

**2014 Joint IEEE International Symposium
on the Applications of Ferroelectrics,
International Workshop on Acoustic
Transduction Materials and Devices &
Workshop on Piezoresponse Force Microscopy**

(ISAF/IWATMD/PFM 2014)

**University Park, Pennsylvania, USA
12-16 May 2014**



IEEE Catalog Number: CFP14ISA-POD
ISBN: 978-1-4799-3861-2

Table of Contents

Effect of Ball Size and Ball Milling Time on Piezoelectric Properties of 0.69PZT-0.31PZNN Jung Hwan Ahn, Daniel Song, Min Sik Woo, Dae Heung Cho, Sung Joo Hwang and Tae Hyun Sung	1
Energy Harvesting Potential of Lead Free NBT-BZT Piezoelectric Ceramics Ayse Gul Akyurekli, Mevlut Gurbuz, Mert Gul, Hakan Gulec, Aydin Dogan	5
Pressure Sensitivity Response of Polymeric Ferroelectret Foam Films Tomás E. Gómez Álvarez-Arenas ... Rintaro Aoyagi, Soichi Banno, and Masaki Maeda	9
Synthesis of A Sodium Niobate-based Lead-free Piezoelectric Ceramic Using A Submicron-sized NaNbO ₃ Powder Francois Bauer, and Lucien Eyraud	13
Pressure-Induced Relaxor-to-Ferroelectric Crossover in Vinylidene Fluoride Relaxor Terpolymer: a Possible Explanation to the High Performance of the Terpolymer Nanocomposites Guillaume Beckers, Bruno Dehez.....	17
Modelling of Electric Field and Stress in Piezoelectric Composite Plates under Bending Load Petr Bednyakov, Nava Setter	21
Correlation between domain structure and piezoelectric properties: Experimental study of (111) _c oriented BaTiO ₃ single crystal J. Bustillo, M. Domenjoud, J. Fortineau, G. Gautier, M. Lethiecq	25
Determination of microscopic parameters of piezoceramic materials under electrical loading using genetic algorithm Wenhui Cao, Tong Tong, Jianguo Chen, Dengren Jin and Jinrong Cheng	29
Active cloaking with transducers Julien Bustillo, Marc Lethiecq, Franck Levassort	33
Synthesis and Photocatalytic Performance of Bi ₂ Fe ₄ O ₉ Microcrystals by Ultrasonic assisted Hydrothermal Method Hanting Dong, Dengren Jin, Chaojun Xie, Jinrong Cheng, Jin Chen, Jianguo Chen.....	37
Domain wall evolution laws of piezoceramic materials under mechanical loading Mathieu Domenjoud, Julien Bustillo, Marc Lethiecq, Franck Levassort	41
Dielectric properties of Barium Strontium Calcium Titanate ceramics with compositional inhomogeneity Frédéric Giraud, Michel Amberg, Betty Lemaire-Semail, and Christophe Giraud-Audine	45
Inverse Biasing Capability of a Dual Deflectable Membrane MEMS Ultrasonic Transducer for Medical Applications T. A. Emadi, and D. A. Buchanan	49
Development of ferroelectric RAM (FRAM) for mass production T. Eshita, W. Wang, K. Nakamura, S. Mihara, H. Saito, and Y. Hikosaka.....	52
Influence of feedback on modal shapes and its consequences on broadband energy harvesting C. Giraud-Audine, F. Giraud and M. Amberg	55
Using an Ultrasonic Transducer to Produce Tactile Rendering on a Touchscreen Frédéric Giraud, Michel Amberg, Betty Lemaire-Semail, and Christophe Giraud-Audine	59

Stress and temperature driven phase transitions in single crystalline KNbO ₃ and textured KNL-NTS ceramics: a Raman and thermal expansion study Gwénaël Gouadec, Philippe Colombar, Aneta Slodczyk and Mai Pham-Thi	63
Energy Harvesting with Multilayer Piezoelectric Ceramics Gül M., Akyürekli A., Güleç H., Gürbüz M., N. Kurosaki, and Dogan A.	67
Wide-Band Piezoelectric Resonance Frequency Energy Harvester Hakan Gulec, Ayse Gul Akyurekli, Mert Gul, Mevlut Gurbuz, Burhanettin Koc, and Aydin Dogan	71
Effect of the Powder Process Type on Dielectric and Leakage Current Characteristics of Flux Grown 94NBT-6BT Single Crystals Mevlüt Gürbüz and Aydın Doğan.....	74
Structural and Electrical Characterization of Electro Spray Deposited PZT Sol-PZT Nanopowder Composite Thick Films Mevlüt Gürbüz, Ümit Çelik, Hideaki Sakurai, Yoshiro Kuromitsu, Ahmet Oral, and Aydın Doğan	78
Monitoring of the Piezoelectric Properties and Structural Changes of the PMN-32%PT Crystals during Poling Process Prof., Habil. Dr. Rymantas Jonas Kazys, Assoc. Prof., Dr. Reimondas Sliteris and PhD student Justina Sestoke.....	82
Measurement of Nonlinear Dielectric Constants of Pb(Zr,Ti)O ₃ Thin Films for Ferroelectric Probe Data Storage Technology Y. Hiranaga and Y. Cho	86
Fabrication and characterization of compositionally graded Pb _x Sr _{1-x} TiO ₃ thin films on stainless steel by the Sol-gel method Shengli Huang, Jianguo Chen, Jinrong Cheng	90
Low temperature performance of Pb(Mg _{1/3} Nb _{2/3}) _{0.72} Ti _{0.28} O ₃ single crystals mapped by metallic and superconducting thin films Ruben Hühne, Sascha Trommler, Patrick Pahlke and Ludwig Schultz	94
Doping effect on the physical properties of bi-layered Aurivillius-type structure SrBi ₂ Nb ₂ O ₉ ferroelectric ceramics: SrBi ₂ Nb ₂ O ₉ (SBN) Aurivillius-type ferroelectric ceramics I. C. Reis and A. C. Silva, R. Guo, A. S. Bhalla and J. D. S. Guerra	98
Enhanced piezoelectric properties of 0.60 BiFeO ₃ -0.35 PbTiO ₃ -0.05 Pb(Zn _{1/3} Nb _{2/3})O ₃ ceramics for high temperature applications Jiajia Jiang, Jianguo Chen, Guoxi Jin, Yingjie Dong and Jinrong Cheng	102
Structure, dielectric, and piezoelectric properties of (0.97-x)BiScO ₃ -xPbTiO ₃ -0.03Pb(Mn _{1/3} Nb _{2/3})O ₃ high temperature and high power piezoelectric ceramics Jianguo Chen, Jinrong Cheng	106
Processing optimization and field-induced strain response in laminated 0.6(Bi _{0.85} La _{0.15})FeO ₃ -0.4PbTiO ₃ ceramics G.X. Jin, J.G. Chen and J.R. Cheng	110

The thermal treatment effect on electrical properties of Mn-modified polycrystalline BiFeO ₃ thin films Sangwook Kim, Won-Jeong Kim, Myang Hwan Lee, Jin Su Park, Da Jeong Kim, Myong-Ho Kim, Tae Kwon Song, and Dalhyun Do.....	114
Development on Highly Transparent Ceramics Y. Kintaka, S. Kuretake, N. Tanaka, and A. Ando.....	118
Reactively Sputtered PMN-PT Thin Films for Electrocaloric Applications A. Kleiner, G. Suchaneck, A. Eydam, G. Gerlach and L. Liu	122
TEM Imaging of Thick, Multi-Layer AlN Film Deposited on Oxide K. Knisely, A. Peczalski, K. Mnaymneh, K. Sun and K. Grosh.....	126
Growth of Ca ₃ Ta(Ga _{0.5} Al _{0.5}) ₃ Si ₂ O ₁₄ piezoelectric single crystal and the piezoelectric properties Tetsuo Kudo, Yasuhiro Shoji, Yuji Ohashi, Andrey Medvedev, Shunsuke Kurosawa, Akira Yoshikawa, Yuui Yokota, and Kei Kamada	130
A Light Sensitive Actuator-based Smart Polymer Loudspeaker Array Po-Cheng Lai and Chih-Kung Lee	133
Patterned photochemical deposition on domain engineered ferroelectric single crystals Kenny Lau, Yun Liu, Qian Li, Ray L. Withers, Zhenrong Li, and Zhuo Xu	137
Composition and phase dependence of dielectric activity in [111]-oriented (1-x)Pb(Mg _{1/3} Nb _{2/3})O ₃ -xPbTiO ₃ crystals as a function of DC bias Nengneng Luo, Qiang Li, Shujun Zhang, Thomas R. Shrout, and Yiling Zhang.....	141
Continuous Feeding Growth of ternary PIN-PMN-PT Single Crystals M. Matsushita and K. Echizenya	145
Fabrication of Piezoelectric Ceramic Hollow Fibers with Low Sintering Temperature and Their Characterization Ebru Mensur-Alkoy, M.Y. Kaya, D. Avdan, M.U. Unver and S. Alkoy	149
Influence of the deposition geometry on structural and ferroelectric properties of epitaxial PMN-PT films Michael Mietschke, Sebastian Fähler, Ludwig Schultz and Ruben Hühne.....	153
0.92Pb(Mg _{1/3} Nb _{2/3})O ₃ – 0.08PbTiO ₃ Relaxor Ferroelectrics Modified with Different Dopants for Electrocaloric Cooling Application C. Molin, U. Keitel, P. Neumeister, S. Gebhardt, A. Schönecker.....	157
Dynamic and long-time tests of the transverse piezoelectric coefficient in PZT thin films A. Mazzalai, D. Balma, N. Chidambaram, P. Muralt, L. Colombo, and T. Schmitz-Kempen.....	161
Texture analysis of thick bismuth ferrite lead titanate layers Meghdad Palizdar, Dhiman Mallick, Tuhin Maity, Saibal Roy, Tim P Comyn, Tim J Stevenson, Chris M. Fancher, Jacob L. Jones, Stephen F. Poterala, Gary L. Messing, Ender Suvaci, Annette P. Kleppe, Andrew J. Jehcoat and Andrew J Bell	165
The Study of 1-1-3 Piezoelectric Composite Based on Relaxor Ferroelectric Single Crystal Lei Qin, Li-kun Wang, Dan Long, Chao Zhong, Bin Zhang, and Jing-jing Liu.....	168
Study on the grain size, valence state and electrical properties of bismuth ferrite nanofibers R. Rivera, R. Kappera, M. Sina, M. Chhowalla and A. Safari	172

Phase Transitions at High-Pressure and Structural Description of the Macroscopic Ferroelectric Properties of the $\text{Pb}(\text{Zr}_{1-x}\text{Ti}_x)\text{O}_3$ Solid Solution J. Rouquette, G. Fraysse, J. Haines, P. Papet and M. Hinterstein	176
Optimization of Piezoelectric Transducer Design by Modeling and Simulation R. Sahul, E. Nesvijski, W. Hackenberger.....	180
A Two-Port Piezoelectric Micromachined Ultrasonic Transducer Firas Sammoura, Stefon Shelton, Sina Akhbari, David Horsley, and Liwei Lin.....	183
Piezo- and ferroelectric P(VDF-TrFE) films with inkjet-printed PEDOT:PSS electrodes: Preparation parameters and property evaluation Martynas Sborikas, Bert Fischer, and Michael Wegener.....	187
Dynamic Energy Harvesting Performance of Two Polyvinylidene Fluoride Piezoelectric Flags in Parallel Arrangement in an Axial Flow X.B. Shan, R.J. Song, Z.L. Xu, and T.Xie.....	191
Dielectric, Elastic and Piezoelectric Properties of Melilite-type $\text{SrGdGa}_3\text{O}_7$ Single Crystals at Elevated Temperature Chuanying Shen, Huaijin Zhang, Yuanyuang Zhang, Jiyang Wang, Shujun Zhang, and T.R. Shrout	195
Study on CuO doping effect on 0.69PZT-0.31PZNN for multi-layer piezoelectric energy harvesting system Daniel Song, Min Sik Woo, Jung Hwan Ahn, Tae Hyun Sung, Kyung Bum Kim, and Sahn Nahm	199
Effect of the grain boundary on the dielectric breakdown strength of $(\text{Ba}_{0.4}\text{Sr}_{0.6})\text{TiO}_3$ paraelectric ceramics with various grain sizes Zhe Song, Hanxing Liu*, Hua Hao, Minghe Cao, Qing Xu, Zhonghua Yao, Zhijian Wang, Wei Hu, Yatong Shi, Zhiyong Yu	203
Energy Harvesting Simulation of Two Piezoelectric Flags in Tandem Arrangement in the Uniform Flow R.J. Song, X.B. Shan, F.B. Tian, and T. Xie.....	207
Wide Frequency Range Noise Shield using Curved Glass Plates with Piezoelectric Macro Fiber Composite Actuators Kateřina Steiger, Pavel Mokrý, Jan Václavík, and Miloš Kodejška	211
Impedance analysis of Nb_2O_5 doped $\text{BaTiO}_3\text{-Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3$ ceramics Yue Sun, Hanxing Liu*, Hua Hao, and Shujun Zhang	215
Nanoscale characterization of ferroelectric materials by scanning probe microscope under ultrahigh vacuum Keigo Suzuki, Takafumi Okamoto, Hiroyuki Kondo, Shoichiro Suzuki, Tadasu Hosokura, Koji Murayama, Nobuhiko Tanaka and Akira Ando	220
Synthesis and Characterization of 0.7BiFeO ₃ -0.3BaTiO ₃ Crystallites by the Hydrothermal Method T. Tong, J.G. Chen, J. Jian, D.R. Jin and J.R. Cheng	224
A Novel Acoustofluidic Device for Antigen Antibody Interaction Detection Using Electrochemical Impedance Measurement Tsung-Heng Tsai and Chih-Kung Lee	228

A Polymer-network Gel Coating Method for BaTiO ₃ -based Dielectric Ceramics With a Multilayer Coreshell Structure Ting Wang, Mengying Liu, Hua Hao, Zhonghua Yao, Minghe Cao, and Hanxing Liu	232
High Tc /High Coupling Perovskite Thin Films K. Wasa, T. Matsushima, H. Adachi, T. Matsunaga, T. Yanagitani, T. Yamamoto.....	236
Electromechanical Modeling and Experimental Verification of Nonlinear Hybrid Vibration Energy Harvester Z.L. Xu, X.B. Shan, R.J. Song, and T. Xie	240
Growth and physical properties of Al doped Ca ₃ NbGa ₃ Si ₂ O ₁₄ piezoelectric single crystals Yuui Yokota, Kei Kamada, Tetsuo Kudo, Yuji Ohashi, Andrey Medvedev, Shunsuke Kurosawa, and Akira Yoshikawa	244
Performance of thin film polyvinylidenefluoride (PVDF) for pyroelectric energy harvesting D. Zabek, J. Taylor, and C. R. Bowen	248
Energy harvesting based on piezoelectric Ericsson cycles in a piezoceramic material Bin Zhang, Benjamin Ducharne, Gaël Sebald, and Daniel Guyomar.....	252
A Novel Traveling Wave Ultrasonic Motor Using Sandwich-type Ring Stator Xiangyu Zhou, Weishan Chen, Junkao Liu.....	256