

2022 U.S.-JAPAN SEMINAR ON DIELECTRIC AND PIEZOELECTRIC CERAMICS

Monday, November 14

A - 1 Invited A: Basic Science & Characterization of Structure and Properties 8:00 am - 10:15 am

Session Chairs: Hiroki Taniguchi and Elizabeth Dickey

	8:00 – 8:15	Introductory Remarks	Dr. Susan Trolier–McKinstry, Dr. Yasushi Enokido
A.I.1	8:15 – 8:45	Polar Antiphase Boundaries in $\text{PbZr}_{1-x}\text{Ti}_x\text{O}_3$ - H. Yokota, K. Kurihara, Z. An, N. Zhang, M. Pasciak, M. Glazer	Hiroko Yokota
A.I.2	8:45 – 9:15	Properties of Novel Ferroelectric van der Waals Crystals Revealed by Multi-modal Characterization Approaches - N. Balke	Nina Balke
A.I.3	9:15 – 9:45	Microstructural Analysis of the Degraded Areas and Reliability of Multi-Layer Ceramic Capacitors - M. Nagayoshi, R. Sakata	Maiko Nagayoshi
A.I.4	9:45 – 10:15	First-principles Modeling of Wurtzite Ferroelectrics - C.G. Van de Walle	Chris G. Van de Walle

10:15 – 10:30 Break

A - 2: Poster Summaries & Poster Viewing - 10:30 am - 12:30 pm

A.P.1		DFT Study on BiFeO_3–BaTiO_3 Superlattices - Y. Noguchi	Yuji Noguchi
A.P.2		Mask or Enhance: Data Curation for the Discovery of Piezoresponse Force Microscopy Contributors - G.K. Ligonde, K.N. Williams, N. Bassiri-Gharb	Gardy Kevin Ligonde
A.P.3		Theoretical analysis of BaTiO_3 and Metal Electrode Interface - Y. Iwazaki, R. Suemasa, M. Araki, Y. Sakai	Yoshiki Iwazaki
A.P.4		In-situ Observation of 90°-domain Switching for Piezoelectric $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ Microcantilevers - Y. Ehara, H. Morioka, T. Kobayashi, S. Yasui, K. Nishida, H. Funakubo	Yoshitaka Ehara
A.P.5		In Situ Monitoring of Cold-Sintering Mechanisms Using a Custom Stage Designed for Small and Wide Angle X-Ray Scattering - R.A. Maier, A. Allen, F. Zhang, I. Levin	Russell A. Maier
A.P.6		Characterization of Point Defects in Mn- and (Mn, Nb)-doped Perovskite Titanates - I. Levin, R.A. Maier, K.F. Garrity, V. Provenzano, B. Ravel	Igor Levin
A.P.7		Advancing Solid State Reaction Science Through <i>in situ</i> X-ray Diffraction and Processing Control - J.L. Jones, J. Corrado Harper, L. Bellcase, R. Broughton, J.S. Forrester	Jacob L. Jones
A.P.9		Information Recovery in Low Signal-to-noise Piezoresponse Force Microscopy Data - K.N. Williams, H.S. Yuchi, G.K. Ligonde, M.W. Repasky, Y. Xie, N. Bassiri-Gharb	Kerisha N. Williams
A.P.10		Analysis of Crystals by pm-order Evaluation Technique Using STEM - S. Otsuki, S. Calderon, S.D. Funni, E.C. Dickey	Shiro Otsuki
A.P.11		Oxygen Vacancy Injection as a Pathway to Enhancing Electromechanical Response in Ferroelectrics - K.P. Kelley, A.N. Morozovska, E.A. Eliseev, V. Sharma, D.E. Yilmaz, A.C.T. van Duin, P. Ganesh, A. Borisevich, S. Jesse, P. Maksymovych, N. Balke, S.V. Kalinin, R.K. Vasudevan	Kyle P. Kelley
A.P.12		Ultra-Resolution Volumetric Properties of Piezoelectrics and Dielectrics via Tomographic AFM - B.D Huey, K. Del Cid Ledezma, L. Ortiz, J. Kaszas, , R. Ramesh, D. Meier, T. Hosokur, K. Suzuki, Y. Zhu	Bryan D. Huey

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- A.P.13 **Direct Observation of Ferroelectricity in Two-Dimensional MoS₂** - A. Gruverman Alexei Gruverman
- A.P.14 **CRUX: Crowdsourced Materials Data Engine for Unpublished XRD Results** - A. Sehirlioglu Alp Sehirlioglu
- A.P.15 **Assessment of Flaws in Cold Sintered Electroceramics via Ultrasonic Wave Speed and Attenuation Measurements** - H.N. Jones, A.P. Argüelles, S. Trolier-McKinstry Haley N. Jones

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Monday, November 14

B - 1 Invited B: MLCC High-Power Electric and High-Frequency Dielectrics 2:00 pm - 4:00 pm

Session Chairs: Clive Randall and Hiroko Yokota

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| B.I.1 | 2:00 – 2:30 | Challenge to Develop DC-bias & Temperature Dependence-free Dielectric Materials with Dielectric Constants Ranging from 500 to 10,000 - S. Wada, P. Sapkota, T. Miyazawa, G.P. Khanal, I. Fujii, S. Ueno | Satoshi Wada |
| B.I.2 | 2:30 – 3:00 | X7R Dielectric for EV Applications - A. Ellmore | Angela Ellmore |
| B.I.3 | 3:00 – 3:30 | Development of Low-Loss Dielectric Materials in Multilayer Ceramic Capacitors for Automotive Applications - S. Suzuki, T. Tateishi, K. Banno, T. Nakamura, H. Sano | Shoichiro Suzuki |
| B.I.4 | 3:30 – 4:00 | Electrical and Thermal Characterization of Class I Multilayer Ceramic Capacitors (MLCCs) in High Alternating Currents - J. Bultitude, L. Jones, I.D. Kinnon, N.A. Reed, J.H. Hayes, A. Templeton | John Bultitude |

4:00 – 4:30 Break

B - 2: Poster Summaries & Poster Viewing - 4:30 pm - 6:30 pm

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|--------|---|-------------------------|
| B.P.1 | Nano-grained (Bi_{1/2}K_{1/2})TiO₃-SrTiO₃ Ceramics for Capacitor Applications - M. Kitamura, S. Fujihara, M. Hagiwara | Maho Kitamura |
| B.P.2 | Increasing Capacitor Lifetime with AC Electric Field Cycling - L.M. Garten, J.A. Bock, E.A. Patterson, I. Graham, M.A. Blea, H.J. Brown-Shaklee | Lauren M. Garten |
| B.P.3 | Dielectric Stimulated Arc Breakdown Across a Spark Gap for Surge Protection - P. Yang, J.K. Grey, D. Vreeland, J.D. Sorenson | Pin Yang |
| B.P.4 | Voltage Tunable Capacitor for Tunable Power Electronics - C.W. Nies, A.P. Ritter, J. Hock, R. Vanalstine, S.M. Fuller | Craig W. Nies |
| B.P.5 | Moisture Incorporation and Effects on Electrical Conductivity in Dielectrics - E.C. Dickey, J.F. McGarahan | Elizabeth C. Dickey |
| B.P.6 | Solvothermal Synthesis of Perovskite Alkaline-Niobates Nanocubes from Tailored Precursors for High-Performance Composite Dielectrics - S. Ueno, Y. Yamada, P. Sapkota, H. Nam, I. Fujii, S. Wada | Shintaro Ueno |
| B.P.7 | Microstructural Analysis of Novel Dielectric Composites Using Ultrasonic Nondestructive Evaluation - C.S. Wheatley, J. Mena-Garcia, C.A. Randall, A.P. Argüelles | Christopher S. Wheatley |
| B.P.8 | Polymer Coated Ceramic Powders for Electronics Applications - C.A. Grabowski, D. Bajaj | Christopher Grabowski |
| B.P.9 | Silver Niobate Capacitors: Cold Sintered Ceramics and Thin Films - A. Safari, J.D. Leber, J. Zhang | Ahmad Safari |
| B.P.10 | Developing a Standard Reference Material for mmWave Dielectrics - L.L. Enright, G.L. Brennecka, N.D. Orloff | Lucas L. Enright |
| B.P.12 | NRL Additive Manufacturing of Ceramics via Microwave Sintering - E.P. Gorzkowski, E.A. Patterson, A.P. Iliopoulos, B. Graber, J.G. Michopoulos | Edward P. Gorzkowski |
| B.P.13 | The role of oxygen vacancies on DC lifetime and TSDC in Bi(Zn,Ti)O₃-BaTiO₃ (BZT-BT) - S. Bishop, M. Blea-Kirby, A. Peretti, W. Bachman, J. Bock | Sean Bishop |

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Tuesday November 15

C - 1 Invited **C: New Materials, Synthesis and Properties for Energy and Environmental Issues** **8:00 am - 10:00 am**

Session Chairs: Takuya Hoshina and Geoff Brennecka

C.I.1	8:00 – 8:30	Silicate and Aluminate-based Ferroelectrics and Antiferroelectrics - H. Taniguchi	Hiroki Taniguchi
C.I.2	8:30 – 9:00	From High-Entropy Ceramics (HECs) to Compositionally Complex Ceramics (CCCs) - J. Luo	Jian Luo
C.I.3	9:00 – 9:30	Melilite-type Silicate Single Crystals for High Temperature Piezoelectric Application - H. Takeda	Hiroaki Takeda
C.I.4	9:30 – 10:00	Multiferroic and Strain Responses in Dilutely Doped BaTiO₃ - M. Staruch, S. Mills, E.A. Patterson, P. Finkel	Margo Staruch

10:00 – 10:30

Break

C - 2: **Poster Summaries and Poster Viewing - 10:30 am - 12:30 pm**

C.P.1		Fabrication of La-doped Bismuth Silicate Bi₂SiO₅ Ceramics - Y. Yasumoto, H. Taniguchi, S. Fujihara, M. Hagiwara	Yoji Yasumoto
C.P.2		Designing Novel Dielectric Composites with High Thermal Conductivity - J. Mena-Garcia, A. Ndayishimiye, Z. Fan, B. Foley, C.A. Randall	Javier Mena-Garcia
C.P.3		Barium Nickelate for Piezoelectric Catalysis - I. Graham, L.M. Garten	Ian Graham
C.P.4		Understanding Piezoelectric and Auxetic Response of Cellulose Nanocrystals - F. Rubaiya, M.L. Shofner, L.M. Garten	Fariha Rubaiya
C.P.5		Unique Polarization Switching System in Kappa-Al₂O₃-type Multiferroics - S. Yasui, T. Katayama, Y. Hamasaki, M. Itoh	Shintaro Yasui
C.P.6		New Materials for Three Dimensional Ferroelectric Microelectronics - S. Trolrier-McKinstry, W. Zhu, J. Hayden, K. Ferri, L. Jacques, F. He, J.I. Yang, J.P. Maria, T.N. Jackson	Susan Trolrier-McKinstry
C.P.7		Cold Sintering of Potassium Sodium Niobate, K_{0.5}Na_{0.5}NbO₃ - K. Nakagawa, M. Iwasaki, C.A. Randall	Koki Nakagawa
C.P.8		The Effect of BaTiO₃ Surface Modification on Cold Sintering - T. Okazaki, Y. Fujioka, C.A. Randall	Toshiki Okazaki
C.P.9		Novel Electroceramic Composites Under the Processing of Cold Sintering - C.A. Randall	Clive A. Randall
C.P.10		Cold Sintering Process of BaTiO₃ Composites with Fine PTFE Powder - T. Nunokawa, C.A. Randall	Takashi Nunokawa
C.P.11		Hybrid Organic-inorganic Perovskites: Piezoelectricity, Ferroelectricity and Rashba Effects - I. Ponomareva, P.S. Ghosh, S. Lisenkov, R. Kashikar	Inna Ponomareva
C.P.12		Stabilizing Polar Polymorphs of Scandium Ferrite for Photovoltaics - M.B. Frye, A. Mock, L.M. Garten	Marshall B. Frye
C.P.13		Fast Charge Transfer via Dielectric Interface in Rechargeable Batteries - T. Teranishi, R. Yamanaka, T. Higuchi, K. Hamada, S. Kondo, A. Kishimoto	Takashi Teranishi
C.P.14		Effect of Dopant Concentration and Processing Methods on the Ferroelectric Behavior of Doped BaTiO₃ Ceramics - S.C. Mills, E.A. Patterson, M. Staruch	Sarah C. Mills

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- C.P.15 **Ionic Exchange of Aurivillius Phases for Protonation** - A. Sehirlioglu, B. Hirt Ben Hirt
- C.P.16 **Electrocaloric Effect of Perovskite High Entropy Oxide Films** - Y. Son, S. Trolier-McKinstry Yeongwoo Son
- C.P.17 **Aerosol Deposition and Characterization of Complex Oxide Systems** - E.A. Patterson, S.C. Mills, H. Ryou, J.A. Wollmershauser, E.P. Gorzkowski Eric A. Patterson

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Tuesday, November 15

D - 1 Invited D: Piezoelectric Materials and Their Applications 2:00 pm - 4:00 pm

Session Chairs: Eric Patterson and Hiroshi Funakubo

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|-------|-------------|--|------------------|
| D.I.1 | 2:00 – 2:30 | Domain Structure and Complex Nonlinear Elastic Constants of Lead-Free and Lead Based Piezoelectric Ceramics for Ultrasonic Applications - H. Shimizu | Hiroyuki Shimizu |
| D.I.2 | 2:30 – 3:00 | Thin Ferroelectric Films & piezoMEMS: A Perspective - J. Evans, Jr. | Joe Evans, Jr. |
| D.I.3 | 3:00 – 3:30 | Development of (Bi_{0.5}Na_{0.5})TiO₃-based Lead-free Piezoelectric Ceramics by Quenching Treatment for Ultrasonic Applications - H. Nagata, Y. Takagi | Hajime Nagata |
| D.I.4 | 3:30 – 4:00 | Ultrasonic Time-of-Flight Sensors Based on Piezoelectric MEMS Ultrasonic Transducers - D.A. Horsley, R.J. Przybyla, S.E. Shelton, B.E. Eovino | David Horsley |

4:00 – 4:30 Break

D - 2: Poster Summaries and Poster Viewing - 4:30 pm - 6:30 pm

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|--------|---|---------------------|
| D.P.1 | Ferroelectric Properties of Ag_xK_{1-x}NbSi₂O₇ Single Crystals - T. Hoshina, Y. Suga, S. Yasuhara, T. Tsurumi | Takuya Hoshina |
| D.P.2 | Performance and Stability of High T_{RT} Relaxor PIN-PMN-PT Single Crystals - A.A. Heitmann, I.M. Doyle, R. Pérez Moyet, N. Noda, K. Echizenya | Adam A. Heitmann |
| D.P.3 | Giant Optical and Piezoelectric Effects Induced by Domain Reconfiguration Related to Ferroelectric Phase Transitions - P. Finkel, M. Staruch, T. Mion, M.G. Cain, J. Daniels | Peter Finkel |
| D.P.4 | Time-dependence and its Origin for Extraordinarily Large Piezoelectric Response in Polarization-inclined Pb(Zr, Ti)O₃ Nanorods - Y. Yamada, K. Okamoto, M. Yoshino, T. Nagasaki, Y. Imai, O. Sakata | Tomoaki Yamada |
| D.P.5 | Ferrielectricity in the Archetypal Antiferroelectric, PbZrO₃ - N. Bassiri-Gharb, Y. Yao, Z. Beller, A. Naden, S. Lisenkov, I. Ponomareva, A. Kumar | Nazanin Bassi-Gharb |
| D.P.6 | Electromechanical Properties of K(Ta,Nb)O₃ Crystal - H. Maiwa | Hiroshi Maiwa |
| D.P.7 | Design of Actuators Based on Ferroelectric-Relaxor Crossover - D. Cann, S. Gupta, P. Mardilovich, B. Gibbons | David Cann |
| D.P.8 | Relaxing in Weird Places - A.M. Rappe, D. Behrendt, J. Zhang, Y. Qi, R. Wexler | Andrew M. Rappe |
| D.P.9 | Ti Doping and Low-temperature Sintering of BiFeO₃ Nanoparticles - M. Hagiwara, Y. Shinjo, M. Mori, S. Fujihara | Manabu Hagiwara |
| D.P.10 | Bulk ScAlN Plate Ultrasonic Transducer in the 10 MHz Range - S. Kuninobu, N. Ishi, T. Yanagitani | Sota Kuninobu |

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Wednesday, November 16

E - 1 Invited

E: Material Science, Integration and Application of Thin Films

8:00 am - 10:05 am

Session Chairs: Tomoaki Yamada and Lauren Garten

	8:00 – 8:05	Bruce Tuttle Remembrance - given by Geoff Brennecka	
E.I.1	8:05 – 8:35	Effect of Li and Nb Co-doping on AlN Piezoelectric Films Prepared by RF Magnetron Sputtering - T. Terada, J. Kimura, Y. Inoue	Tomohiro Terada
E.I.2	8:35 – 9:05	Ferroelectrics Everywhere - J.P. Maria, J. Hayden, D. Goodling, R. Zu, S. Baksa, R. Taheri, N. Alem, I. Dabo, V. Gopalan, S. Troler-McKinstry	Jon-Paul Maria
E.I.3	9:05 – 9:35	GHz Frequency Switchable BAW Filter Applications of Ferroelectric ScAlN and MgZnO Thin Films - T. Yanagitani	Takahiko Yanagitani
E.I.4	9:35 – 10:05	Material Synthesis and Device Structures for High Frequency Aluminum Scandium Nitride Electromechanical Resonators - R.H. Olsson, R. Beaucejour, Z. Tang, X. Du	Troy Olsson

10:05 – 10:30 Break

E - 2: Poster Summaries and Poster Viewing - 10:30 am - 12:30 pm

E.P.1		Ferroelectricity of 20-nm Thick (Al_{0.8}Sc_{0.2})N Thin Films with TiN Electrodes - R. Ota, S. Yasuoka, R. Mizutani, T. Shiraishi, K. Kakushima, H. Funakubo	Reika Ota
E.P.2		Wake-up in Al_{1-x}B_xN Ferroelectric Films - W. Zhu, F. He, J. Hayden, J.I. Yang, J.P. Maria, S. Troler-McKinstry	Wanlin Zhu
E.P.3		Ferroelectric Al_{0.7}Sc_{0.3}N for High Operating Temperature Non-volatile Memory - D.E. Drury, K. Yazawa, A. Zakutayev, E.A. Andarawis, D.M. Shaddock, B.M. Hanrahan, G.L. Brennecka	Daniel E. Drury
E.P.4		Anomalous Switching Kinetics in Ferroelectric Wurtzite Thin Films - K. Yazawa, J. Hayden, J.P. Maria, S. Troler-McKinstry, A. Zakutayev, G.L. Brennecka	Keisuke Yazawa
E.P.5		Ferroelectric Zn_{2/3}Mg_{1/3}O Films - L. Jacques, G. Ruy, S. Shetty, J.P. Maria, S. Troler-McKinstry	Leonard Jacques
E.P.6		Defining Properties via Material Microstructure: Defect and Strain Engineering Approaches for Developing Ferroelectric AlScN - J.A. Wellington-Johnson, L.M. Garten	John A. Wellington-Johnson
E.P.7		Stability of Piezoelectric Thin Film Tin Selenide - J.R. Chin, S. Marini, L.M. Garten	Jonathan R. Chin
E.P.8		Quantification of Stress During Field Cycling of Hafnium Zirconium Oxide Thin Films - S.T. Jaszewski, S.S. Fields, J.F. Ihlefeld	Samantha T. Jaszewski
E.P.9		A Landau Approach to the Thermodynamics of Ferroelectric Al_{1-x}Sc_xN - G.L. Brennecka, K. Yazawa, A. Zakutayev	Geoff Brennecka
E.P.10		Quantifying the Electrode Clamping Effect in Ferroelectric Hafnium Zirconium Oxide Thin Films - J.F. Ihlefeld, S.S. Fields, T. Cai, S.T. Jaszewski, M.D. Henry, B. Sheldon	Jon Ihlefeld
E.P.11		Ferroelectricity of Polar-axis Oriented Epitaxial (Bi, K)TiO₃ Thin Films Grown by Hydrothermal Method - H. Funakubo, R. Kubota, Y. Ito, A. Tateyama	Hiroshi Funakubo
E.P.12		Defect Chemistry, Charge Transport, Electrical Degradation, and Lifetime In KNN Films - B. Akkopru-Akgun, S. Troler-McKinstry	Betul Akkopru-Akgun

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E.P.13	Annealing Effects in BaTiO₃/Ca(Mn,Nb)O₃/SrTiO₃ Epitaxial Thin Films - S. Yasuhara, T. Hoshina, T. Tsurumi	Sou Yasuhara
E.P.14	Effects of Over-Stoichiometric Lead Compensation on Antiferroelectric Performance and Structure of PbZrO₃ Thin Films - Z. J. Beller, M.H. Haddad, N. Bassiri-Gharb	Zachary Beller
E.P.15	Electro-optic Effect in Single- and Multi-domain Pb(Zr, Ti)O₃ Thin Films - S. Kondo, T. Teranshi, A. Kishimoto, T. Nagasaki, T. Yamada	Shinya Kondo
E.P.16	Lead-Loss Compensation for Processing of Phase-Pure Perovskite PbZrO₃ Thin Films on Si Substrates - M.H. Haddad, Z.J. Beller, N. Bassiri-Gharb	Milan H. Haddad
E.P.17	Mechanical Q Factor Extraction of Sputter-grown Pb(Zr_xTi_{1-x})O₃ Epitaxial Thin Films Without Removing Substrate - Y. Shimizu, T. Yanagitani	Yuki Shimizu
E.P.18	Domain Wall Motion and its Contribution to PZT-based MEMS Actuators - F. He, M. Hejazi, S. Lee, A. Ong, S. Trolier-McKinstry	Fan He
E.P.19	Fingerprint Imaging Using GHz PbTiO₃ Epitaxial Thin Films Ultrasonic Transducer - K. Nakamura, Y. Koike, Y. Sato, T. Yanagitani	Kae Nakamura