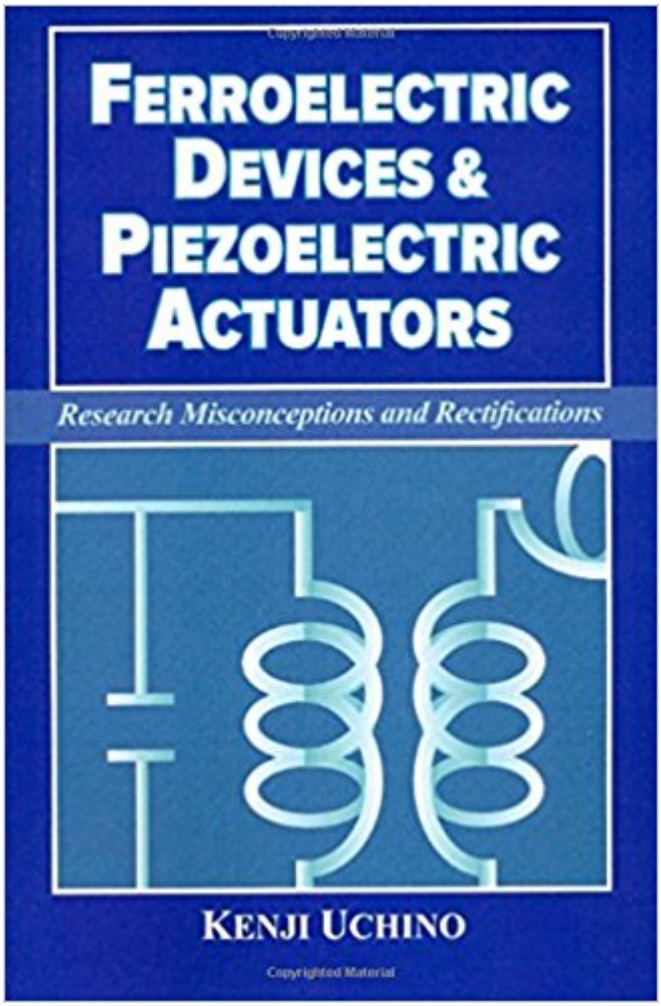
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Ferroelectric Devices & Piezoelectric Actuators: Research Misconceptions And Rectifications



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Synopsis

Principles and best practices for improved understanding and design of piezoelectrics New problems and solutions for ferroelectrics design, fabrication and applications This volume investigates basic principles and shared understandings regarding the materials and properties of piezoelectrics and ferroelectrics, including concepts such ionic displacement and strain, transmission coefficient, constraint-dependency of piezo materials properties, mechanical impedance matching, resonance/anti-resonance and more. The author demonstrates how misguided or false versions of these and similar ideas and formulas negatively influence research, instruction and design. At the same time, Uchino, an acknowledged worldwide expert in piezoelectric R&D, provides ways to correct such faulty approaches, and in so doing offers a practical synopsis of methods and formulas for producing a wide array of electroactive and electronic materials. The second part of the book contains problems and solutions in the area of ferroelectric devices, including problems associated with the design and performance of dielectrics, memory devices, electro-optic, pyroelectric devices and more.

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Customer Reviews

The new text book entitled Ferroelectric Devices & Piezoelectric Actuators by Kenji Uchino, professor of Electrical Engineering, the Pennsylvania State University is the most comprehensive and informative book dealing with the fundamental concepts and the application of ferroelectric and piezoelectric materials that I have come across in this field. The book definitely would be a great text

book for not only senior level or graduate students, but also expert researchers/professors who are teaching ferroelectrics and piezoelectrics in a university. In addition, this book can be a solutions book for his another textbook Ferroelectric Devices 2nd edition widely used for university courses currently, since the full answers of the questions inquired in that book is provided in this new book. The book especially addresses in a concise manner what students and even expert researchers/professors have misconceptions in fundamentals of ferroelectrics/piezoelectrics those are barely found in any other literatures. Prof. Uchino attempts to describe proper rectification in full depth to correct the misconceptions in this book. Though there are huge progress in the ferroelectric/piezoelectric materials and their devices in these days, many of student/researchers/professors have improper concept of basic physical phenomena and models. I believe that the book can be an ideal reference literature for them as it contains a lot of physical meaning of the models and equations, supporting explanations based on the practical devices, critical questions we can meet in real situation and fully supported correct answers, and will enrich their knowledge of the subject and may even stimulate his own inventiveness. I highly recommend this book for those who are interested in studying the fundamentals of ferroelectric/piezoelectric materials and various related devices. --Jungho Ryu, Ph.D, Principal Researcher, Functional Ceramics Group , Korea Institute of Materials Science (KIMS)

Kenji Uchino, one of the pioneers in piezoelectric actuators, is Founding Director of International Center for Actuators and Transducers and Professor of EE and MatSE at Penn State University. He was Associate Director (Global Technology Awareness) at The US Office of Naval Research Global Tokyo Office as IPA from 2010 till 2014. He was also the Founder and Senior Vice President & CTO of Micromechatronics Inc., State College, PA. After being awarded his Ph. D. degree from Tokyo Institute of Technology, Japan, he became Research Associate/Assistant Professor (1976) in Physical Electronics Department at this university. Then, he joined Sophia University, Japan as Associate Professor in Physics Department in 1985. He was then recruited from The Penn State University in 1991. He was also involved with Space Shuttle Utilizing Committee in NASDA, Japan during 1986-88, and Vice President of NF Electronic Instruments, USA, during 1992-94. He was the Founding Chair of Smart Actuators/Sensors Committee, Japan Technology Transfer Association sponsored by Ministry of Economics, Trading and Industries, Japan from 1987 to 2014, and is a long-term Chair of International Conference on New Actuators, Messe Bremen, Germany since 1997. He was also the associate editor for Journal of Advanced Performance Materials, J. Intelligent Materials Systems and Structures and Japanese Journal of Applied Physics. Uchino served as

Administrative Committee Member (Elected) of IEEE Ultrasonics, Ferroelectrics and Frequency Control (1998-2000) and as Secretary of American Ceramic Society, Electronics Division (2002-2003). His research interest is in solid state physics, especially in ferroelectrics and piezoelectrics, including basic research on theory, materials, device designing and fabrication processes, as well as application development of solid state actuators/sensors for precision positioners, micro-robotics, ultrasonic motors, smart structures, piezoelectric transformers and energy harvesting. K. Uchino is known as the discoverer/inventor of the following famous topics: (1) lead magnesium niobate (PMN)-based electrostricive materials, (2) cofired multilayer piezoelectric actuators (MLA), (3) superior piezoelectricity in relaxor-lead titanate-based piezoelectric single crystals (PZN-PT), (4) photostrictive phenomenon, (5) shape memory ceramics, (6) magnetoelectric composite sensors, (7) transient response control scheme of piezoelectric actuators (Pulse-Drive technique), (8) micro ultrasonic motors, (9) multilayer disk piezoelectric transformers, and (10) piezoelectric loss characterization methodology. On-going research projects are also in the above areas, especially in the last three items (8), (9) and (10) most recently. He has authored 520 papers, 68 books and 31 patents in the ceramic actuator area. 39 papers/books among his publications have been cited more than 100 times, leading to his average h-index 62. Total citation number 20,800 and annual average citation number 446 are very high in College of Engineering. He was also awarded his MBA degree from St. Francis University (2008), and authored a textbook, Entrepreneurship for Engineers for College of Business. He is a Fellow of American Ceramic Society since 1997, a Fellow of IEEE since 2012, and also is a recipient of 28 awards, including International Ceramic Award from Global Academy of Ceramics (2016), IEEE-UFFC Ferroelectrics Recognition Award (2013), Inventor Award from Center for Energy Harvesting Materials and Systems, Virginia Tech (2011), Premier Research Award from The Penn State Engineering Alumni Society (2011), the Japanese Society of Applied Electromagnetics and Mechanics Award on Outstanding Academic Book (2008), SPIE (Society of Photo-Optical Instrumentation Engineers), Smart Product Implementation Award (2007), R&D 100 Award (2007), ASME (American Society of Mechani

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