Piezoelectricity Introduction To Theory And Applications Of Electromechanical Phenomena In Crystals 2 Volumes

Piezoelectric Energy Harvesting
Piezoelectric Sensorics
Lead-Free Piezoelectric Materials
Mechanics Of Piezoelectric Structures (Second Edition)
Piezoelectricity: Volume Two
Piezoelectricity
An Introduction to the Theory of Piezoelectricity
Special Topics in the Theory of Piezoelectricity
Piezoelectricity
The Theory of Piezoelectric Shells and Plates
Piezoelectric and Acoustic Materials for Transducer Applications
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Piezotronics and Piezo-Phototronics
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Lattice Dynamical Foundations Of Continuum Theories: Elasticity, Piezoelectricity, Viscoelasticity, Plasticity
An Introduction to the Theory and Design of Sonar Transducers
Analysis Of Piezoelectric Devices
Piezoelectricity: Volume One
Plate and Panel Structures of Isotropic, Composite and Piezoelectric Materials, Including Sandwich Construction
Piezoelectricity
Piezoelectric Materials
Piezoelectric Materials and Devices
The Beginnings of Piezoelectricity
Advanced Mechanics of Piezoelectricity

PATRICK CANTU

Piezoelectric Energy Harvesting Academic Press
Presents the fundamental physics of piezoelectric sensors. Only book with this scope Targeted to those engineers, phycisists and chemists who are involved in materials processing, device design and manufacturing.
Piezoelectric Sensorics Springer Science & Business Media
Second in two-volume series covers properties and techniques of quartz, Rochelle salt, ferroelectric crystals, various applications of piezoelectricity, pyroelectricity, optical properties of crystals, and atomic theory of piezoelectricicty. 1946 edition.
Lead-Free Piezoelectric Materials Springer
The Beginnings of Piezoelectricity, the first history of the subject, exhaustively examines how diverse influences led to the discovery of the phenomenon in 1880, and how they shaped subsequent research until the consolidation of an empirical and theoretical knowledge of the field circa 1895. Shaul Katzir's historical account shows that this 'mundane' science was an intriguing intellectual and practical enterprise, which involved originality, surprises and controversies.
Mechanics Of Piezoelectric Structures (Second Edition) Apc International, Limited
The fundamental principle of piezotronics and piezo-phototronics were introduced by Wang in 2007 and 2010, respectively. Due to the polarization of ions in a crystal that has non-central symmetry in materials, such as the wurtzite structured ZnO, GaN and InN, a piezoelectric potential (piezopotential) is created in the crystal by applying a stress. Owing to the simultaneous possession of piezoelectricity and semiconductor properties, the piezopotential created in the crystal has a strong effect on the carrier transport at the interface/junction. Piezotronics is for devices fabricated using the piezopotential as a "gate" voltage to control charge carrier transport at a contact or junction. The piezo-phototronic effect uses the piezopotential to control the carrier generation, transport, separation and/or recombination for improving the performance of optoelectronic devices, such as photon detector, solar cell and LED. The functionality offered by piezotroics and piezo-phototronics are complimentary to CMOS technology. There is an effective integration of piezotronic and piezo-phototronic devices with silicon based CMOS technology. Unique applications can be found in areas such as human-computer interfacing, sensing and actuating in nanorobotics, smart and personalized electronic signatures, smart MEMS/NEMS, nanorobotics and energy sciences. This book introduces the fundamentals of piezotronics and piezo-phototronics and advanced applications. It gives guidance to researchers, engineers and graduate students.
Piezoelectricity: Volume Two Springer Science & Business Media

Structural Health Monitoring with Piezoelectric Wafer Active Sensors, Second Edition provides an authoritative theoretical and experimental guide to this fast-paced, interdisciplinary area with exciting applications across a range of industries. The book begins with a detailed yet digestible consolidation of the fundamental theory relating to structural health monitoring (SHM). Coverage of fracture and failure basics, relevant piezoelectric material properties, vibration modes in different structures, and different wave types provide all the background needed to understand SHM and apply it to real-world structural challenges. Moving from theory to experimental practice, the book then provides the most comprehensive coverage available on using piezoelectric wafer active sensors (PWAS) to detect and quantify damage in structures. Updates to this edition include circular and straight-crested Lamb waves from first principle, and the interaction between PWAS and Lamb waves in 1-D and 2-D geometries. Effective shear stress is described, and tuning expressions between PWAS and Lamb waves has been extended to cover axisymmetric geometries with a complete Hankel-transform-based derivation. New chapters have been added including hands-on SHM case studies of PWAS stress, strain, vibration, and wave sensing applications, along with new sections covering essential aspects of vibration and wave propagation in axisymmetric geometries. Comprehensive coverage of underlying theory such as piezoelectricity, vibration, and wave propagation alongside experimental techniques Includes step-by-step guidance on the use of piezoelectric wafer active sensors (PWAS) to detect and quantify damage in structures, including clear information on how to interpret sensor signal patterns Updates to this edition include a new chapter on composites and new sections on advances in vibration and wave theory, bringing this established reference in line with the cutting edge in this emerging area

Piezoelectricity Springer Science & Business Media

This collection of 32 major review papers provides a complete understanding of the physics of piezoelectricity. With a thorough overview of applications and a major section exploring measurements and standards, this volume gives a systematic derivation of piezoelectric coefficients and equations of state for coupling mechanical, electrical, and thermal fields. A useful graduate text for design engineers, materials scientists, chemists, metallurgists, and condensed matter physicists.

An Introduction to the Theory of Piezoelectricity Springer Science & Business Media

Currently, many smart materials exhibit one or multifunctional capabilities that are being effectively exploited in various engineering applications, but these are only a hint of what is possible. Newer classes of smart materials are beginning to display the capacity for self-repair, self-diagnosis, self-multiplication, and self-degradation. Ultimately, what will make them practical and commercially viable are control devices that provide sufficient speed and sensitivity. While there are other candidates, piezoelectric actuators and sensors are proving to be the best choice. Piezoelectric Actuators: Control Applications of Smart Materials details the authors' cutting-edge research and development in this burgeoning area. It presents their insights into optimal control strategies, reflecting their latest collection of refereed international papers written for a number of prestigious journals. Piezoelectric materials are incorporated in devices used to control vibration in flexible structures. Applications include beams, plates, and shells; sensors and actuators for cabin noise control; and position controllers for structural systems such as the flexible manipulator, engine mount, ski, snowboard, robot gripper, ultrasonic motors, and various type of sensors including accelerometer, strain gage, and sound pressure gages. The contents and design of this book make it useful as a professional reference for scientists and practical engineers who would like to create new machines or devices featuring smart material actuators and sensors integrated with piezoelectric materials. With that goal in mind, this book: Describes the piezoelectric effect from a microscopic point of view Addresses vibration control for flexible structures and other methods that use active mount Covers control of flexible robotic manipulators Discusses application to fine-motion and hydraulic control systems Explores piezoelectric shunt technology This book is exceptionally valuable as a reference for professional engineers working at the forefront of numerous industries. With its balanced presentation of theory and application, it will also be of special interest to graduate students studying control methodology.

Special Topics in the Theory of Piezoelectricity World Scientific

The book discusses the underlying physical principles of piezoelectric materials, important properties of ferroelectric/piezoelectric materials used in today's transducer technology, and the principles used in transducer design. It provides examples of a wide range of applications of such materials along with the appertaining rationales. With contributions from distinguished researchers, this is a comprehensive reference on all the pertinent aspects of piezoelectric materials.

Piezoelectricity Springer Science & Business Media

This book offers an introduction to piezoelectric shells and distributed sensing, energy harvesting and control applications. It familiarizes readers with a generic approach of piezoelectric shells and fundamental electromechanics of distributed piezoelectric sensors, energy harvesters and actuators applied to shell structures. The book is divided into two major parts, the first of which focuses on piezoelectric shell continua, while the second examines distributing sensing, energy harvesting and control of elastic continua, e.g., shells and plates. The exploitation of new, advanced multifunctional smart structures and structronic systems has been one of the mainstream research and development activities over the years. In the search for innovative structronics technologies, piezoelectric materials have proved to be very versatile in both sensor and actuator applications. Consequently, the piezoelectric technology has been applied to a broad range of practical applications, from small-scale nano- and micro-sensors/actuators to large-scale airplane and space structures and systems. The book provides practicing engineers and researchers with an introduction to advanced piezoelectric shell theories and distributed sensor/energy harvester/actuator technologies in the context of structural identification, energy harvesting and precision control. The book can also be used as a textbook for graduate students. This second edition contains substantial new materials, especially energy harvesting and experimental components, and has been updated and corrected for a new generation of readers.

The Theory of Piezoelectric Shells and Plates CRC Press

Piezoelectric materials are attracting significant research efforts and resources worldwide. The major thrust areas include structural health monitoring, bio-mechanics, bio-medicine and energy harvesting. Engineering and technological applications of this smart material warrants multi-dimensional theoretical and experimental knowledge and expertise in fields of mechanics, instrumentation, digital electronics and information technology, over and above the specific domain knowledge. This book presents, from theory to practice, the application of piezoelectric smart materials in engineering domains such as structural health monitoring (SHM), bio-mechanics, bio-medical engineering and energy harvesting.

Piezoelectric and Acoustic Materials for Transducer Applications Courier Dover Publications

"Piezoelectric-Based Vibration-control Systems: Applications in Micro/Nano Sensors and Actuators" covers: Fundamental concepts in smart (active) materials including piezoelectric and piezoceramics, magnetostrictive, shape-memory materials, and electro/magneto-rheological fluids; Physical principles and constitutive models of piezoelectric materials; Piezoelectric sensors and actuators; Fundamental concepts in mechanical vibration analysis and control with emphasis on distributed-parameters and vibration-control systems; and Recent advances in piezoelectric-based microelectromechanical and nanoelectromechanical systems design and implementation.

Introduction to Sensors Springer Science & Business Media

Piezoelectricity has been a steadily growing field, with recent advances made by researchers from applied physics, acoustics, materials science, and engineering. This collective work presents a comprehensive treatment of selected advanced topics in the subject. The book is written for an intermediate graduate level and is intended for researchers, mechanical engineers, and applied mathematicians interested in the advances and new applications in piezoelectricity.

An Introduction to the Theory of Piezoelectricity John Wiley & Sons

This is the most systematic, comprehensive and up-to-date book on the theoretical analysis of piezoelectric devices. It is a natural continuation of the author's two previous books: "An Introduction to the Theory of Piezoelectricity" (Springer, 2005) and "The Mechanics of Piezoelectric Structures" (World Scientific, 2006). Based on the linear, nonlinear, three-dimensional and lower-dimensional structural theories of electromechanical materials, theoretical results are presented for devices such as piezoelectric resonators, acoustic wave sensors, and piezoelectric transducers. The book reflects the contribution to the field from Mindlin's school of applied mechanics researchers since the 1950s.

Vibrations of Linear Piezostructures Courier Dover Publications

This book introduces physical effects and fundamentals of piezoelectric sensors and actuators. It gives a comprehensive overview of piezoelectric materials such as quartz crystals and polycrystalline ceramic materials. Different modeling approaches and methods to precisely predict the behavior of piezoelectric devices are described. Furthermore, a simulation-based approach is detailed which enables the reliable characterization of sensor and actuator materials. One focus of the book lies on piezoelectric ultrasonic transducers. An optical approach is presented that allows the quantitative determination of the resulting sound fields. The book also deals with various applications of piezoelectric sensors and actuators. In particular, the studied application areas are · process measurement technology, · ultrasonic imaging, · piezoelectric positioning systems and · piezoelectric motors. The book addresses students, academic as well as industrial reseachers and development engineers who are concerned with piezoelectric sensors and actuators.

Piezoelectric-Based Vibration Control Springer Science & Business Media

"Advanced Mechanics of Piezoelectricity" presents a comprehensive treatment of piezoelectric materials using linear electroelastic theory, symplectic models, and Hamiltonian systems. It summarizes the current state of practice and presents the most recent research findings in piezoelectricity. It is intended for researchers and graduate students in the fields of applied mechanics, material science and engineering, computational engineering, and aerospace engineering. Dr. Qinghua Qin is a professor at the School of Engineering, Australian National University, Australia.

Piezoelectric Shells World Scientific

As a continuation of the author's previous book An Introduction to the Theory of Piezoelectricity (Springer, New York, 2005) on the three-dimensional theory of piezoelectricity, this book covers one- and two-dimensional theories of piezoelectric structures including rods, beams, plates and shells. In addition to the so-called low-frequency motions of extension and bending, high-frequency motions of thickness shear and thickness stretch are also considered for certain applications unique in resonant piezoelectric devices. Both single-layer and multi-layer structures are treated. Nonlinear effects due to large deflection or large shear deformation are also discussed. The emphasis in on the development of structural theories with various levels of sophistication for different applications in piezoelectric devices.The book is heavily influenced by R D Mindlin's early contributions to this field. It is destined to be one of the most systematic and comprehensive books on piezoelectric structures. This second edition is a major reorganization of the first edition with multiple additions as well as deletion of chapters and sections.

Piezoelectric Nanomaterials for Biomedical Applications Springer Science & Business Media

Plates and panels are primary components in many structures including space vehicles, aircraft, automobiles, buildings, bridge decks, ships and submarines. The ability to design, analyse, optimise and select the proper materials for these structures is a necessity for structural designers, analysts and researchers. This text consists of four parts. The first deals with plates of isotropic (metallic and polymeric) materials. The second involves composite material plates, including anisotropy and laminate considerations. The third section treats sandwich constructions of various types, and the final section gives an introduction to plates involving piezoelectric materials, in which the "smart" or "intelligent" materials are used as actuators or sensors. In each section, the formulations encompass plate structures subjected to static loads, dynamic loads, buckling, thermal/moisture environments, and minimum weight structural optimisation. This is a textbook for a graduate course, an undergraduate senior course and a reference. Many homework problems are given in various chapters.

Introduction to Theory and Design of Sonar Transducers Courier Dover Publications

Discovered in 1880, piezoelectric materials play a key role in an innovative market of several billions of dollars. Recent advances in applications derive from new materials and their development, as well as to new market requirements. With the exception of quartz, ferroelectric materials are used for they offer both high efficiency and sufficient versatility to meet adequately the multidimensional requirements for application. Consequently, strong emphasis is placed on tailoring materials and technology, whether one deals with single crystals, ceramics or plastic materials. Tailoring requires a basic understanding of both physical principles and technical possibilities and limitations. This report elucidates these developments by a broad spectrum of examples, comprising ultrasound in medicine and defence industry, frequency control, signal processing by SAW-devices, sensors, actuators, including novel valves for modern motor management. It delivers a mutual fertilization of technology push and market pull that should be

of interest not only to materials scientists or engineers but also to managers who dedicate themselves to a sound future-oriented R&D policy.
Piezoelectric Actuators CRC Press
Piezoelectric Materials and Devices: Applications in Engineering and Medical Sciences provides a complete overview of piezoelectric materials, covering all aspects of the materials starting from fundamental concepts. The treatment includes physics of piezoelectric materials, their characteristics and applications. The author uses simple language to explain the theory of piezoelectricity and introduce readers to the properties and design of different types of piezoelectric materials, such as those used in engineering and medical device applications. This book: Introduces various types of dielectrics and their classification based on their characteristics Addresses the mathematical formulation of piezoelectric effects and the definition of various piezoelectric constants Describes the structure and properties of practical piezoelectric materials such as quartz, lead zirconate titanate, barium titanate, zinc oxide, and polyvinylidene fluoride Covers the entire gamut of piezoelectric devices used in engineering and medical applications Discusses briefly the use of piezoelectric materials for energy harvesting and structural health monitoring Explores new developments in biomedical applications of piezoelectric devices such as drug delivery, blood flow and blood pressure monitoring, robotic operating tools, etc. Elaborates on design and virtual prototyping of piezoelectric devices through the use of FE software tools ANSYS and PAFEC Giving design engineers, scientists, and technologists the information and guidance they will need to adopt piezoelectric materials in the development of smart devices, this book will also motivate engineering and science students to initiate new research for developing innovative devices. Its contents will be invaluable to both students and professionals seeking a greater understanding of fundamentals and applications in the evolving field of piezoelectrics.
Applications of Piezoelectric Quartz Crystal Microbalances Springer
This book is based on lecture notes for a graduate course that has been offered at University of Nebraska-Lincoln on and off since 1998. The course is intended to provide graduate students with the basic aspects of the continuum modeling of electroelastic interactions in solids. A concise treatment of linear, nonlinear, static and dynamic theories and problems is presented. The emphasis is on formulation and understanding of problems useful in device applications rather than solution techniques of mathematical problems. The mathematics used in the book is minimal. The book is suitable for a one-semester graduate course on electroelasticity. It can also be used as a reference for researchers. I would like to take this opportunity to thank UNL for a Maude Hammond Fling Faculty Research Fellowship in 2003 for the preparation of the first draft of this book. I also wish to thank Ms. Deborah Derrick of the College of Engineering and Technology at UNL for editing assistance with the book, and Professor David Y. Gao of Virginia Polytechnic Institute and State University for recommending this book to Kluwer for publication in the series of Advances in Mechanics and Mathematics. JSY Lincoln, Nebraska 2004 Preface Electroelastic materials exhibit electromechanical coupling. They experience mechanical deformations when placed in an electric field, and become electrically polarized under mechanical loads. Strictly speaking, piezoelectricity refers to linear electromechanical couplings only.