish to apply the theory to practical problems. As far as practicable, the book provides a self-contained account of the theory of relativistic atomic and molecular structure, based on the accepted formalism of bound-state Quantum Electrodynamics. The author was elected a Fellow of the Royal Society of London in 1992.
of the process are covered, including scientific
Guillermo Velarde - 2020-11-26
Nuclear Fusion by Inertial Confinement provides
a comprehensive analysis of directly driven
inertial confinement fusion. All important aspects
of the process are covered, including scientific
considerations that support the concept, lasers
and particle beams as drivers, target fabrication,
analytical and numerical calculations, and
materials and engineering considerations.
Authors from Australia, Germany, Italy, Japan,
Russia, Spain, and the U.S. have contributed to
the volume, making it an internationally
significant work for all scientists working in the
Inertial Confinement Fusion (ICF) field, as well
as for graduate students in engineering and
physics with interest in ICF.

Spins in Chemistry - Roy McWeeny -
2004-06-18
Originally delivered as a series of lectures, this
volume systematically traces the evolution of the
"spin" concept from its role in quantum
mechanics to its assimilation into the field of
chemistry. Author Roy McWeeny presents an in-
depth illustration of the deductive methods of
quantum theory and their application to spins in
chemistry, following the path from the earliest
employed in the investigation of molecular
structure and properties. Starting with the origin
and development of the spin concept, the text
advances to an examination of spin and valence;
reviews a simple example of the origin of spin
Hamiltonians; and explores spin density, spin
populations, and spin correlation. Additional
topics include nuclear hyperfine effects and
electron spin-spin coupling, the g tensor, and
chemical shifts and nuclear spin-spin coupling.

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Scanning Transmission Electron Microscopy
of Nanomaterials - Nobuo Tanaka - 2014-08-21
The basics, present status and future prospects
of high-resolution scanning transmission electron
microscopy (STEM) are described in the form of
a textbook for advanced undergraduates and
graduate students. This volume covers recent
achievements in the field of STEM obtained with
advanced technologies such as spherical
aberration correction, monochromator, high-
sensitivity electron energy loss spectroscopy and
the software of image mapping. The future
Prospects chapter also deals with z-slice imaging and confocal STEM for 3D analysis of nanostructured materials. Contents: Introduction (N Tanaka) Historical Survey of the Development of STEM Instruments (N Tanaka) Basic Knowledge of STEM: Basics of STEM (N Tanaka and K Saitoh) Application of STEM to Nanomaterials and Biological Specimens (N Shibata, S D Findlay, Y Ikuhara and N Tanaka) Theories of STEM Imaging: Theory for HAADF-STEM and Its Image Simulation (K Watanabe) Theory for Annular Bright Field STEM Imaging (S D Findlay, N Shibata and Y Ikuhara) Electron Energy-Loss Spectroscopy in STEM and Its Imaging (K Kimoto) Density Functional Theory for EELNES in STEM-EELS (T Mizoguchi) Advanced Methods in STEM: Aberration Correction in STEM (H Sawada) Secondary Electron Microscopy in STEM (H Inada and Y Zhu) Scanning Confocal Electron Microscopy (K Mitsuishi and M Takeguchi) Electron Tomography in STEM (N Tanaka) Electron Holography and Lorentz and confocal STEM for 3D analysis of nanostructured materials. Contents: Introduction (N Tanaka) Historical Survey of the Development of STEM Instruments (N Tanaka) Basic Knowledge of STEM: Basics of STEM (N Tanaka and K Saitoh) Application of STEM to Nanomaterials and Biological Specimens (N Shibata, S D Findlay, Y Ikuhara and N Tanaka) Theories of STEM Imaging: Theory for HAADF-STEM and Its Image Simulation (K Watanabe) Theory for Annular Bright Field STEM Imaging (S D Findlay, N Shibata and Y Ikuhara) Electron Energy-Loss Spectroscopy in STEM and Its Imaging (K Kimoto) Density Functional Theory for EELNES in STEM-EELS (T Mizoguchi) Advanced Methods in STEM: Aberration Correction in STEM (H Sawada) Secondary Electron Microscopy in STEM (H Inada and Y Zhu) Scanning Confocal Electron Microscopy (K Mitsuishi and M Takeguchi) Electron Tomography in STEM (N Tanaka) Electron Microscopy in STEM (N Tanaka) Recent Topics and Future Prospects in STEM (N Tanaka) Readership: Graduate students and researchers in the field of nanomaterials and nanostructures. Key Features: Most advanced; befitting beginning graduate students Very convenient for advanced researchers who would like to use STEM and have a comprehensive understanding of the theory of image contrast and application details Spans from the basic theory to the applications of STEM Keywords: STEM; Nanomaterials; HAADF-STEM; Atomic Resolution; Elemental Mapping; Dark Field Images; Nanoanalysis; Nanofabrication; Nanodiffraction Reviews: “This is written in a very readable style, packed with information and helpful explanations, and above all, very up to date. The book is generously illustrated, with many nice line-drawings, historic photographs, micrographs and spectra and, as a bonus, it has a name index
Scanning Transmission Electron Microscopy of Nanomaterials - Nobuo Tanaka - 2014-08-21

The basics, present status and future prospects of high-resolution scanning transmission electron microscopy (STEM) are described in the form of a textbook for advanced undergraduates and graduate students. This volume covers recent achievements in the field of STEM obtained with advanced technologies such as spherical aberration correction, monochromator, high-sensitivity electron energy loss spectroscopy and the software of image mapping. The future prospects chapter also deals with z-slice imaging and confocal STEM for 3D analysis of nanostructured materials. Contents:

- Introduction (N Tanaka)
- Historical Survey of the Development of STEM Instruments (N Tanaka)
- Basic Knowledge of STEM: Basics of STEM (N Tanaka and K Saitoh)
- Application of STEM to Nanomaterials and Biological Specimens (N Shibata, S D Findlay, Y Ikuhara and N

HAADF-STEM and Its Image Simulation (K Watanabe)
Theory for Annular Bright Field STEM Imaging (S D Findlay, N Shibata and Y Ikuhara)
Electron Energy-Loss Spectroscopy in STEM and Its Imaging (K Kimoto)
Density Functional Theory for ELNES in STEM-EELS (T Mizoguchi)
Advanced Methods in STEM: Aberration Correction in STEM (H Sawada)
Secondary Electron Microscopy in STEM (H Inada and Y Zhu)
Scanning Confocal Electron Microscopy (K Mitsuishi and M Takeguchi)
Electron Tomography in STEM (N Tanaka)
Electron Holography and Lorentz Electron Microscopy in STEM (N Tanaka)
Recent Topics and Future Prospects in STEM (N Tanaka)

Readership: Graduate students and researchers in the field of nanomaterials and nanostructures.

Key Features: Most advanced; befitting beginning graduate students; very convenient for advanced researchers who would like to use STEM and have a comprehensive understanding of the
Introduction to the Physics of Electron Emission - Kevin L. Jensen - 2017-09-15

A practical, in-depth description of the physics behind electron emission physics and its usage in science and technology. Electron emission is both a fundamental phenomenon and an enabling component that lies at the very heart of modern science and technology. Written by a recognized authority in the field, with expertise in both the basic theory and the applications of STEM.

Keywords: STEM; Nanomaterials; HAADF-STEM; Atomic Resolution; Elemental Mapping; Dark Field Images; Nanoanalysis; Nanofabrication; Nanodiffraction

Reviews: “This is written in a very readable style, packed with information and helpful explanations, and above all, very up to date. The book is generously illustrated, with many nice line-drawings, historic photographs, micrographs and spectra and, as a bonus, it has a name index as well as a subject index.” Ultramicroscopy

Electron emission physics and electron beam physics, An Introduction to Electron Emission provides an in-depth look at the physics behind thermal, field, photo, and secondary electron emission mechanisms, how that physics affects the beams that result through space charge and emittance growth, and explores the physics behind their utilization in an array of applications. The book addresses mathematical and numerical methods underlying electron emission, describing where the equations originated, how they are related, and how they may be correctly used to model actual sources for devices using electron beams. Writing for the beam physics and solid state communities, the author explores applications of electron emission methodology to solid state, statistical, and quantum mechanical ideas and concepts related to simulations of electron beams to condensed matter, solid state and fabrication communities. Provides an extensive description of the physics
behind four electron emission mechanisms—field, photo, and secondary, and how that physics relates to factors such as space charge and emittance that affect electron beams. Introduces readers to mathematical and numerical methods, their origins, and how they may be correctly used to model actual sources for devices using electron beams. Demonstrates applications of electron methodology as well as quantum mechanical concepts related to simulations of electron beams to solid state design and manufacture. Designed to function as both a graduate-level text and a reference for research professionals. Introduction to the Physics of Electron Emission is a valuable learning tool for postgraduates studying quantum mechanics, statistical mechanics, solid state physics, electron transport, and beam physics. It is also an indispensable resource for academic researchers and professionals who use electron sources, model electron emission, develop cathode technologies, or utilize electron beams. Introduction to the Physics of Electron Emission - Kevin L. Jensen - 2017-09-15

A practical, in-depth description of the physics behind electron emission physics and its usage in science and technology. Electron emission is both a fundamental phenomenon and an enabling component that lies at the very heart of modern science and technology. Written by a recognized authority in the field, with expertise in both electron emission physics and electron beam physics, An Introduction to Electron Emission provides an in-depth look at the physics behind thermal, field, photo, and secondary electron emission mechanisms, how that physics affects the beams that result through space charge and emittance growth, and explores the physics behind their utilization in an array of applications. The book addresses mathematical and numerical methods underlying electron emission, describing where the equations originated, how they are related, and how they may be correctly used to model actual sources.
Electron Emission is a valuable learning tool for beam physics and solid state communities, the author explores applications of electron emission methodology to solid state, statistical, and quantum mechanical ideas and concepts related to simulations of electron beams to condensed matter, solid state and fabrication communities. Provides an extensive description of the physics behind four electron emission mechanisms—field, photo, and secondary, and how that physics relates to factors such as space charge and emittance that affect electron beams. Introduces readers to mathematical and numerical methods, their origins, and how they may be correctly used to model actual sources for devices using electron beams Demonstrates applications of electron methodology as well as quantum mechanical concepts related to simulations of electron beams to solid state design and manufacture Designed to function as both a graduate-level text and a reference for research professionals Introduction to the Physics of postgraduates studying quantum mechanics, statistical mechanics, solid state physics, electron transport, and beam physics. It is also an indispensable resource for academic researchers and professionals who use electron sources, model electron emission, develop cathode technologies, or utilize electron beams.

**Physical Chemistry** - Henry Eyring - 1967

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**The Enzymes** - Paul D. Boyer - 1975-06-01

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**Infrared Photodetectors Based on Low-Dimensional Materials** - Nan Guo - 2018-09-27

This book is focused on the study of physical mechanisms and device design for achieving high-performance infrared photodetection based on low-dimensional materials. Through theory
electric measurements, it provides solutions to the trade-off problems which are commonly encountered in traditional infrared photodetectors and presents novel methods to improve the responsivity, detectivity and response speed. Researchers and scientists in the field of opto-electronic device can benefit from the book.

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