2019 International Workshop on Acoustic Transduction Materials and Devices

Agenda

Tuesday May 7, 2019

Session I: **Plenary 1 - Materials and Transducers - I** **GENERAL SESSION**

Session Chair: **Susan Trolier-McKinstry** **President's Hall 3 & 4**

	8:00 – 8:10	***Introductory Remarks***	Susan Trolier–McKinstry, Richard J. Meyer, Jr.
I.1	8:10 – 8:25	**High Piezoelectricity in Relaxor-PT based Materials with Local Structural Heterogeneity** - S. Zhang, F. Li, M.J. Cabral, E.C. Dickey, J.M. LeBeau, L.-Q. Chen and T. Shrout	Shujun Zhang
I.2	8:30 – 8:45	**Large Piezoelectricity of Novel Ternary Perovskite Ceramics at High Temperatures** - Z.-G. Ye, A.A. Bokov, T. Zhao and S. Dong	Zuo-Guang Ye
I.3	8:50 – 9:05	**Gen III "Mn-modified" PMN-PZT Single Crystals for High Power/High Frequency /Composite Applications** - M.-C. Kim, H.-T. Oh, D.-H. Kim and H.-Y. Lee	Ho-Yong Lee
I.4	9:10 – 9:25	**Manufacturing and Uniformity of Grain Textured Piezoelectric Ceramics** - M. Fanton, R. Meyer, E. Kupp, B.H. Watson, Y.M. Brova, R. Walton, and G. Messing	Mark Fanton
I.5	9:30 – 9:45	**"Hi-Fi Stake", "HAPA" and "HD-FTA" Piezoelectric Actuators** - L.C. Lim, S. Zhang, Y.X. Xia, D.H. Lin and S.P. Lim	Leong-Chew Lim
	9:50 – 10:30	***Morning Break***	
I.6	10:30 – 10:45	**Design of a Compact Array for Underwater Navigation** - T.E. Blanford, D.C. Brown and R.J. Meyer	Thomas E. Blanford
I.7	10:50 – 11:05	**Applied Acoustic Metamaterials** - S.A. Cummer, C.Shen, J. Li, and X. Peng	Steve Cummer
I.8	11:10 – 11:25	**Enhancement of Piezoelectric Response in (100) -oriented Films using Extrinsic Contribution** - H. Funakubo, N. Oshima, H. Inoue, Y. Ehara, T. Shimizu and H. Uchida	Hiroshi Funakubo
I.9	11:30 – 11:45	**A New Class of Electrocaloric Materials - Exhibiting Large Electrocaloric Response at Low Electric Field** - X. Chen, W. Xu, B. Lu, T. Zhang, Q. Wang and Q.M. Zhang	Xin Chen
	11:50 – 12:05	***Three–Minute Summaries***	
I.10	11:50 – 11:53	**Harris Corporation** - S. Ural, L. Fuoco and C. Hills	Seyit Ural
I.11	11:53 – 11:56	**Electrode Options for Piezoceramic Components** - R. Petrucci and W. Coburn	Russel Petrucci
I.12	11:56 – 11:59	**Smart Materials Corporation Display of Products** - T. Daue	Thomas Daue
I.13	11:59 – 12:02	**Piezoelectric PVDF, PVDF-TrFE Film and Test Instruments** - S. Zhang, H. Zhang, B. Li and N. Ling	Shihai Zhang
I.14	12:02 – 12:05	**Piezoelectric Materials for Extreme Environments** - T.P. Comyn, A.J. Bell, P.I. Cowin	Tim Comyn
I.15	12:05 – 12:08	**Broad-bandwidth, Time-domain Vibration Measurements on an Ultrasound Transducer with a new Ultra-high-frequency, Laser Doppler Vibrometer** - D.E. Oliver, M.W. Pineda, S. Boedecker, G. Siegmund, and C. Rembe	Mario Pineda
I.16	*Poster Only*	**APC International, Ltd., Products and Services** - J. Zahnd and R. Staut	Ronald Staut
I.17	*Poster Only*	**CTS Piezoelectric Products** - S. Hulick	Scott Hulick
I.18	*Poster Only*	**Kemet/Tokin Piezo Ceramic Products**	Atsuko Hoffman
I.19	*Poster Only*	**Piezo Kinetics, Inc.**	Todd Baney

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Session II: Piezoelectric Thin Films — CONCURRENT SESSION

Session Chair: Hiroshi Funakubo — President's Hall 3

II.1	2:00 – 2:15	**Simulations and Experiments on Epitaxial Hafnia** - R. E. Cohen and P. Zubko	Ronald Cohen
II.2	2:20 – 2:35	**Domain Structure Evolution as a Function of Temperature on Lead Zirconate Titanate Thin Films on Various Substrates** - K. Coleman, B. Hanrahan, W. Zhu and S. Trolier-McKinstry	Kathleen Coleman
II.3	2:40 – 2:55	**Enhanced Dielectric Breakdown Strength and Electrical Reliability via Introducing Mn Acceptor Ion into Lead Zirconate Titanate (PZT) Films** - B. Akkopru-Akgun, T. Bayer, K. Tsuji, C.A. Randall, M.T. Lanagan and S. Trolier-McKinstry	Betul Akkopru-Akgun
II.4	3:00 – 3:15	**Polymer Substrate Based Flexible Thin-Film PZT Ultrasonic Transducers for Finger Vein Imaging** - T. Liu, J.N. Kim, K. Choi, T.N. Jackson and S. Trolier-McKinstry	Tianning Liu
	3:20 – 4:00	***Afternoon Break***	
II.5	4:00 – 4:15	**PiezoMEMS Foundry** - J.T. Evans, N.B. Montross, G.D. Salazar, S.T. Smith and B.C. Howard	Naomi Montross
II.6	4:20 – 4:35	**Ferroelastic Domain Reorientation in Piezoelectric MEMS** - K. Coleman, J. Walker and S. Trolier-McKinstry	Susan Trolier-McKinstry
	4:40 – 5:01	***Three-Minute Summaries***	
II.7	4:40 – 4:43	**Development of Lead-free Mn-doped Potassium Sodium Niobate Thin Films** - J.I. Yang, V. Kovacova, W. Zhu, L.C. Jacques, S.W. Ko and S. Trolier-McKinstry	Jung In Yang
II.8	4:43 – 4:46	**$BiFeO_3$ Thin Films by Sol-gel Method for Energy Harvesting Applications** - V. Kovacova, J.I. Yang and S. Trolier-McKinstry	Veronika Kovacova
II.9	4:46 – 4:49	**Schottky Barrier at the Lead Zirconate Titanate (PZT) Platinum Interface by Density Functional Theory (DFT)** - N. Kirchner-Hall, S. Trolier-McKinstry and I. Dabo	Nicole Kirchner-Hall
II.10	4:49 – 4:52	**Thermal Investigations of Piezoelectric MEMS Devices** - W. Zhu, J. Lundh, K. Coleman. S.W. Ko, S. Choi, P. Mardilovich and S. Trolier-McKinstry	Wanlin Zhu
II.11	4:52 – 4:55	**Stress Control in Piezoelectric Adjustable X-ray Optics** - N. Bishop, N, Kirchner-Hall, J. Walker, V. Cotroneo, V. Kradinov, P.B. Reid and S. Trolier-McKinstry	Nathan Bishop
II.12	4:55 – 4:58	**ASIC for High-frequency PMUT Utilized in Hand-held Devices: High Speed TIQ Flash ADC Design** - J.H. Park, A. Ozdemir, J.N. Kim	Jun Hyuk Park
II13.	4:58 – 5:01	**Pulsed Laser Deposition of $K_xNa_{1-x}NbO_3$ Films on Platinized Silicon Substrates** - C. Moses, C. Morandi, K. Coleman, N. Bishop, L. Jacques, and S. Trolier-McKinstry	Donovan Moses

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Session III: Piezoelectric Materials Processing — **CONCURRENT SESSION**

Session Chair: Shujun Zhang — **President's Hall 4**

III.1	2:00 – 2:15	**High Piezoelecric Performance and Temperature Stability of <001> Textured PMN-PZT Ceramics** - H. Liu, Y. Yan, H. Leng, J.B Blottman, A.A. Heitman and S. Priya -	Hairui Liu
III.2	2:20 – 2:35	**Piezoelectric Response of Additively Manufactured Textured PIN-PMN-PT**- R.L. Walton, M.J. Brova, B.H. Watson, R.J. Meyer and G.L Messing	Rebecca L. Walton
III.3	2:40 – 2:55	**<001> Textured Mn-doped PZT-PZN-PNN Hard Piezoelectric Ceramics** - H. Leng, Y. Yan, H. Liu and S. Priya	Haoyang Leng
III.4	3:00 – 3:15	**Low Temperature Reactive Sintering and Electrical Properties of CuO-doped PIN-PMN-PT** - B.H. Watson, M. Brova, M.A. Fanton, R.J. Meyer and G.L. Messing	Beecher Watson
	3:20 – 4:00	***Afternoon Break***	
III.5	4:00 – 4:15	**Preparation of $BaTiO_3$-$KNbO_3$ System Nano-structured Ceramics by Solvothermal Solidification Method and Their Ferroelectric Properties** - S. Wada, R. Kayanuma, Y. Isobe, S. Ueno, I. Fujii, E. Magome, C. Moriyoshi and Y. Kuroiwa	Satoshi Wada
III.6	4:20 – 4:35	**Physical Models for Cold Sintering of Lead Zirconate Titanate** - D. Wang, K. Tsuji, C.A. Randall and S. Trolier-McKinstry	Dixiong Wang
III.7	4:40 – 4:55	**Effects of Dopant and Sintering Methods on the Electro-Acoustic Properties of BNT-BKT-BLT Composition** – E. Taghaddos, H. Charalambous, J. Leber, T. Tsakalakos, and A. Safari	Ahmad Safari
III.8	5:00 – 5:15	**Survey of Ultrasound Materials for Photoacoustic Imaging -** S.-R. Kothapalli, A. Dangi, and S. Argawal	Sri-Rajaseekhar Kothapalli
	5:20 - 5:26	***Three–Minute Summaries***	
III.9	5:20 – 5:23	**Cold Sintering of PZT Composites for Medical Ultrasound Transducers** - S. Gupta, D. Wang, C.A. Randall and S. Trolier-McKinstry	Shtuti Gupta
III.10	5:23 – 5:26	**Chemical Precipitation of Nb-doped $Pb(Zr_{0.95}Ti_{0.05})O_3$ Powder** - M.A. Hutchinson, J.T. Gibson, D.V. Gough, S.J. Lockwood, C.B. DiAntonio and N.P. Sherlock	Nevin P. Sherlock
III.11	5:26 – 5:29	**Development of Multiferroic Inks for Hybrid 3D Deposition of Multifunctional Devices** - B. Young, R. Guy and A. Bhalla	Brandon Young
III.12	5:29 – 6:02	**Energy Harvesting Using Stacked Piezoelectric Composites - Experimental Evaluation and Simulated Optimization** - B. Gamboa, A.S. Bhalla and R. Guo	Bryan Gamboa

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Wednesday May 8, 2019

Session IV: **Plenary 2 - Piezoelectric Single Crystals** **GENERAL SESSION**

Session Chair: **Richard Meyer** **President's Hall 3 & 4**

IV.1	8:00 – 8:15	**Infrared Irradiation Induced Ferroelectric Phase Switching in Relaxor Ferroelectric Single Crystals** - S. Young, M. Staruch, L.M. Garten, S. Lofland, A. Caruso and P. Finkel	Peter Finkel
IV.2	8:20 – 8:35	**Electric Field and Frequency Dependent Dynamic Hysteresis of PMN-PT Single Crystal** - Y. Zhang and W. Cao	Wenwu Cao
IV.3	8:40 – 8:55	**Effect of Poling Temperature on Dielectric and Piezoelectric Properties of 0.7Pb($Mg_{1/3}Nb_{2/3}$)O_3 - 0.3$PbTiO_3$ Single Crystals by Alternating Current Poling** - H. Wan, C. Luo, W.-Y. Chang, Y. Yamashita and X. Jiang	Haotian Wan
IV.4	9:00 – 9:15	**Dynamic Study on Alternating Current Poling of 0.7Pb($Mg_{1/3}Nb_{2/3}$)O_3-0.3$PbTiO_3$ Single Crystals with Thickness of 5 mm** - C. Luo, H. Wan, H. Wu, Y. Yamashita and X. Jiang	Chengtao Luo
IV.5	9:20 – 9:35	**Development of Sm-doped Relaxor-PT Crystals with Ultrahigh Piezoelectric Coefficient** - J. Luo, S. Taylor, F. Li, S.J. Zhang, T.R. Shrout and W. Hackenberger	Jun Luo
	9:40 – 10:20	***Morning Break***	
IV.6	10:20 – 10:35	**Unraveling the Mystery of AC Poling in Relaxor-PT Crystals** - F. Li, B. Wang, C. Qiu, J. Liu, S. Zhang, J. Luo, L.-Q. Chen and T.R. Shrout	Fei Li
IV.7	10:40 – 10:55	**In situ Study of Inter-ferroelectric Phase Transitions in Domain Engineered Ferroic Crystals** - M. Cain, M. Staruch, P. Finkel, P. Thompson and D. Wermeille	Markys Cain
IV.8	11:00 – 11:15	**PMN-PT Single Crystal Growth** - J. Tian, H. Ganegoda, H. Pan and H. Marshall	Jian Tian
	11:20 – 12:04	***Three-Minute Summaries***	
IV.9	11:20 – 11:23	**The Piezoelectric Single Crystal Standard: Past, Present, and Future** - L.M. Ewart and Z.-G. Ye	Lynn Ewart
IV.10	11:23 – 11:26	**Potential of All-Optical Piezocrystal Characterization for FEA Simulation** - N.G. Fenu, N. Giles-Donovan, P. Prentice and S. Cochran	Nicola Fenu
IV.11	11:26 – 11:29	**The Effect of Static Domain Walls on Piezoelectric Properties of Rhombohedral Ferroelectric Single Crystals** - B. Wang, F. Li and L.-Q. Chen	Bo Wang
IV.12	11:29 – 11:32	**Growth and Piezoelectric Properties in PIN-PSN-PT Crystals with High T_{R-T} and T_C Phase Transition Temperatures** - D.B. Lin, F. Li, S.J. Zhangand T.R. Shrout	Dabin Lin

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IV.13	11:52 – 11:55	**Visualization of Relaxor Ferroelectric Domain Via Angle-resolved Later PFM** - K. Chu and D. Damjanovic	Kanghyun Chu
IV.14	11:55 – 11.58	**Birefringence Investigation of the Phase Transition Behavior of PIN-PMN-PT Piezocrystal** - R. Pérez-Moyet, I.M. Doyle and A.A. Heitman	Richard Pérez-Moyet
IV.15	11:58 – 12:01	**Characterizing d_{36} Devices using Laser Doppler Vibrometry** - H. Rose, N. Giles-Donovan, N.G. Fenu, and S. Cochran	Hannah Rose
IV.16	12:01 - 12:04	**Single Crystal Fibre Laser Hydrophoneb** - D.R. Jones	David Jones

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Session V:		**Novel Devices**	**CONCURRENT SESSION**
Session Chair:		**Mark Fanton**	**President's Hall 3**
V.1	2:00 – 2:15	**High Power, Low Frequency Textured PMN Based Projector** - S. Dynan, G. Bower, J. Zook, S. Tuncdemir, W.M. Bradley, E. Gurdal, R. Bird and T. Rorick	Steve Dynan
V.2	2:20 – 2:35	**Modeling of Acoustic Transducers and Acoustical Systems Using SimScape** - S.C. Thompson	Stephen Thompson
V.3	2:40 – 2:55	**A Miniaturized Acoustic Vector Sensor with PIN-PMN-PT Single Crystal Cantilever Beam Accelerometers** - Y. Je, C. Joh, Y. Cho, J. Lee, S. Lee and H.S. Park	Yub Je
V.4	3:00 – 3:15	**Design Study of a Broadband Tonpilz Transducer** - S.J. Brumbaugh and D. Brown	Scott Brumbaugh
	3:20 – 4:00	***Afternoon Break***	
V.5	4:00 – 4:15	**Piezoelectric Loss Mechanisms - Recent Case Studies** - K. Uchino	Kenji Uchino
V.6	4:20 – 4:35	**Dielectric and Piezoelectric Properties of High Coercive Field ZnO-doped PIN-PZT-PT Ceramics** - M.J. Brova, B. Watson, R.L. Walton, E. Kupp, M.A. Fanton, R. Meyer and G.L. Messing	Michael Brova
V.7	4:40 – 4:55	**Metastable States with Large Property Enhancements in Classic Ferroelectrics** - V. Gopalan	Venkatraman Gopalan
	5:00 – 5:12	***Three–Minute Summaries***	
V.8	5:00 – 5:03	**Uniaxially Compressive Stress Effect on the Piezoelectric Loss Mechanism in a 'Soft' PZT** - H. Daneshpajooh, Y. Park. M. Choi, T. Scholewar, E. Hennig and K. Uchino	Hossein Daneshpajooh
V.9	5:03 – 5:06	**Partial Electrode Configuration for Loss Determination of k_{33} Mode Piezoelectric Ceramics** - Y. Park, Y. Zhang, T. Scholewar, E. Hennig and K. Uchino	Yoonsang Park
V.10	5:06 – 5:09	**Towards a Fundamental Understanding of Energy Density for Piezocrystals** - N. Giles-Donovan, N.G. Fenu, C. Stock and S. Cochran	Nathan Giles-Donovan
V.11	5:09 – 5:12	**Flexoelectricity in Barium Strontium Titanate (BST) Ceramics**	Michael Hahn
V.12	*Poster Only*	**Design and Fabrication of a Cymbal Transducer for Underwater Broadband Sensor Nodes** - H. Shim, S. Pyo and Y. Roh	Hayeong Shim
V.13	*Poster Only*	**Design of an Acoustic Bender Transducer for Low Frequency Active Sonobuoys** - S. Pyo, H. SHim and Y. Roh	Seonghun Pyo
V.14	*Poster Only*	**ONR's Research Program on Acoustic Transduction Materials and Devices** - H.C. Robinson, W.A. Smith, C.M Wu and M.-J. Pan	Harold C. Robinson
V.15	*Poster Only*	**Design of a Textured Ceramic Tonpilz with PyTRN** - N.K. Mayo, A.A. Heitmann and J.B. Blottman	Nathaneal Mayo
V.16	*Poster Only*	**Transducer Bandwidth and Sensitivity Enhancement by Using Stratified Impedance Matching Layers with Optimized Structure and Gradient Profile** - T.E.G. Alvarez-Arenas and G. Ortiz	Tomás Gômez Alvarez-Arenas

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Wednesday May 8, 2019

Session VI: Transducers — **CONCURRENT SESSION**

Session Chair: Sandy Cochran — **President's Hall 4**

VI.1	2:00 – 2:15	**Cross Coupling and Mode Splitting in Thickness Mode Resonators** - T. Scholehwar, E. Hennig and M. Oertel	Timo Scholehwar
VI.2	2:20 – 2:35	**Optimization of Piezoelectrically-driven Synthetic Jet Actuators using a Low-order Electro-Elastic-Acoustic Model with Nonlinear Damping**	George Lesieutre
VI.3	2:40 – 2:55	**Improve Energy Harvesting Performance Through Textured Piezoceramics** - S. Tuncdemir, A. Erkan Gurdal, S. Dursun and C.A. Randall	Safakcan Tuncdemir
VI.4	3:00 – 3:15	**Review on Advanced Piezoelectric Energy Harvesters** - T.-B. Xu	Tian-Bing Xu
	3:20 – 4:00	***Afternoon Break***	
VI.5	4:00 – 4:15	**Low Temperature Cofired Magnetoelectric Voltage Tunable Inductor (VTIs) with High Current Saturation** - X. Li, Y. Yan and S. Priya	Xiaotian Li
VI.6	4:20 – 4:35	**Material and Structure Design of Magnetoelectric Voltage Tunable Inductors** - Y. Yan, L.D. Geng, Y. Tan, J. Ma, L. Zhang, X. Li, H. Liu, M. Sanghadasa, K. Ngo, A.W. Ghosh, Y.U. Wand and S. Priya	Yongke Yan
	4:40 – 4:55	***Three–Minute Summaries***	
VI.7	4:40 – 4:43	**Piezoelectric Energy Harvesters for High Temperature Applications** - W.T. Chen, S. Tuncdemir, A. Erkan Gurdal, G.J. Knowles, W.M. Bradley and C.A. Randall	Wei Ting Chen
VI.9	4:43 – 4:46	**Multilayer Co-fired Textured Piezoelectric Transformers Enabling Non-Resonant Drive** - A. Erkan Gurdal, S. Dursun, S. Tuncdemir, K. Uchino and C.A. Randall	A. Erkan Gurdal
VI.10	4:46 – 4:49	**Flash Analog-to-Digital Converter with Threshold Inverter Quantization Architecture for High Frequency Ultrasound Imaging Systems** - A. Ozdemir, J.H. Park, S. Trolier-McKinstry, T.N. Jackson and K. Choi	Ali Ozdemir
VI.11	*Poster Only*	**A Biomimetic Transistor for Audio-morphic Computing - Emulating Nural Computational Algorithm in the Auditory Cortex of Barn Owl** - Sarbashis Das, A. Dodda and Saptarshi Das	Sarbashis Das

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Thursday May 9, 2019

Session VII: Materials and Transducers II — **GENERAL SESSION**

Session Chair: Ahmad Safari — **President's Hall 3 & 4**

VII.1	8:00 – 8:15	**PMN-PT Crystal Growth using Vertical Gradient Freeze (VGF) Technology** - G. Wang, J.M. Frank, and J. Buzniak	Guojian Wang
VII.2	8:20 – 8:35	**[001] Lead Zirconate Titanate (PZT) Crystals with Composition Near the Morphotropic Phase Boundary** - W. Zhu, V. Kovacova, V. Fratello, and S. Trolier-McKinstry	Wanlin Zhu
VII.3	8:40 – 8:55	**Growth and Characterization of High-Tc and High-Performance Ternary Piezo-/Ferroelectric Single Crystals of $Pb(Yb_{1/2}Nb_{1/2})O_3$-$PbZrO_3$-$PbTiO_3$** - Y. Yuan, Z.-H. Liu, M. Bari and Z.-G. Ye	Yi Yuan
VII.4	9:00 – 9:15	**Past, Present, and Future Perspective of Alternative Current Poling for Piezoelectric Single Crystals (Review)** - Y. (John) Yamashita, T. Karaki, H. Lee and X. Jiang	Yohachi (John) Yamashita
VII.5	9:20 – 9:35	**Non-linearity in Engineered Lead Magnesium Niobate ($PbMb_{1/3}Nb_{2/3}O_3$) Thin Films** - S. Shetty, L. Martin, and S. Trolier-McKinstry	Smitha Shetty
	9:40 – 10:20	***Morning Break***	
VII.6	10:20 – 10:35	**3D Steerable, Acoustically Powered Microswimmers for Single-Particle Manipulation** - L.Q. Ren, N. Nama, F. Soto, Z Yan, W. Wang, J. Wang and T.E. Mallouk	Liqiang Ren
VII.7	10:40 – 10:55	**Thin Film PZT-based PMUT Arrays for 1D Particle Manipulation and Imaging Applications** - C.Y. Cheng, A. Dangi, S. Tiwari, L. Ren, R. Benoit, Y. Qiu, H. Lay, S. Agrawal, R. Pratap, S. Kothapalli, T. Mallouk, S. Cochran and S. Trolier-McKinstry	Christopher Cheng
VII.8	11;00 - 11:15	**Fabrication of Novel Transducer Components and Materials via Additive Manufacturing** - C.D. Eadie, R.J. Meyer, and K.C. Meinert	Christopher Eadie
VII.9	11:20 – 11:35	**Advances in High Intensity Ultrasound** - R. Sahul and A. Mezheritsky	R. Sahul
VII.10	11:40 – 11:55	**Acoustic Energy Focusing for Wireless Power Transfer** - V.F.-G. Tseng, T.E. Drummond, N. Lazarus, S. Bedair -	Victor Farm-Guoo Tseng