

1.	Record Nr.	UNIORUON00016715
	Autore	ITANI, Jun'ichiro
	Titolo	Gorira to pigumi no mori / Itani Jun'ichiro
	Pubbl/distr/stampa	Tokyo, : Iwanami, 1974
	Descrizione fisica	322 p. : ill. ; 17 cm
	Classificazione	GIA SERIE
	Soggetti	Africa - Geografia
	Lingua di pubblicazione	Giapponese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
2.	Record Nr.	UNINA9911019883603321
	Autore	Altalhi Tariq
	Titolo	Ferroic Materials-Based Technologies
	Pubbl/distr/stampa	Newark : , : John Wiley & Sons, Incorporated, , 2024 ©2024
	ISBN	9781394238194 1394238193 9781394238187 1394238185
	Edizione	[1st ed.]
	Descrizione fisica	1 online resource (350 pages)
	Altri autori (Persone)	Jafar MazumderMohammad Abu
	Disciplina	620.17
	Soggetti	Ferromagnetic materials Ferroelectricity
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Nota di contenuto	Cover -- Series Page -- Title Page -- Copyright Page -- Contents -- Preface -- Chapter 1 Ferroic Materials: From Past to Present -- 1.1

Introduction -- 1.2 Types of Ferroic Materials -- 1.2.1 Ferromagnetic Materials -- 1.2.1.1 Past of Ferromagnetic Materials -- 1.2.1.2 Present of Ferromagnetic Materials -- 1.2.2 Ferroelectric Materials -- 1.2.2.1 Past of Ferroelectric Materials -- 1.2.2.2 Present of Ferroelectric Materials -- 1.2.3 Ferroelastic Materials -- 1.2.3.1 Past of Ferroelastic Materials -- 1.2.3.2 Present of Ferroelastic Materials -- 1.2.4 Multiferroic Materials -- 1.2.4.1 Past of Multiferroic Materials -- 1.2.4.2 Present of Multiferroic Materials -- 1.3 Conclusion -- References -- Chapter 2 An Overview of Ferroic Materials -- 2.1 Introduction -- 2.2 Types of Ferroic Materials -- 2.2.1 Primary Ferroics -- 2.2.1.1 Ferromagnetic Materials -- 2.2.1.2 Ferroelectric Materials -- 2.2.1.3 Ferroelastic Materials -- 2.2.2 Secondary Ferroics -- 2.2.2.1 Multiferroics -- 2.2.2.2 Ferroelastoelectric Materials -- 2.2.2.3 Ferromagnetoelastic Materials -- 2.2.2.4 Ferromagnetoelctric Materials -- 2.3 Past of Ferroic Materials -- 2.3.1 Discovery of Magnetism and Electricity -- 2.3.2 Discovery of Ferromagnetism -- 2.3.3 Discovery of Ferroelectricity -- 2.3.4 Discovery of Ferroelasticity -- 2.4 Present of Ferroic Materials -- 2.5 Properties of Ferroic Materials -- 2.6 Scaling of Properties -- 2.7 Recent Advances in Ferroic Materials -- 2.8 Conclusion -- References -- Chapter 3 Future Perspectives of Ferroic/Multiferroic Materials -- 3.1 Introduction -- 3.2 Ferroic and Multiferroic Materials and Types -- 3.2.1 Ferroic Materials -- 3.2.2 Multiferroic Materials -- 3.3 Emerging Ferroic and Multiferroic Materials -- 3.3.1 Introduction to Emerging Ferroic and Multiferroic Materials -- 3.3.2 Examples of Emerging Ferroic and Multiferroic Materials. -- 3.4 Introduction to Advances in Characterization Techniques of Ferroic/Multiferroic Materials -- 3.4.1 Scanning Probe Microscopy -- 3.4.2 X-Ray Diffraction and Scattering -- 3.4.3 Neutron Scattering -- 3.4.4 Raman Spectroscopy -- 3.5 Applications -- 3.5.1 Magnetoelectric Devices -- 3.5.2 Multiferroic Microwave Phase Shifter -- 3.5.3 Multiferroic Magnetic Recording Read Heads -- 3.5.4 Multi-State Memories and Multiferroic Random Access Memories -- 3.5.5 Photovoltaic Multiferroic Solar Cells -- 3.6 Challenges and Future Directions for Ferroic and Multiferroic Materials -- 3.6.1 Stability and Reliability -- 3.6.2 Integration with Existing Technologies -- 3.6.3 Scalability -- 3.6.4 Novel Applications -- 3.7 Integration of Ferroic and Multiferroic Materials into Current Technology -- 3.7.1 Integration of Multiferroic Materials into Memory Devices -- 3.7.2 Integration of Ferroelectric Materials into Energy Harvesting Devices -- 3.7.3 Integration of Ferroelectric Materials into Sensors -- 3.7.4 Integration of Ferromagnetic Materials into Spintronic Devices -- 3.7.5 Integration of Multiferroic Materials into Microwave Devices -- 3.8 Conclusion -- References -- Chapter 4 Basic Principles and Measurement Techniques of Electrocaloric Effect in Ferroelectric Materials -- 4.1 Introduction -- 4.2 Electrocaloric Effect (ECE) -- 4.2.1 Brief History of ECE -- 4.2.2 Working Principle -- 4.2.3 Theory -- 4.2.3.1 Maxwell Approach -- 4.2.3.2 Landau Phenomenological Approach -- 4.3 Direct and Indirect Measurement Techniques -- 4.3.1 Direct Methods for Measurement of ECE -- 4.3.1.1 Differential Scanning Calorimetry (DSC) -- 4.3.1.2 Fast Infrared Photometry -- 4.3.1.3 Scanning Thermal Microscopy (SThM) -- 4.3.2 Indirect Method -- 4.4 Electrocaloric Effect in Ferroelectric Materials -- 4.4.1 Lead-Based Ferroelectric Materials -- 4.4.1.1 PZT-Based Normal Ferroelectrics. -- 4.4.1.2 $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - PbTiO_3 (PMN-PT) Relaxor Ferroelectrics -- 4.4.2 Lead-Free Ferroelectric Materials -- 4.4.2.1 BaTiO_3 -Based Ceramics -- 4.4.2.2 $\text{Ba}(\text{Zr}_{0.2}\text{Ti}_{0.8})\text{O}_3$ -($\text{Ba}_{0.7}\text{Ca}_{0.3}\text{TiO}_3$ (BCZT))-Based Ferroelectrics -- 4.4.2.3 (K, Na) NbO_3 (KNN)-Based Ceramics -- 4.4.2.4 Hafnia and Zirconia-Based Ferroelectric Thin Films -- 4.5 Summary --

References -- Chapter 5 Ferroelectric/Ferroelastoelectric Materials: Preparation, Improvement, and Characterizations -- 5.1 Introduction -- 5.2 Structure and Properties of Ferroelectric and Ferroelastoelectric Materials -- 5.3 Synthesis Methods for Ferroelectric and Ferroelastoelectric Materials -- 5.3.1 Solid-State Reactions -- 5.3.2 Sol-Gel Techniques -- 5.3.3 Hydrothermal Synthesis -- 5.3.4 Chemical Vapor Deposition (CVD) -- 5.3.5 Electrochemical Deposition -- 5.3.6 Pulsed Laser Deposition -- 5.3.7 Molecular Beam Epitaxy -- 5.4 Improvement of Ferroelectric and Ferroelastoelectric Materials -- 5.5 Applications of Ferroelectric and Ferroelastoelectric Materials -- References -- Chapter 6 Elastocaloric Effect in Ferroelectric Materials -- 6.1 Introduction -- 6.1.1 Elastocaloric Effect -- 6.1.1.1 Types of Elastocaloric Effect -- 6.1.2 Force Elasticity and Entropy Elasticity -- 6.1.2.1 Force Elasticity -- 6.1.2.2 Entropy Elasticity -- 6.1.2.3 Relationship between Force Elasticity and Entropy Elasticity -- 6.1.3 Entropy Elastic Stress and Strain Actions for Solid-State Cooling -- 6.1.3.1 Basics of Solid-State Cooling -- 6.1.3.2 Overview of Entropy-Elastic Materials for Cooling -- 6.1.3.3 Entropy and Thermoelectric Performance -- 6.1.3.4 Elastic Stress and Strain Behavior -- 6.1.3.5 Properties and Characteristics of Entropy-Elastic Materials -- 6.1.3.6 Potential Applications of Entropy-Elastic Materials in Cooling Technologies -- 6.2 Ferroelectric Materials -- 6.2.1 Introduction to Ferroelectric Materials. 6.2.1.1 Definition and Characteristics of Ferroelectric Materials -- 6.2.2 Historical Overview -- 6.2.3 Structure and Properties of Ferroelectric Materials -- 6.2.4 Types of Ferroelectric Materials -- 6.2.5 Applications of Ferroelectric Materials -- 6.3 Performance Indicators -- 6.3.1 Elastocaloric Effect (T) -- 6.3.2 Specific Heat Capacity -- 6.3.3 Endurance Limit -- 6.3.4 Inversion Temperature -- 6.3.5 Coefficient of Performance (COP) -- 6.3.6 Other Important Parameters -- 6.4 Challenges and Future Potential -- 6.5 Sustainability and Environmental Impact -- 6.6 Conclusions -- References -- Chapter 7 Effective Flexomagnetic/Flexoelectric Sensitivity in Ferroics/Nanosized Ferroic Materials -- 7.1 Introduction -- 7.2 Basic Mathematical Form for Flexoeffect Contribution in Ferroic Nanomaterials -- 7.3 Symmetry and Definition of the Flexoelectric Coupling -- 7.4 Symmetry and Definition of the Flexomagnetic Coupling -- 7.5 The Chapter Structure and Motivation -- 7.6 Flexocoupling Response in Ferroics -- 7.6.1 Response of Flexoelectric Coupling in Different Ferroics Having Lower and Cubic Symmetry -- 7.7 Flexomagnetic Behavior of Coupling in Ferroics Having Cubic Symmetry -- 7.8 Effective Flexoresponse -- 7.9 Flexoelectricity in Different Materials -- 7.9.1 Flexoelectricity in Biological Materials -- 7.9.2 Flexoelectricity in Liquid Crystal -- 7.9.3 Flexoelectricity in Semiconductors -- 7.10 Conclusion -- References -- Chapter 8 Advancements in Ferroic Thin Films, Multilayers, and Heterostructures -- 8.1 Ferroic Materials -- 8.1.1 Ferroic Thin Films -- 8.1.1.1 Historical Developments of Ferromagnetic Thin Films -- 8.1.1.2 Historical Developments of Ferroelectric Thin Films -- 8.1.1.3 Importance of Thin Films in Ferroic Materials -- 8.1.1.4 Properties of Thin Films in Ferroic Materials -- 8.1.1.5 Recent Research on New Ferroic Thin Film Materials. 8.1.1.6 Characterization Methods for Ferroic Thin Films -- 8.1.2 Ferroic Multilayers -- 8.1.2.1 History of Ferroic Multilayers -- 8.1.2.2 Importance of Ferroic Multilayers -- 8.1.2.3 Properties of Ferroic Multilayers -- 8.1.2.4 Advances in Ferroic Multilayers -- 8.1.2.5 Recent Research -- 8.1.2.6 Characterization Techniques -- 8.1.3 Heterostructures -- 8.1.3.1 Types of Ferroic Heterostructures -- 8.1.3.2 Historical Development -- 8.1.3.3 Properties of

Heterostructures -- 8.1.3.4 Characterization Techniques -- 8.2
Conclusion -- References -- Chapter 9 Physics of Multiferroic Materials
-- 9.1 Introduction -- 9.2 Origin of Ferromagnetism and
Antiferromagnetism -- 9.3 Origin of Ferroelectric Materials -- 9.4
Historical Background and Present -- 9.5 Multiferroicity and Its Origin
-- 9.6 Multiferroic Materials -- 9.7 Classification of Multiferroic
Materials -- 9.7.1 Single-Phase Multiferroics -- 9.7.1.1 Type I
Multiferroics -- 9.7.1.2 Type II Multiferroics -- 9.7.2 Composite
Multiferroics -- 9.8 Applications of Multiferroics -- 9.9 Conclusion --
References -- Chapter 10 Overview of Comparison Between Primary
Ferroic Crystals with Secondary Ferroic Crystals -- 10.1 Introduction --
10.2 Formation of Ferroic Domains and Domain Boundaries -- 10.3
Description of Ferroelectricity-Phenomenological Way -- 10.3.1 Proper
Ferroelectrics -- 10.3.2 Improper Ferroelectrics -- 10.3.3 Pseudo-
Proper Ferroelectrics -- 10.4 Important Term in Primary Ferroics --
10.4.1 Ferroelectric Materials -- 10.4.2 Ferromagnetic Materials --
10.4.3 Ferroelastic Materials -- 10.4.4 Ferrotoroidic Materials -- 10.5
Multiferroics -- 10.5.1 Type 1 and Type 2 Multiferroics -- 10.6
Secondary Ferroics -- 10.6.1 Ferrobielectrics and Ferrobimagnetics-
Secondary Ferroic Systems -- 10.6.1.1 Ferrobielectrics -- 10.6.1.2
Ferrobimagnetism -- 10.6.1.3 Ferroelastoelectricity -- 10.6.1.4
Ferrobielasticity.
10.6.1.5 Ferromagnetoelectricity.

Sommario/riassunto

This book provides a comprehensive overview of ferroic materials, exploring their historical development, current applications, and future potential. It delves into various types of ferroic and multiferroic materials, including ferromagnetic, ferroelectric, and ferroelastic materials, and discusses the advances in synthesis and measurement techniques. The text also addresses the integration of these materials into modern technology and their applications in devices such as sensors, memory devices, and energy harvesting systems. The book is intended for researchers, scientists, and advanced students in materials science, physics, and engineering, aiming to offer insights into the properties and potential applications of ferroic materials.
