

**V.V. Eremenko / N.F. Kharchenko**  
**Yu.G. Litvinenko / V.M. Naumenko**

# Magneto-Optics and Spectroscopy of Antiferromagnets



Springer-Verlag

# Magneto Optics And Spectroscopy Of Antiferromagnets

**K. Tsushima, K. Shinagawa**



## **Magneto Optics And Spectroscopy Of Antiferromagnets:**

Magneto-Optics and Spectroscopy of Antiferromagnets V.V. Eremenko,N.F. Kharchenko,Yu.G. Litvinenko,V.M. Naumenko,2012-12-06 Certain magnetic materials have optical properties that make them attractive for a wide variety of applications such as optical switches This book describes the physics of one class of such magneto optic materials the insulating antiferromagnets The authors summarize recent results concerning the structure optical properties spectroscopy and magneto optical properties of these materials In particular they consider magnetic phase transitions symmetry effects the linear magneto optical effect magnons spectroscopic study of spin waves photoinduced magnetic effects and the effects of impurities *Magneto-Optics and Spectroscopy of Antiferromagnets* V.V. Eremenko,N.F. Kharchenko,Yu.G. Litvinenko,V.M. Naumenko,2011-10-29 Certain magnetic materials have optical properties that make them attractive for a wide variety of applications such as optical switches This book describes the physics of one class of such magneto optic materials the insulating antiferromagnets The authors summarize recent results concerning the structure optical properties spectroscopy and magneto optical properties of these materials In particular they consider magnetic phase transitions symmetry effects the linear magneto optical effect magnons spectroscopic study of spin waves photoinduced magnetic effects and the effects of impurities *Magneto-optics and Spectroscopy of Antiferromagnets* Viktor Valentinovich Eremenko,1992 **Smart Materials for Ranging Systems** J. J. M. Franse,Jaap Franse,Victor Eremenko,Valentyna Sirenko,2006-04-21 This book considers the different aspects of materials with specific magnetic electric and elastic properties They are considered in view of potential application in the design and manufacturing of smart materials Modern smart materials play a key role at investigations in interdisciplinary materials sciences and are serving to forge new links between basic and applied research Progress is reported in the fabrication and understanding of in situ formation and characterization of solid state structures with specified properties *Photonic Devices* Jia-ming Liu,2009-06-11 Photonic devices lie at the heart of the communications revolution and have become a large and important part of the electronic engineering field so much so that many colleges now treat this as a subject in its own right With this in mind the author has put together a unique textbook covering every major photonic device and striking a careful balance between theoretical and practical concepts The book assumes a basic knowledge of optics semiconductors and electromagnetic waves Many of the key background concepts are reviewed in the first chapter Devices covered include optical fibers couplers electro optic devices magneto optic devices lasers and photodetectors Problems are included at the end of each chapter and a solutions set is available The book is ideal for senior undergraduate and graduate courses but being device driven it is also an excellent engineers reference Spintronics Puja Dey,Jitendra Nath Roy,2021-04-13 This book highlights the overview of Spintronics including What is Spintronics Why Do We Need Spintronics Comparative merit demerit of Spintronics and Electronics Research Efforts put on Spintronics Quantum Mechanics of Spin Dynamics of magnetic moments Landau Lifshitz Gilbert Equation Spin Dependent

Band Gap in Ferromagnetic Materials Functionality of Spin in Spintronics Different Branches of Spintronics etc Some important notions on basic elements of Spintronics are discussed here such as Spin Polarization Spin Filter Effect Spin Generation and Injection Spin Accumulation Different kinds of Spin Relaxation Phenomena Spin Valve Spin Extraction Spin Hall Effect Spin Seebeck Effect Spin Current Measurement Mechanism Magnetoresistance and its different kinds etc Concept of Giant Magnetoresistance GMR different types of GMR qualitative and quantitative explanation of GMR employing Resistor Network Theory are presented here Tunnelling Magnetoresistance TMR Magnetic Junctions Effect of various parameters on TMR Measurement of spin relaxation length and time in the spacer layer are covered here This book highlights the concept of Spin Transfer Torque STT STT in Ferromagnetic Layer Structures STT driven Magnetization Dynamics STT in Magnetic Multilayer Nanopillar etc This book also sheds light on Magnetic Domain Wall MDW Motion Ratchet Effect in MDW motion MDW motion velocity measurements Current driven MDW motion etc The book deals with the emerging field of spintronics i e Opto spintronics Special emphasis is given on ultrafast optical controlling of magnetic states of antiferromagnet Spin photon interaction Faraday Effect Inverse Faraday Effect and outline of different all optical spintronic switching One more promising branch i e Terahertz Spintronics is also covered Principle of operation of spintronic terahertz emitter choice of materials terahertz writing of an antiferromagnetic magnetic memory device is discussed Brief introduction of Semiconductor spintronics is presented that includes dilute magnetic semiconductor ferromagnetic semiconductor spin polarized semiconductor devices three terminal spintronic devices Spin transistor Spin LED and Spin Laser This book also emphasizes on several modern spintronics devices that includes GMR Read Head of Modern Hard Disk Drive MRAM Position Sensor Biosensor Magnetic Field sensor Three Terminal Magnetic Memory Devices Spin FET Race Track Memory and Quantum Computing

**Multiferroics** Andres Cano,Dennis Meier,Morgan Trassin,2021-06-21

Multiferroics materials with a coexistence of magnetic and ferroelectric order provide an efficient route for the control of magnetism by electric fields The authors cover multiferroic thin film heterostructures device architectures and domain interface effects They critically discuss achievements as well as limitations and assess opportunities for future applications

**Magnetoelectric Interaction Phenomena in Crystals** Manfred Fiebig,Victor V. Eremenko,Irina E. Chupis,2013-11-09

In the quest for higher data density in information technology manipulation of magnetization by other means than magnetic fields has become an important challenge This lead to a startling revival of the magnetoelectric effect which characterizes induction of a polarization by a magnetic field or of a magnetization by an electric field The magnetoelectric crosslink of material properties opens just those degrees of freedom which are needed for the mutual control of magnetic and electric states The book gives a state of the art review on magnetoelectrics research classifies current research tendencies and points out possible future trends Novel compounds and growth techniques and new theoretical concepts for the understanding of magnetoelectric coupling phenomena are introduced Highlights are the discovery of gigantic magnetoelectric effects which

are strong enough to trigger electric or magnetic phase transitions the concept of magnetochirality and development structural magnetoelectric effects in artificial multiphase compounds The book is addressed to condensed matter physicists with a particular focus on experts in highly correlated systems      **Advances in Magneto-optics** K. Tsushima, K. Shinagawa, 1987      *International Tables for Crystallography, Volume D* A. Authier, 2014-11-17 International Tables for Crystallography is the definitive resource and reference work for crystallography and structural science Each of the volumes in the series contains articles and tables of data relevant to crystallographic research and to applications of crystallographic methods in all sciences concerned with the structure and properties of materials Emphasis is given to symmetry diffraction methods and techniques of crystal structure determination and the physical and chemical properties of crystals The data are accompanied by discussions of theory practical explanations and examples all of which are useful for teaching Volume D is concerned with the influence of symmetry on the physical and tensor properties of crystals and on their structural phase transitions This role is very important in many different disciplines of the science of materials such as crystallography elasticity solid state physics magnetism optics ferroelectricity and mineralogy and Volume D deals with all these aspects in a unified way The volume is divided into 3 parts Part 1 Introduces the mathematical properties of tensors and group representations and gives their independent components for each of the crystallographic groups Part 2 Devoted to the symmetry aspects of excitations in reciprocal space phonons electrons Raman scattering and Brillouin scattering Part 3 Deals with the symmetry aspects of structural phase transitions and twinning A prominent feature is the joint description of twinning and domain structures which are usually presented in completely separate ways in handbooks of physics and mineralogy Supplementary software is provided to support and enhance Chapters 1 1 and 1 2 for the determination of irreducible group representations and tensor components and Part 3 on structural phase transitions New to this edition This second edition of Volume D features a new chapter Chapter 1 11 on the tensorial properties of local crystal susceptibilities by V E Dmitrienko A Kirfel and E N Ovchinnikova This chapter describes the symmetry and physical phenomena that allow and restrict forbidden reflections excited at radiation energies close to the X ray absorption edges of atoms Reflections caused by magnetic scattering are also discussed In Part 1 Chapters 1 1 an introduction to the properties of tensors 1 2 on representations of crystallographic groups 1 3 elastic properties 1 5 magnetic properties and 1 10 on tensors in quasiperiodic structures have been revised In particular Chapter 1 5 features a new section on multiferroics by M Kenzelmann Chapter 3 3 on twinning of crystals has been updated and new sections on the effect of twinning in reciprocal space and on the relations between twinning and domain structure have been added Chapter 3 4 on domain structures has also been updated More information on the series can be found at <http://it.iucr.org>      **Magneto-Optics** Satoru Sugano, Norimichi Kojima, 2013-03-09 This book is designed to provide graduate students and research beginners with an introductory review of recent developments in the field of microscopic magneto optics The field contains the most important subjects in solid state physics

chemical physics and electronic engineering Microscopic studies of magneto optics stem from those of ligand field spectra of paramagnetic ions in solids and liquids which are also well known to have brought developments in material research for solid state lasers As the introductory chapter of this monograph Chap 1 deals with the fundamental properties of ligand field spectra in useful solids Chapter 2 is on elementary excitations such as magnons and excitons in magnetically ordered crystals a central aspect of recent developments in microscopic magneto optics Chapter 3 concerns Raman spectroscopy accompanying magnetic excitations of high energies in strongly correlated electron systems which are related to high T<sub>c</sub> superconductors Chapter 4 is on recent developments in the studies of non linear optical effects citing experiments for Cr<sup>2+</sup> and describing a microscopic theory for its second harmonic generation In Chap 5 after introducing a phenomenological theory of the Faraday and Kerr effects we present a microscopic theory based on the ligand field theory and discuss the future developments Chapter 6 concerns diluted magnetic semiconductors discussing formation magnetic properties and quantum confinement effects of magnetic polarons Chapter 7 is also on diluted magnetic semiconductors emphasizing the importance in growing new magnetic semiconductors and in studying their remarkable magneto optical properties

**Physics Briefs**, 1993      **Nonlinear Homogenization and Its Applications to Composites, Polycrystals and Smart Materials** P. Ponte Castaneda, J.J. Telega, B. Gambin, 2004-09-15 Although several books and conference proceedings have already appeared dealing with either the mathematical aspects or applications of homogenization theory there seems to be no comprehensive volume dealing with both aspects The present volume is meant to fill this gap at least partially and deals with recent developments in nonlinear homogenization emphasizing applications of current interest It contains thirteen key lectures presented at the NATO Advanced Workshop on Nonlinear Homogenization and Its Applications to Composites Polycrystals and Smart Materials The list of thirty one contributed papers is also appended The key lectures cover both fundamental mathematical aspects of homogenization including nonconvex and stochastic problems as well as several applications in micromechanics thin films smart materials and structural and topology optimization One lecture deals with a topic important for nanomaterials the passage from discrete to continuum problems by using nonlinear homogenization methods Some papers reveal the role of parameterized or Young measures in description of microstructures and in optimal design Other papers deal with recently developed methods both analytical and computational for estimating the effective behavior and field fluctuations in composites and polycrystals with nonlinear constitutive behavior All in all the volume offers a cross section of current activity in nonlinear homogenization including a broad range of physical and engineering applications The careful reader will be able to identify challenging open problems in this still evolving field For instance there is the need to improve bounding techniques for nonconvex problems as well as for solving geometrically nonlinear optimum shape design problems using relaxation and homogenization methods      **Recent Optical and Photonic Technologies** Ki Young Kim, 2010-01-01 Research and development in modern optical and photonic technologies have

witnessed quite fast growing advancements in various fundamental and application areas due to availability of novel fabrication and measurement techniques advanced numerical simulation tools and methods as well as due to the increasing practical demands The recent advancements have also been accompanied by the appearance of various interdisciplinary topics The book attempts to put together state of the art research and development in optical and photonic technologies It consists of 21 chapters that focus on interesting four topics of photonic crystals first 5 chapters THz techniques and applications next 7 chapters nanoscale optical techniques and applications next 5 chapters and optical trapping and manipulation last 4 chapters in which a fundamental theory numerical simulation techniques measurement techniques and methods and various application examples are considered This book deals with recent and advanced research results and comprehensive reviews on optical and photonic technologies covering the aforementioned topics I believe that the advanced techniques and research described here may also be applicable to other contemporary research areas in optical and photonic technologies Thus I hope the readers will be inspired to start or to improve further their own research and technologies and to expand potential applications I would like to express my sincere gratitude to all the authors for their outstanding contributions to this book     **The Cumulative Book Index** ,1994 A world list of books in the English language

**Non-linear Optics in Metals** K. H. Bennemann,1998-11-26 This book is a state of the art introduction to a very recent activity in solid state physics which has developed during the last 10 years and promises to become an important new tool for analysing electronic atomic and magnetic properties of surfaces interfaces and film structures Important applications are to be expected for information storage like e g magnetic recording The subject is one of the most recent examples of the successful history of light matter interaction and a most promising tool for non destructive high sensitivity analysis of material specific properties of solids     **Subject Guide to Books in Print** ,1996     **Technical Digest** ,1999     Optics and Spectroscopy ,2005     **The British National Bibliography** Arthur James Wells,1992

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