

**2015 Joint IEEE International
Symposium on the Applications of
Ferroelectric (ISAF 2015),
International Symposium on
Integrated Functionalities
(ISIF 2015), and Piezoelectric Force
Microscopy Workshop (PFM 2015)**

**Singapore
24 – 27 May 2015**



**IEEE Catalog Number: CFP15ISA-POD
ISBN: 978-1-4799-9975-0**

Table of Contents

Temperature Dependence of the Brillouin Frequency Shift and the Linewidth of the LA Mode in the Ferroelectric Phase of PZT-x ($\text{PbZr}_{1-x}\text{Ti}_x\text{O}_3$) <i>Hamit YURTSEVEN, C. SISMAN KORKMAZ, A. KIRACI</i>	1
Tunable and Switchable Resonators and Filters Based on Ferroelectric BST Thin Films for Wireless Communications <i>Thottam KALKUR, Almonir MANSOUR</i>	5
Operating Principle and Vibration Characteristic of an I-Shape Ultrasonic Motor <i>Yingxiang LIU, Dongmei XU, Weishan CHEN, Jipeng YAN</i>	9
A Cross Beam Linear Ultrasonic Motor Using Bending Vibrations <i>Dongmei XU, Yingxiang LIU, Junkao LIU, Weishan CHEN</i>	13
Structural and Scaling Behavior in Relaxor Ferroelectric BZT Ceramic Doped with Rare Earth Europium Ion <i>Sarit Kumar GHOSH, S. K. ROUT, S.K. DESHPANDE</i>	17
Low Temperature Sintering of $\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3$ Based Ceramics <i>Gregory YESNER, Max KUCIEJ, Ahmad SAFARI</i>	21
Energy Scavenging from Vibration with Two-Layer Laminated Fluoroethylenepropylene Piezoelectret Films <i>Xiaoqing ZHANG, Liming WU, G. M. SESSLER</i>	24
Evaluation of Oxygen Vacancy in ZnO using Raman Spectroscopy <i>Hiroaki FUKUSHIMA, Tomomi KOZU, Hiromi SHIMA, Hiroshi FUNAKUBO, Hiroshi UCHIDA, Takashi KATODA, Ken NISHIDA</i>	28
Vibration Characteristic Analysis of a Piezoelectric Transducer Using First Bending Vibration Modes <i>Zhaoyang YU, Yingxiang LIU, Dongmei XU, Junkao LIU, Weishan CHEN</i>	32
Linear and Nonlinear Models of Electroelasticity in the Software Package ACELAN <i>Alexander SKALIUKH, Andrey NASEDKIN, Pavel OGANESYAN, Arkady SOLOVIEV</i>	36
Structure and Ferroelectric Properties of High T_c $\text{Bi}(\text{Me})\text{O}_3$ - PbTiO_3 Single Crystal Thin Films <i>Kiyotaka WASA, H. HANZAWA, S. YOSHIDA, S. TANAKA, H. ADACHI, T. MATSUNAGA</i>	40
Buckling Behavior of Piezoelectric Diaphragms for Highly Sensitive Structures of Ultrasonic Microsensors Controlled Through Intrinsic Stress of PZT Films <i>Kaoru YAMASHITA, Kaito ARAI, Hikaru TANAKA, Taiki NISHIUMI, Minoru NODA</i>	44
Reactive Sputtering Process and Properties of $\text{Ba}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$ Films for High Frequency Applications <i>Jimwoong KIM, Hiromi SHIMA, T. YAMAMOTO, Shintaro YASUI, Hiroshi FUNAKUBO, Tomoaki YAMADA, Ken NISHIDA</i>	48
Hybrid Wafers Based on a “Silicon/PPLN Thin Film” Stack for Optical and Radio-Frequency Applications <i>Florent BASSIGNOT, Fabien HENROT, Mathieu CHAUVET, Ludovic GAUTHIER-MANUEL, B. GUICHARDAZ, Hervé MAILLOTTE, Sylvain BALLANDRAS</i>	52
PMN-PT Crystal of Less Defects and More Uniformity <i>Zibo JIANG</i>	56
Low-Temperature Sintering of $(\text{Ba}_{0.85}\text{Ca}_{0.15})(\text{Zr}_{0.1}\text{Ti}_{0.9})\text{O}_3$ Ceramics and Thick-Films <i>Yang BAI, Ales MATOUSEK, Hana HUGHES, Tim W. BUTTON, Canlin OU</i>	60

Study on Effective Piezoelectric Coefficient for Finite Element Analysis of Multi-Layer Ceramic Capacitor <i>Byung-Han KO, Dongjoon KIM, No-Cheol PARK, Young-Pil PARK</i>	64
Piezoelectric Free-Standing Thick-Film Structures for Material Characterization and Energy Harvesting Applications <i>Yang BAI, Hana HUGHES, Tim W. BUTTON, Carl MEGGS, Yun JIANG, Canlin OU</i>	67
Giant Strain and Compling Effects of Relaxor/Ferroelectric Lead-Free Composite Piezoceramics <i>Haibo ZHANG, Qi ZHANG, Wook JO, Claudia GROH, Kyle G. WEBBE, Jürgen RÖDEL</i>	71
The Field Induced Crystalline Phase Transition Dependence of the Dielectric, Ferroelectric, and Piezoelectric Properties of a Hydrogenated P(VDFco-TrFE) <i>Weimin XIA, F. LIANG, J. H. XING, C. J. CAO, Z. C. ZHANG, Z. XU</i>	75
Optimized Microstructure and Enhanced Breakdown Strength in $\text{Ca}_{1-x}\text{Sr}_x\text{TiO}_3$ Solid Solutions <i>Lin ZHANG, Hanxing LIU, Hua HAO, Minghe CAO, Zhonghua YAO</i>	79
Electrical Capacitance with Meshed Electrodes for Piezo- and Pyro-electric Energy Harvesting Applications <i>Daniel ZABEK, C.R. BOWEN, J. TAYLOR</i>	83
Energy Storage Properties of BNT-BT Based Solid Solution <i>Qi XU, Hanxing LIU, Lin ZHANG, Minghe CAO, Juan XIE, Hua HAO, Zhonghua YAO</i>	87
Effects of K Excess on the Structure and Properties of $(\text{K}_{0.5}\text{Na}_{0.5})\text{NbO}_3$ Ceramics <i>Aifen TLAN, Zongwei JIA, Guanglin REN, Xian DUAN, Huiling DU</i>	91
Flexible PZT/Aluminium Thin Films Characterizations for Energy Harvesting at Very Low Frequencies (~ 1 Hz) <i>Raynald SEVENO, Benoit GUIFFARD, Thibault DUFAY, Jean-Christophe THOMAS</i>	94
Shape Evolution and Enhanced Sensing and Functionalization of RE-OH Nanostructures <i>Muhammad ANIS-UR-REHMAN, A. MUNIR, A. S. SALEEMI, Ali ABDULLAH</i>	98
Crystal Growth of $\text{Ca}_3\text{Nb}(\text{Ga}_{0.75}\text{Al}_{0.25})_3\text{O}_{14}$ Piezoelectric Bulk Single Crystal <i>Yuuji YOKOTA, Kei KAMADA, Tetsuo KUDO, Yuji OHASHI, Shunsuke KUROSAWA, Akira YOSHIKAWA</i>	102
Investigation on Characteristics of Resistance Change by Coexistence of Oxygen Vacancy and Polarization Reversal in MOD BaTiO_3 Ferroelectric Thin Film <i>Shuhei HASHIMOTO, Toshiyuki SUGIE, Ziyang ZHANG, Kaoru YAMASHITA, Minoru NODA</i>	105
A Comparative Study of BaTiO_3 - $\text{BaFe}_{12}\text{O}_{19}$ Multiferroic Composites Prepared by Conventional and Microwave Sintering Techniques <i>Zijing DONG, Yongping PU, Peikui WANG</i>	108
Micro- and Nanosized Effect of $\text{Ba}(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3$ Fillers on Dielectric Properties of $\text{Ba}(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3/\text{PVDF}$ Composites <i>Mingrui FANG, Zhuo WANG, Haijuan LI, Yongfei WEN, Chun WANG</i>	112
Preparation and Dielectric Properties of $\text{Ba}(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3/\text{Al}_2\text{O}_3$ Composite Ceramics with Core/shell Structure <i>Zhuo WANG, Chun WANG, Mingrui FANG, Yongfei WEN, Haijuan LI</i>	116
Insights into the Influence of Magnetic Fields on the Propagation of Elastic Wave Packets Within a Piezoelectric Micro-Scale Beams <i>Khameel MUSTAPHA, Basil. T. WONG</i>	120
Electrocaloric Properties of PZT- and BaTiO_3 - Based Ceramics and LiNbO_3 Crystals <i>Hiroshi MAIWA, Noriaki TSUTSUI, Wataru SAKAMOTO</i>	124

Dielectric, Electric Modulus, Ferroelectric and Magnetic Properties of $\text{Bi}_{1-x}\text{Gd}_x\text{FeO}_3$ Ceramics <i>Peikui WANG, Yongping PU, Zijing DONG</i>	128
Effects of Different Microwave Calcination Temperatures on the Pure BiFeO_3 Ceramics Prepared by Microwave Hydrothermal Method <i>Peikui WANG, Yongping PU, Zijing DONG</i>	132
Structural and Electrical Studies of Mixed Metal/Ceramic Composite Dielectric Thin Films <i>Ali ABDULLAH, Arslan MUNIR, A. S. SALEEMI, Muhammad SAQIB, Muhammad ANIS-UR-REHMAN</i>	136
Properties of $0.74\text{BiNaTiO}_3\text{-}0.06\text{SrTiO}_3/\text{Bi}_{0.5}(\text{Na}_{0.8}\text{K}_{0.2})_{0.5}\text{TiO}_3$ Ceramic Composite <i>Soon-Jong JEONG, M. S. KIM, S. M. JANG, I. S. KIM, M. SALEEM</i>	139
Insulator-Metal Transition Associated with Resistive Switching in Real SrTiO_3 and TiO_2 Crystals <i>Kristof SZOT, Christian RODENBÜCHER</i>	143
Robust Hydrophone with Hydrothermal PZT Thick-Film Vibrator and Titanium Front Layer for Use in High-Power Ultrasound Fields <i>Nagaya OKADA, Shinichi TAKEUCHI</i>	147
Effect of Potassium Content on the Dielectric and Electrical Properties of Sodium Potassium Niobate Ceramics <i>Dhananjay K. SHARMA, Andrei L. KHOLKIN, Suman KUMARI, Seema SHARMA</i>	151
Structure and Dielectric Properties of Bi_2O_3 Doped $\text{BaTiO}_3\text{-(Na}_{1/4}\text{Bi}_{3/4})(\text{Mg}_{1/4}\text{Ti}_{3/4})\text{O}_3$ Lead-Free Ceramics <i>Xuechen HUANG, Hanxing LIU, Hua HAO, Chuyu PENG, Lin ZHANG, Yun SUN, Yuanhang ZHOU, Minghe CAO</i>	155
Direct Electrocaloric Measurements Using a Differential Scanning Calorimeter <i>Mehmet SANLIALP, Vladimir SHVARTSMAN, Doru C. LUPASCU, Christian MOLIN, Sylvia GEBHARDT</i>	159
Hydrogen Profile Measurement of $(\text{Pb,L a})(\text{Zr,Ti})\text{O}_3$ Capacitor with Conductive Electrode After Hydrogen Annealing <i>Yoko TAKADA, Naoki OKAMOTO, Takeyasu SAITO, Kazuo KONDO, Takeshi YOSHIMURA, Norifumi FUJIMURA, Koji HIGUCHI, Akira KITAJIMA, Hideo IWAI, Rie SHISHIDO</i>	163
Microstructure and Electrical Properties of $(1-x)\text{Bi}_{0.5}(\text{Na}_{0.80}\text{K}_{0.20})_{0.5}\text{TiO}_3\text{-}x\text{LiNbO}_3$ Lead-Free Piezoelectric Ceramics <i>Pimpilai WANNASUT, Pharatree JAITA, Anucha WATCHARAPASORN, Sukanda JIANSIRISOMBOON</i>	167
Effect of Cobalt Substitution on the Structural, Electrical and Magnetic Properties of BaTiO_3 Ceramics <i>Alka RANI, Jayant KOLTE, Prakash GOPALAN</i>	171
Fabrication of Tetragonal $\text{Pb}(\text{Zr,Ti})\text{O}_3$ Nanorods by Focused Ion Beam and Characterization of the Domain Structure <i>Daisuke ITO, Tomoaki YAMADA, Masahito YOSHINO, Takanori NAGASAKI, Osami SAKATA, Junki KUROIISHI, Takahiro NAMAZU, Takahisa SHIRAISHI, Takao SHIMIZU, Hiroshi FUNAKUBO</i>	175
Integration of $\text{Pb}(\text{Zr,Ti})\text{O}_3$ Thin Films with Photo-Sensitive Polymer <i>Takashi OKUBO, Ryo SANO, Kensuke KANDA, Takayuki FUJITA, Kazusuke MAENAKA</i>	178
Influence of Uncertainty in Dielectric Properties on the Design Performance of a Tunable Composite Right/Left Handed Leaky Wave Antenna <i>X. GAO, Tim JACKSON, P.G. GARDNER, M.M. KECHIK, B. JANCAR, O. OCHAR, A. BELOUS</i>	182
Vibration Reduction of MLCC Considering Piezoelectric and Electrostriction Effect <i>Dongjoon KIM, Byung-Han KO, Sanggeuk JEONG, No-Cheol PARK, Young-Pil PARK</i>	186

Homogeneity Evaluation of $\text{Ca}_3\text{Ta}(\text{Ga}_{0.5}\text{Al}_{0.5})_3\text{Si}_2\text{O}_{14}$ Single Crystal by the Line-Focus-Beam Ultrasonic Material Characterization System <i>Yuji OHASHI, Tetsuo KUDO, Yasuhiro SHOJI, Shunsuke KUROSAWA, Akira YOSHIKAWA, Yuui YOKOTA, Kei KAMADA</i>	190
Influence of Asymmetric Electrodes on the Switching of PZT Thin Films <i>Robin NIGON, Nachiappan CHIDAMBARAM, Trygve RAEDER, Paul MURALT</i>	193
Sub-Micron Domain Engineering in Lithium Niobate by Laser Light Irradiation of Patterned Chromium <i>Andreas BOES, Vijay SIVAN, Guanghui REN, Didit YUDISTIRA, Sakellaris MAILIS, Elisabeth SOERGEL, Arnan MITCHELL</i>	197
Mn-Doped PMN-PT Thin Films for Electrocaloric Applications <i>Anja KLEINER, G. SUCHANECK, A. EYDAM, G. GERLACH, L. LIU, A. GÜNTHER, N. NEUMANN</i>	200
Monte Carlo Simulations of the Electrocaloric Effect in Relaxor Ferroelectrics <i>Yang-Bin MA, Karsten ALBE, Bai-Xiang XU</i>	203
Patterning and Nanoscale Characterization of Ferroelectric Amino Acid Beta-glycine <i>Ensieh SEYEDHOSSEINI, Andrei L. KHOLKIN, Daria VASILEVA, Alla NURAEVA, Semen VASILEV, Pavel ZELENOVSKIY, Vladimir SHUR</i>	207
Co-Precipitated Magnetoplumbite Nanoparticles and Their Structural and Dielectric Properties <i>Muhammad ANIS-UR-REHMAN, Zeenat KHAN, Seemab KANWAL, Fatima TUZ-ZAHRA</i>	211
LiTaO_3 /Silicon Composite Wafers for the Fabrication of Low Loss Low TCF High Coupling Resonators for Filter Applications <i>Emilie COURJON, Sylvain BALLANDRAS, William DANIAU, Thomas BARON, Jean-Baptiste MOULET, Thomas SIGNAMARCHEIX</i>	215
Investigation of Magnetic Field Sensor Based on $(\text{TbCo}_2/\text{FeCo})_n/\text{AlN}/\text{TiN}/\text{NCD}$ Composite Membrane <i>Abdelkrim TALBI, M. MOUTAOUEKKIL, Jean-Claude GERBEDOEN, Y. DUSCH, Ali SOLTANI, Vladimir PREOBRAZHENSKY, Nicolas TIERCELIN, Olivier BOU MATAR, Philippe PERNOD, Vincent MORTET, O. ELMAZRIA, M. ELHOSNI</i>	218
Switchable Band Pass BAW Filter Based on $\text{Ba}_{0.7}\text{Sr}_{0.3}\text{TiO}_3$ for C Band RF Applications <i>Almonir MANSOUR, Milad HMEDA, Thottam KALKUR, Pamir ALPAY, Nick SBOCKEY, G.S. TOMPA</i>	222
The Orientation Controlled $(\text{Pb},\text{La})(\text{Zr},\text{Ti})\text{O}_3$ Capacitor for Improved Reliabilities <i>Takeyasu SAITO, Taiga AMANO, Yoko TAKADA, Naoki OKAMOTO, Kazuo KONDO, Takeshi YOSHIMURA, Norifumi FUJIMURA, Koji HIGUCHI, Akira KITAJIMA</i>	226
Interpretation of Switching Data in Oxide Resistive Switching Thin Films <i>In K. YOO, Jong W. KIM, Kwon Y. KIM</i>	230
Next-Generation Ferroelectric Memories Based on FE-HfO_2 <i>Stefan MÜLLER, S. SLESAZECK, T. MIKOLAJICK, J. MÜLLER, P. POLAKOWSKI, S. FLACHOWSKY</i>	233
Effects of Different Ratios of K/Na on the Structure and Properties of $(\text{K}_x\text{Na}_{1-x})\text{NbO}_3$ Ceramics <i>Dongsheng ZHANG, Zheng ZHANG</i>	237
Generating Characteristics of a Hump Shaped Piezoelectric Energy Harvester <i>ByeongHa LEE, SeongSu JEONG, Holk JUN, SeongKyu CHEON, YongWoo HA, TaeGone PARK, MyongHo KIM</i>	240
Design of an Ultrasonic Motor Which has Nib Shaped Stator <i>SeongKyu CHEON, SeongSu JEONG, Holk JUN, ByeongHa LEE, TaeGone PARK, JongKyu PARK</i>	244

Magnetic Flux Density Computation in Voltage-Controlled Lanthanum Strontium Manganite Materials <i>Mahmoud AL AHMAD</i>	249
Capacitance Force Piezoelectric Extraction <i>Mahmoud AL AHMAD</i>	253
Nanowires Piezoelectric Constants Determination Using Current-Voltage Measurements <i>Mahmoud AL AHMAD, Nedal AL TARADEH, Irfan SAADAT</i>	257
Comparison of Actuator Performance in Lead-Based and Lead-Free Piezoelectric Cymbals <i>Piyalak NGERNCHUKLIN, Chutima EAMCHOTCHAWALIT, Ahmad SAFARI</i>	261
Advanced Processing of Lead Titanate-polyimide Composites for High Temperature Piezoelectric Sensing <i>Hamideh KHANBAREH, Maruti HEGDE, Sybrand VAN DER ZWAAG, W.A. GROEN</i>	265
Phase Transitions and Dielectric, Ferroelectric and Piezoelectric Properties of $\text{Bi}_{0.5}(\text{Na}_{0.82}\text{K}_{0.18})_{0.5}\text{TiO}_3$ -Doped $(\text{Ba}_{0.85}\text{Ca}_{0.15})(\text{Zr}_{0.1}\text{Ti}_{0.9})\text{O}_3$ Ceramics <i>Yang BAI, Ales MATOUSEK, Hojay POOLADVAND, Pavel TOFEL, Bo NAN, Vijay BIJALWAN, Michael KRAL, Hana HUGHES, Tim W. BUTTON</i>	268
Dielectric Dispersion in Ferroelectric Composite Nanocrystalline Cellulose – Triglycine Sulfate <i>Hoi Thuong NGUYEN, Alexander Stepanovich SIDORKIN, Svetlana Dmitrievna MILOVIDOVA, Olga Vladimirovna ROGAZINSKAYA</i>	272
Thermal Expansion Characteristics of [001]-Oriented PIN-PMN-PT Single Crystals <i>Gemeng HUANG, Kexin SONG, Ming MA, Zhenrong LI, Shiji FAN, Zhuo XU</i>	276
Optical, Dielectric and Photocatalytic Properties of Perovskite ZnTiO_3 Nanoparticle Synthesized by Sonochemical Process <i>Chakkaphan WATTANAWIKKAM, W. PECHARAPA</i>	280
High Temperature “Hard” Piezoelectric Ceramics of BiScO_3 - PbTiO_3 - $\text{Pb}(\text{Nb}, \text{Mn})\text{O}_3$ with Fe_2O_3 Addition <i>Jianguo CHEN, Qiang LI, Guoxi JIN, Jinrong CHENG</i>	284
Recent Progress on Development of Sputtered PZT Film at FUJIFILM <i>Yoshikazu HISHINUMA, Takamichi FUJII, Takayuki NAONO, Takami ARAKAWA, Youming LI</i>	288
Study of Y-cut LiNbO_3 (010) Crystal Under Oscillated Vibration at High Temperature for Energy Harvesting in Hostile Environment <i>Emmanuel LE BOULBAR, C.R. BOWEN</i>	292
Author Index	296