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KEY=COLOSSAL - HALLIE PARSONS

Colossal Magnetoresistive Manganites

Springer Science & Business Media **The physics of transition metal oxides has become a central topic of interest to condensed-matter scientists ever since high temperature superconductivity was discovered in hole-doped cuprates with perovskite-like structures. Although the renewed interest in hole-doped perovskite manganites following the discovery of their colossal magnetoresistance (CMR) properties, began in 1993 about a decade after the discovery of high temperature superconductivity, their first investigation started as early as 1950 and basic theoretical ideas were developed during 1951-1960. Experience in sample preparation and characterization, and in growth of single crystals and epitaxial thin films, gained during the research on high temperature superconductors, and the development of theoretical tools, were very efficiently used in research on CMR manganites. In early nineties it appeared to many condensed matter physicists that although the problem of high temperature superconductivity is a difficult one to solve, a quantitative understanding of CMR phenomena might be well within reach. This book is intended to be an account of the latest developments in the phys ics of CMR manganites. When I planned this book back in 2000, I thought that research on the physics of CMR manganites would be more or less consolidated by the time this would be published. I was obviously very optimistic indeed. We are now in 2003 and we still do not have a quantitative understanding of the central CMR effect. Meanwhile the field has expanded. It is still a very active field of research on both the experimental and theoretical fronts.**

Nanoscale Phase Separation and Colossal Magnetoresistance

The Physics of Manganites and Related Compounds

Springer Science & Business Media **The study of the spontaneous formation of nanostructures in single crystals of several compounds is now a major area of research in strongly correlated electrons. These structures appear to originate in the competition of phases. The book addresses nanoscale phase separation, focusing on the manganese oxides known as manganites that have the colossal magnetoresistance (CMR) effect of potential relevance for device applications. It is argued that the nanostructures are at the heart of the CMR phenomenon. The book contains updated information on manganite research directed to experts, both theorists and experimentalists. However, graduate students or postdocs will find considerable introductory material, including elements of computational physics.**

Colossal Magnetoresistive Oxides

CRC Press **The features and mechanism of Colossal Magnetoresistance, or CMR, in manganese oxides as well as device physics are highlighted in this book, with a focus on tunneling MR for some artificial structures. Underlying new science, such as tunable electron-lattice interaction in a metal and roles of orbital degrees of freedom in producing an unconventional metallic feature, is also discussed. The book provides a systematic exploration of the CMR materials and an extensive investigation of the electronic phenomena of those compounds by various experimental means.**

Colossal Magnetoresistance, Charge Ordering and Related Properties of Manganese Oxides

World Scientific **Metal oxides constitute one of the most amazing classes of materials with a wide range of properties. They exhibit a variety of phenomena, such as ferroelectricity, ferromagnetism and superconductivity. A new aspect of metal oxides -- colossal magnetoresistance exhibited by certain manganese oxides, in particular rare earth manganates of perovskite structure -- has received much attention in the last four years. Some of these oxides show 100% magnetoresistance and have much potential for technological applications. Previously this phenomenon was found only in layered and granular metallic materials. Studies of colossal magnetoresistance have led to the discovery of many other new phenomena and properties such as charge ordering and orbital ordering. In view of the importance of colossal magnetoresistance, charge ordering and related phenomena exhibited by oxides to the physics and chemistry of solid materials, it is necessary and timely to have a book dealing with these topics. This book begins with a review of the subject followed by contributions from a number of experts which cover the present status of the subject.**

Colossal Magnetoresistive Manganites for Sensing Applications

Magnetic and Transport Properties of Some Manganites with Colossal Magnetoresistance

Magnetic and Electrical Properties of the Colossal Magnetoresistance" Perovskite Manganites

On the Properties of Colossal Magnetoresistive Perovskite Manganites

An Experimental and Theoretical Investigation

Physics of Manganites

Springer Science & Business Media **This series of books, which is published at the rate of about one per year, addresses fundamental problems in materials science. The contents cover a broad range of topics from small clusters of atoms to engineering materials and involves chemistry, physics, materials science and engineering, with length scales ranging from Ångstroms up to millimeters. The emphasis is on basic science rather than on applications. Each book focuses on a single area of current interest and brings together leading experts to give an up to date discussion of their work and the work of others. Each article contains enough references that the interested reader can access the relevant literature. Thanks are given to the Center for Fundamental Materials Research at Michigan State University for supporting this series. M. F. Thorpe, Series Editor E mail: thorpe@pa. msu. edu V PREFACE This book records invited lectures given at the workshop on Physics of Manganites, held at Michigan State University, July 26 29, 1998. Doped manganites are an interesting class of compounds that show both metal insulator and ferromagnetic to paramagnetic transitions at the same temperature. This was discovered in the early 1950s by Jonker and van Santen and basic theoretical ideas were developed by Zener (1951), Anderson and Hasegawa (1955), and deGennes (1960) to explain these transitions and related interesting observations.**

Electronic and Magnetic Ordering Phenomena in Multiferroic and Colossal

Magnetoresistive Manganites

Physics of Transition Metal Oxides

Springer Science & Business Media **The fact that magnetite (Fe304) was already known in the Greek era as a peculiar mineral is indicative of the long history of transition metal oxides as useful materials. The discovery of high-temperature superconductivity in 1986 has renewed interest in transition metal oxides. High-temperature su perconductors are all cuprates. Why is it? To answer to this question, we must understand the electronic states in the cuprates. Transition metal oxides are also familiar as magnets. They might be found stuck on the door of your kitchen refrigerator. Magnetic materials are valuable not only as magnets but as electronics materials. Manganites have received special attention recently because of their extremely large magnetoresistance, an effect so large that it is called colossal magnetoresistance (CMR). What is the difference between high-temperature superconducting cuprates and CMR manganites? Elements with incomplete d shells in the periodic table are called tran sition elements. Among them, the following eight elements with the atomic numbers from 22 to 29, i. e. , Ti, V, Cr, Mn, Fe, Co, Ni and Cu are the most im portant. These elements make compounds with oxygen and present a variety of properties. High-temperature superconductivity and CMR are examples. Most of the textbooks on magnetism discuss the magnetic properties of transition metal oxides. However, when one studies magnetism using tradi tional textbooks, one finds that the transport properties are not introduced in the initial stages.**

Neutron Scattering from Magnetic Materials

Elsevier **Neutron Scattering from Magnetic Materials is a comprehensive account of the present state of the art in the use of the neutron scattering for the study of magnetic materials. The chapters have been written by well-known researchers who are at the forefront of this field and have contributed directly to the development of the techniques described. Neutron scattering probes magnetic phenomena directly. The generalized magnetic susceptibility, which can be expressed as a function of wave vector and energy, contains all the information there is to know about the statics and dynamics of a magnetic system and this quantity is directly related to the neutron scattering cross section. Polarized neutron scattering techniques raise the sophistication of measurements to even greater levels and gives additional information in many cases. The present book is largely devoted to the application of polarized neutron scattering to the study of magnetic materials. It will be of particular interest to graduate students and researchers who plan to investigate magnetic materials using neutron scattering. · Written by a group of scientist who have contributed directly in developing the techniques described. · A complete treatment of the polarized neutron scattering not available in literature. · Gives practical hits to solve magnetic structure and determine exchange interactions in magnetic solids. · Application of neutron scattering to the study of the novel electronic materials.**

Synchrotron X-ray Studies of Colossal Magnetoresistance in Manganites

Electronic Structure of Materials

Challenges and Developments

CRC Press **This book is a short survey of magnetochemistry as a promising method for revealing the electronic structure of inorganic substances, particularly solid oxide materials. It is supported by five chapters that describe materials with various structures and applications, showing how the method of magnetic dilution with the aid of other physical methods (electron spin resonance, magnetization, Raman and Mössbauer spectroscopy, and electrical conductivity), accompanied by thorough structural and quantum mechanical studies, may be used for describing the states of atoms and interatomic interactions in multicomponent oxide systems. The book will serve as a guide for researchers in the field of various oxide materials, since it shows the roots for selecting the best structures and qualitative and quantitative compositions of oxide materials on the basis of the knowledge about their electronic structure. It is devoted to some of the most popular structures of multicomponent oxides among modern materials—perovskites and pyrochlores—giving a unified approach to their chemical structure.**

Magnetic and Transport Properties of Colossal Magnetoresistance Manganites and Magnetic Semiconductors

Magnetism -- Colossal Magnetoresistance Manganites -- Diluted Magnetic Semiconductors -- Magnetic Critical Phenomena -- Metal-Insulator Transition -- Anomalous Hall Effect -- Phase Separation -- Griffiths-like Phase.

An Investigation of Manganites Exhibiting Colossal Magnetoresistance

Twinning Microstructure and Charge Ordering in the Colossal Magnetoresistive Manganite Nd12Sr12MnO3

Charge ordering (C.O.) in the colossal magnetoresistive (CMR) manganites gives rise to an insulating, high-resistance state. This charge ordered state can be melted into a low-resistance metallic-like state by the application of magnetic field. Thus, the potential to attain high values of magnetoresistance with the application of small magnetic fields may be aided by a better understanding of the charge-ordering phenomenon. This study focused on microstructural characterization in Nd12Sr12MnO3. In Nd12Sr12MnO3, the nominal valence of Mn is 3.5+. On cooling, charge can localize and lead to a charge ordering between Mn 3+ and Mn 4+. The ordering of charge results in a superlattice structure and a reduction in symmetry. Thin foil specimens were prepared from bulk samples by conventional thinning and ion milling (at LiqN2 temperature) methods. The room temperature TEM observation of Nd12Sr12MnO3 reveals that it contains a highly twinned microstructure, together with a small number of stacking faults (SFS). A figure shows the same area of the specimen at different zone axes obtained by tilting around two perpendicular directions as indicated. Three grains A, B and C are labeled for each of the zone axes. The room temperature EDPs from the matrix and twins shows an approximate 90° rotation suggesting a 90° twin orientation. These results are further confirmed by C.O. at low temperatures. The twinning planes can be determined by tilting with large angles.

Multifunctional Oxide Heterostructures

OUP Oxford **This book is devoted to the rapidly developing field of oxide thin-films and heterostructures. Oxide materials combined with atomic-scale precision in a heterostructure exhibit an abundance of macroscopic physical properties involving the strong coupling between the electronic, spin, and structural degrees of freedom, and the interplay between magnetism, ferroelectricity, and conductivity. Recent advances in thin-film deposition and characterization techniques made possible the experimental realization of such oxide heterostructures, promising novel functionalities and device concepts. The book consists of chapters on some of the key innovations in the field over recent years, including strongly correlated oxide heterostructures, magnetoelectric coupling and multiferroic materials, thermoelectric phenomena, and two-dimensional electron gases at oxide interfaces. The book covers the core principles, describes experimental approaches to fabricate and characterize oxide heterostructures, demonstrates new functional properties of these materials, and provides an overview of novel applications.**

Colossal Magnetoresistive Manganite Based Fast Bolometric X-ray Sensors for Total Energy Measurements of Free Electron Lasers

Origin of Colossal Magnetoresistance in LaMnO3 Manganite

Phase separation is a crucial ingredient of the physics of manganites; however, the role of mixed phases in the development of the colossal magnetoresistance (CMR) phenomenon still needs to be clarified. In this paper, we report the realization of CMR in a single-valent LaMnO3 manganite. We found that the insulator-to-metal transition at 32 GPa is well described using the percolation theory. Pressure induces phase separation, and the CMR takes place at the percolation threshold. A large memory effect is observed together with the CMR, suggesting the presence of magnetic clusters. The phase separation scenario is well reproduced, solving a model Hamiltonian. Finally, our results demonstrate in a clean way that phase separation is at the origin of CMR in LaMnO3.

Colossal-magnetoresistance Materials

Manganites and Conventional Ferromagnetic Semiconductors

Low Magnetic Field, Room Temperature Colossal Magnetoresistance in Manganite Thin Films

Colossal-magnetoresistance Materials

Manganites and Conventional Ferromagnetic Semiconductors

Structural and Electrical Properties of Some Manganites Compounds

LAP Lambert Academic Publishing **Colossal magnetoresistive (CMR) compounds with the perovskite structure are mainly characterized by a competition between ferromagnetism and paramagnatism, and between a metallic and insulator behavior.Electrical and structure have been studied in La1-xSrxMnOy (x = 0.1,0.15,0.2,0.25,0.3,0.35). The magnetoresistance was determined by measuring the temperature dependence of resistivity under a magnetic field 0.5 T. It was negative for all compositions and significantly influenced by the Sr content and annealing time. The obtained magnetoresitance values may make the materials promising for different applications.**

Investigation of Colossal Magnetoresistance in a Bulk and Thick Film Manganites

Polarons

Cambridge University Press **A distinctive introduction to the principles governing polaron science for experimental and theoretical graduate students and researchers.**

Electronic Properties of Doped Semiconductors

Springer Science & Business Media **First-generation semiconductors could not be properly termed "doped- they were simply very impure. Uncontrolled impurities hindered the discovery of physical laws, baffling researchers and evoking pessimism and derision in advocates of the burgeoning "pure" physical disciplines. The eventual banish ment of the "dirt" heralded a new era in semiconductor physics, an era that had "purity" as its motto. It was this era that yielded the successes of the 1950s and brought about a new technology of "semiconductor electronics". Experiments with pure crystals provided a powerful stimulus to the develop ment of semiconductor theory. New methods and theories were developed and tested: the effective-mass method for complex bands, the theory of impurity states, and the theory of kinetic phenomena. These developments constitute what is now known as semiconductor phys ics. In the last fifteen years, however, there has been a noticeable shift towards impure semiconductors - a shift which came about because it is precisely the impurities that are essential to a number of major semiconductor devices. Technology needs impure semiconductors, which unlike the first-generation items, are termed "doped" rather than "impure" to indicate that the impurity levels can now be controlled to a certain extent.**

Colossal Magnetoresistance and Phase Separation in Magnetic Semiconductors

World Scientific **Colossal magnetoresistance materials, to which manganites and conventional ferromagnetic semiconductors belong, draw great attention because of their intriguing physical properties and the excellent prospects for their practical applications in electronic devices. In addition, magnetic semiconductors are basic materials for high-temperature conductors, and it is impossible to construct a theory of the latter without elucidating properties of the former. This book presents theoretical and experimental results on manganites and conventional magnetic semiconductors, with emphasis on the former. It is addressed mainly to researchers dealing with manganites or high-temperature superconductors, but is also useful for undergraduate and graduate students. Contents:Introduction and Necessary Information about Non-magnetic Semiconductors and Insulating Magnetic SystemsPrinciples of Theory of Conducting MagneticNon-degenerate Ferromagnetic SemiconductorsNon-degenerate Antiferromagnetic Semiconductors and Self-trapped StatesDegenerate Ferromagnetic SemiconductorsDegenerate Antiferromagnetic Semiconductors and Phase SeparationLanthanum ManganitesOther ManganitesSpecific Effects and Theory of Manganites Readership: Advanced graduate students, lecturers and researchers in condensed matter physics, superconductivity and magnetic materials. Keywords:Magnetic Semiconductors;Magnetic Polaron (Ferron);Electronic Phase Separation;Manganites;Colossal Magnetoresistance;Solid State Physics**

Optical Conductivity of Colossal Magnetoresistance Manganites

A Thesis Submitted to the Victoria University of Wellington in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Physics

Colossal Magnetoresistance in Ultrathin Manganite Films

Solid Oxide Fuel Cell (SOFC) Materials

Materials Research Forum LLC **Developing materials for SOFC applications is one of the key topics in energy research. The book focuses on manganite structured materials, such as doped lanthanum chromites and lanthanum manganites, which have interesting properties: thermal and chemical stability, mixed ionic and electrical conductivity, electrocatalytic activity, magnetocaloric property and colossal magnetoresistance (CMR). These materials have applications in solid oxide fuel cells, high temperature NOx sensors, hard disk read heads, magnetic sensors and magnetoresistive random access memories. For the first time, the charge density distributions have been studied in these materials as synthesized by high temperature solid state reaction. Charge density analysis is helpful in understanding the physical and chemical properties of materials and in developing optimized structures. The morphological, elemental, optical and magnetic properties of the materials have also been studied. Solid Oxide Fuel Cells, SOFC, Manganite Structured Materials, Lanthanum Chromites, Lanthanum Manganites, Electrocatalytic Activity, Magnetocaloric Property, Colossal Magnetoresistance, High Temperature NOx Sensors, Hard Disk Read Heads, Magnetic Sensors, Magnetoresistive Random Access Memories, Charge Density Distribution**

Fabrication and Characterization of Magnetotransport in Colossal Magnetoresistive Manganite Thin Films and Hybrid Structures

Colossal Magnetoresistance Effect in Natural and Artificial Manganite Structures

Polarons

Recent Progress and Perspectives

This book presents recent research results on the illustrious verge of polaron science, which is broadly applied in condensed matter physics, solid state physics, and chemistry fields. It covers the modern progress of the polaron effect in various classes of materials. This book provides a thorough overview of the recent advancements in the polarons arena, and presents several active forms of guidance of scrutiny developed by well-known researchers. It describes interesting topics related to the new physical phenomena, experimental results, and applications of polarons. The scope includes both theoretical models and experimental works on different aspects of polarons, manifesting in conducting polymers,

functionalized nanowires, glasses and their nanocomposites, organic semiconductors, semiconducting nanostructures, manganites, ferrites, transition metal oxides, high-temperature superconductors, colossal magnetoresistance oxides, and magnetic semiconductors. A collective of authoritative research articles provide recent achievements of theoretical models and experimental realizations of polaron properties in solid state physics and chemistry. They involve substantial research varying from single polaron phenomena to multi-polarons problems in advanced materials. This book will be beneficial as a reference to support an inclusive perspective of the polaron phenomena in advanced materials and will be of prodigious significance to a broad range of researchers in condensed matter physics and material sciences.

Colossal Magnetoresistance, Charge Ordering and Related Properties of Manganese Oxides

World Scientific **Metal oxides constitute one of the most amazing classes of materials with a wide range of properties. They exhibit a variety of phenomena, such as ferroelectricity, ferromagnetism and superconductivity. A new aspect of metal oxides — colossal magnetoresistance exhibited by certain manganese oxides, in particular rare earth manganates of perovskite structure — has received much attention in the last four years. Some of these oxides show 100% magnetoresistance and have much potential for technological applications. Previously this phenomenon was found only in layered and granular metallic materials. Studies of colossal magnetoresistance have led to the discovery of many other new phenomena and properties such as charge ordering and orbital ordering. In view of the importance of colossal magnetoresistance, charge ordering and related phenomena exhibited by oxides to the physics and chemistry of solid materials, it is necessary and timely to have a book dealing with these topics. This book begins with a review of the subject followed by contributions from a number of experts which cover the present status of the subject. Contents:Colossal Magnetoresistance, Charge Ordering and Other Novel Properties of Manganates and Related Materials (C N R Rao & A K Raychaudhuri)The Important Role of Crystal Chemistry upon the CMR Properties of Manganites (B Raveau et al.)Magnetotransport and Magnetoelastic Effects in Manganese Oxide Perovskites (M R Ibarra & J M De Teresa)Colossal Magnetoresistive Manganites: The Push Towards Low Field Magnetoresistance (R Ramesh et al.)Low-Field Magnetoresistance Induced by Grain Boundaries in Doped Manganese Perovskites (A Gupta)Colossal Magnetoresistance Without Double-Exchange: Pyrochlores (M A Subramanian et al.)First Order Insulator-Metal Transitions in Perovskite Manganites with Charge-Ordering Instability (H Kuwahara & Y Tokura)Striped Charge and Orbital Ordering in Perovskite Manganites (S W Cheong & C H Chen)Electronic Structure of Perovskite-Type Manganese Oxides (A Fujimori et al.)Spin-Valve Effect in Manganese Oxide Perovskites: CMR (N Kumar et al.)Theory of Colossal Magnetoresistance: Some Questions (T V Ramakrishnan) Readership: Students and researchers in solid state chemistry, condensed matter physics, solid state physics and materials science. keywords:Rare Earth Manganites;Manganese Oxides;Colossal Magnetoresistance;Magnetic Properties of Oxides**

Theoretical Investigation of the Spin, Charge, and Orbital Dynamics in Colossal Magnetoresistive Manganites

Ferroelectric Field Effect Studies of the Colossal Magnetoresistive Oxide Lanthanum Strontium Manganite

Open Problems in Strongly Correlated Electron Systems

Springer Science & Business Media **Proceedings of the NATO Advanced Research Workshop, Bled, Slovenia, 26-30 April 2000**

Resistance Fluctuations and Phase Coexistence in Colossal Magneto-resistive Manganite Thin Films

Nodal Quasiparticle in Pseudogapped Colossal Magnetoresistive Manganites

A characteristic feature of the copper oxide high-temperature superconductors is the dichotomy between the electronic excitations along the nodal (diagonal) and antinodal (parallel to the Cu-O bonds) directions in momentum space, generally assumed to be linked to the d-wave symmetry of the superconducting state. Angle-resolved photoemission measurements in the superconducting state have revealed a quasiparticle spectrum with a d-wave gap structure that exhibits a maximum along the antinodal direction and vanishes along the nodal direction. Subsequent measurements have shown that, at low doping levels, this gap structure persists even in the high-temperature metallic state, although the nodal points of the superconducting state spread out in finite Fermi arcs. This is the so-called pseudogap phase, and it has been assumed that it is closely linked to the superconducting state, either by assigning it to fluctuating superconductivity or by invoking orders which are natural competitors of d-wave superconductors. Here we report experimental evidence that a very similar pseudogap state with a nodal-antinodal dichotomous character exists in a system that is markedly different from a superconductor: the ferromagnetic metallic groundstate of the colossal magnetoresistive bilayer manganite La{sub 1.2}Sr{sub 1.8}Mn2O--. Our findings therefore cast doubt on the assumption that the pseudogap state in the copper oxides and the nodal-antinodal dichotomy are hallmarks of the superconductivity state.