Geoff Brennecka

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Colorado School of Mines
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Employment and Adjunct Appointments

Colorado School of Mines, Golden, CO

Metallurgical and Materials Engineering Department
Colorado Center for Advanced Ceramics
Fryrear Chair for Innovation and Excellence, 2018 - 2021
Associate Professor, 2018 - present
Assistant Professor, 2014 - 2018

Sandia National Laboratories, Albuquerque, NM

Electronic, Optical, and Nanostructured Materials Department
Principal Member of the Technical Staff, 2011 - 2014
Senior Member of the Technical Staff, 2007 - 2010
Post-Doctoral Appointee, 2006 - 2007

Adjunct Appointments

Middle Tennessee State University, *Department of Recording Arts and Technologies,* 2017 - present
Boise State University, *Department of Materials Science and Engineering,* 2013 - present
Missouri S&T, *Department of Materials Science and Engineering,* 2012 - present
New Mexico Institute of Mining and Technology, *Department of Materials Engineering,* 2013

Education

Ph.D., Materials Science and Engineering, University of Illinois at Urbana-Champaign, 2006

Advisor: Prof. David A. Payne
Dissertation: Structural Origins of Enhanced Dielectric Properties in TiO_2-Modified Ta_2O_5 Ceramics

M.S., Ceramic Engineering, University of Missouri-Rolla, 2002

Advisor: Prof. Wayne Huebner
Thesis: Stress-Induced Orientation in Chemical Solution Deposited Tetragonal PZT Thin Films

B.S., Ceramic Engineering, University of Missouri-Rolla, 2001

Graduated *Summa Cum Laude*

Awards and Honors

Dean's Excellence Award 2018
Awarded to one faculty member per year in recognition of excellence in research, teaching, and service

Selected as co-organizer of 2018 NAE Japan-America Frontiers of Engineering (JAFOE) 2018
US lead for Smart Materials and Structures focus area

Fellow of the American Ceramic Society 2017

University of Illinois MatSE Department Young Alumnus Award 2017
Awarded annually to a high-performing alumnus under the age of 40

NSF CAREER Award: Dynamic Defect Interactions in Ferroelectrics 2016
Funded out of the Ceramics program from the Division of Materials Research

Du-Co Ceramics Young Professional Award 2015
Young professional who demonstrates exceptional leadership and service to ACerS

IEEE-UFFC Ferroelectrics Young Investigator Award 2014
Selected as the top international researcher in the ferroelectrics field under the age of 40

Distinguished Ceramic Alumnus Award from the Missouri S&T MSE department 2014
Chosen by the current students and faculty

Selected to participate in the 2014 Japan-America Frontiers of Engineering Symposium 2014
Recognizes fewer than 60 top engineers from the US and Japan between the ages of 30 and 45

Karl Schwartzwalder Professional Achievement in Ceramic Engineering Award 2013
Nation's outstanding young ceramic engineer, selected by the National Institute of Ceramic Engineers

American Ceramic Society Emerging Leader Award 2010
In recognition of exemplary service to the American Ceramic Society

Courses Taught

MTGN 272 Su15, Su16, Su17, Su18
Particulate Materials Processing (Field Session) Colorado School of Mines

MTGN 298 F18, S19
The Art and Science of Glassblowing Colorado School of Mines

MTGN 412 F14, F15, F16, F17
Ceramic Engineering Colorado School of Mines

MTGN 414 S18
Ceramic Processing Colorado School of Mines

MTGN 466 S15, S18, S19
Materials Design and Synthesis (Senior Design) Colorado School of Mines

MTGN 499 S16, F16, S17, F17, F18
Independent Study Colorado School of Mines

MLGN 598 S17
Anisotropic Dielectrics Colorado School of Mines

MLGN 599 Su17
Independent Study Colorado School of Mines

MATE 301 S13
Introduction to Ceramic Engineering New Mexico Tech

Funded Projects at Mines

COUPLED: Computation Of Undiscovered Piezoelectrics and Linked Experiments for Design
NSF DMREF, $1.5M over 4 yrs, 2015 *Lead PI*

- Co-PIs: Cristian Ciobanu, Paul Constantine, Corinne Packard, Vladan Stevanovic, and Andriy Zakutayev
- Parallel high-throughput computational and experimental effort to develop new piezoelectric materials
- Includes an Industrial Advisory Board (IAB) with more than 20 member companies from 7 countries and 3 continents

Integration of High-Performance Ceramic Capacitors with Low-Cost Copper Electrodes via Advanced Kinetic Control
Colorado Office of Economic Development and International Trade, $150k over 2 yrs, 2015 *Lead PI*

- Collaboration with Pneumaticoat (now ForgeNano) to develop process to integrate advanced BT-BZT-based dielectrics with copper electrodes

CAREER: SusChem: Dynamic Defect Interactions in Ferroelectrics
NSF CAREER Award, $460k over 5 yrs, 2016 *Lead PI*

- Investigating the fundamental interactions between a variety of defects and ferroelectric domain walls
- Extending quantitative understanding of domain dynamics to high power drive conditions

Nanoparticle Capacitors for Multipoint Initiation
Army SBIR with Aegis Technology, $65k to Mines in Phases I and II, 2015-2018 *Academic PI*

- Fabricating, testing, and characterizing advanced composite multilayer ceramic capacitors (MLCCs) for pulse discharge applications
- Suggesting process modifications based on characterization and testing results

Critical Evaluation of Additive Manufacturing for Critical Ceramic Components
Honeywell National Security Campus, $45k + student for 2 yrs, 2016 *Lead PI*

- Evaluating maturity, opportunities, and limitations of additive manufacturing techniques for electrical ceramic components
- Funding amount does not include student tuition, fees, salary, and consumables, all paid directly

Dielectrics under extreme electric fields: *In situ* studies on nanoscale mechanisms
DOE BES with Iowa State University, $156k to Mines over 3 yrs, 2017 *co-PI, led by Xiaoli Tan*

- Fundamental studies of dielectric breakdown in oxide thin films
- *In situ* TEM studies with high spatial and temporal resolution

Characterization of Piezoelectric Fibers for Sensing Shock Waves from Underwater Explosions
Navy STTR with Advanced Materials and Devices, $60k to Mines in Phase I, 2018 *Academic PI*

- Evaluating commercial piezoelectric sensors for potential use as shock sensors
- Suggesting circuit modifications based on results and potentially designing/fabricating custom sensors

Setup of Machine-Guided Development of Candidate Materials for Thermionic Cooling
Lockheed Martin, $50k, 2018 *PI*

- Initial exploration of data-driven search and development of improved thermionic materials

Quantum Annealing Determination of Interaction Parameters for Improved DFT
Lockheed Martin, $50k, 2018 *PI*

- Exploration of a hybrid DFT / Quantum Annealing approach to computational materials science

Additional Funded Activities

- CSM Tech Fee, $5k for a pair of 3D printers and accessories, 2015
- MRS Foundation, $8k for a glass melter for the CSM hot glass shop, 2016
- NSF EAPSI Program, $9k for Jake Ivy to study with Prof. John Daniels at UNSW in Australia, 2016
- CSM Tech Fee, $40k for equipment to build a hot glass shop in the MME Foundry, 2016
- CSM Tech Fee, $18k for rheometer, 2016

Professional Society and Service Activities

The American Ceramic Society (ACerS):

Ceramics and Glass Industry Foundation (CGIF): Board of Directors 2018-present
Board of Directors: Member 2014-17, Finance Committee 2014-15, 16-17
Electronics Division: Chair 2016-17, other officers 2013-16; Historian 2008
Keramos: National Vice President, 2017-19
Nominating Committee: Member 2017-21
Panel of Fellows: EPDC Representative 2017-21
Order of the Engineer: Link #180 2017-present
Education Integration Committee: Chair 2012-14
National Institute of Ceramic Engineers (NICE): President 2011-12, other officers 2008-11
Education & Student Programs Presidential Advisory Committee: Co-Chair 2012
David W. Kingery Award Committee: Member 2012-13; Chair 2014
Du-Co Ceramics Young Professional Award Committee: Member 2016, Chair 2013
Arthur L. Friedberg Award Committee: Member 2011-13
Arthur Frederick Greaves-Walker Award Committee: Member 2013-16
Helped ACerS launch the **Young Professionals Network (YPN)** in 2009
Co-founded the ACerS **President's Council of Student Advisors** in 2008; served as Mentor ever since
Chair of the ACerS/NICE Student Congress (precursor to PCSA) in 2000

IEEE:

Member of Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC)
UFFC Administrative Committee (AdCom): Elected member, 2014-17
UFFC AdCom Education Committee: 2015-17, Chair 2016-17
Ferroelectrics Committee (FerroCom): Elected member, 2011-present
FerroCom Awards Committee: Chair, 2017-present
FerroCom Education Committee: Chair, 2016-2017
FerroCom Technical Programming Chair: Processing, 2013-present
Elevated to Senior Member in 2011
Member of Nuclear and Plasma Sciences Society (NPSS)
Member of Power Electronics Society (PELS)
Member of Dielectrics and Electrical Insulation Society (DEIS)

Colorado School of Mines:

MME ABET visit coordinator and self-study author, 2018
Graduate Council, 2015-19
MME Assessment Committee, 2014-18, Chair 2016-19; head of curriculum review, 2015-18

MME Undergraduate Affairs Committee, 2015-19
REMRSEC Facilities Committee, 2018-19
Materials Science Graduate Admissions Committee, 2015-19
CASE Graduate Student Recruitment Committee, 2016-19
MME and Materials Science Graduate Student Recruitment Coordinator, 2014-19
MME Graduate Affairs Committee, 2014-15
MME Search Committee for EM lab manager, 2014-15
MME Search Committee for junior faculty, 2014-15
Fulbright student application review committee, 2014-15
Research Council, 2014

Materials Research Society (MRS): Active member since 2003

American Society for Engineering Education (ASEE): Active member since 2016

American Association for the Advancement of Science (AAAS): Active member since 2017

Thesis Examiner for the Dept. of Materials Science and Engineering at the Univ. of New South Wales, Australia, 2016

Alumni Board for the Dept. of Materials Science and Engineering at the Univ. of Illinois, 2012-18

Industrial Advisory Board for the Center for Dielectrics and Piezoelectrics (NSF I/UCRC), 2012-14

Conferences and Symposia Organized

IEEE Joint IFCS-ISAF (International Frequency Control Symposium - International Symposium on Applications of Ferroelectrics) 2020
Co-lead organizer of entire meeting (ISAF lead) Keystone, CO

19th US-Japan Seminar on Advanced Dielectrics and Piezoelectrics 2019
Technical Chair Tsukuba, Japan

F^{2}cπ^2 Joint Conference 2019
IEEE ISAF Chair Lausanne, Switzerland

10th International Conference on Materials for Advanced Technologies 2019
Co-organizer, Polarization-crucial Materials for Sensing, Transduction, & Energy Singapore

21st International Conference on Ternary and Multinary Compounds 2018
Overall co-organizer Boulder, CO

NAE Japan-America Frontiers of Engineering 2018
Co-organizer of Smart Materials and Structures track Tsukuba, Japan

14th International Ceramics Congress 2018
International Advisory Board Perugia, Italy

National Academies, Decadal Review of Materials Science 2017
Lead on-site organizer Golden, CO

18th US-Japan Seminar on Advanced Dielectrics and Piezoelectrics 2017
Technical Programming Chair Santa Fe, NM

NSF Professional Development Workshop in Ceramics 2017
Lead organizer of entire meeting Waikaloa, HI

Electronic Materials and Applications 2017
Lead organizer of entire meeting Orlando, FL

5G Materials for the Millimeter Wave Revolution 2017-19
Electronic Materials and Applications Orlando, FL

IEEE ISAF-ECAPD-PFM Joint Meeting 2016
Processing lead for the Technical Programming Committee for ISAF Darmstadt, Germany

IEEE Future Directions *Smart Materials Initiative* Workshop 2016
Lead organizer Golden, CO

Electronic Materials and Applications 2015
Co-organizer of entire meeting Orlando, FL

International Symposium for the Application of Ferroelectrics, ISAF 2015
Processing lead for the Technical Programming Committee for ISAF Biopolis, Singapore

Advanced Solution and Colloidal Processing for Ceramics 2014
MS&T 2014 Pittsburgh, PA

Solution Proc. & Prop. of Funct. Oxide Thin Films & Nanostructures 2014
Spring EMRS Lille, France

Solution-Based Processing for Ceramic Materials 2013
MS&T 2013 Montreal, QC, Canada

IEEE UFFC Joint Meeting, ISAF 2013
Processing lead for the Technical Programming Committee for ISAF Prague, Czech Republic

Production Quality Ferroelectric Thin Films and Devices 2013
Electronic Materials and Applications Orlando, FL

Failure: The Greatest Teacher 2013-19
Electronic Materials and Applications Orlando, FL

Solution-Based Processing for Ceramic Materials 2012
MS&T 2012 Pittsburgh, PA

Education and Student Programs Thrust Leader 2012
Materials Challenges for Alternative and Renewable Energy Clearwater, FL

Solution-Based Processing for Ceramic Materials 2011
MS&T 2011 Columbus, OH

Nano Phenomena & Surface, Interfacial Effects in Electronic Ceramics 2010, 2011
Electronic Materials and Applications Orlando, FL

Highlights of Student Research in Basic Science & Electronic Ceramics 2011-14
Electronic Materials and Applications Orlando, FL

The Future of Electronic Ceramics: A New Investigator Symposium 2010
Electronic Materials and Applications Orlando, FL

Rio Grande Symposium on Advanced Materials 2009-13
co-organizer 2009-11, 2013; lead organizer in 2012 Albuquerque, NM

17$^{\text{th}}$ International Symposium on the Applications of Ferroelectrics & 2008 Meeting of the Electronics Div. of the American Ceramic Society 2008
co-organizer of entire meeting Santa Fe, NM

Editorial and Peer-Review Activities

Editor for the *Journal of the American Ceramic Society* 2017-present

Associate Editor for the *Journal of the American Ceramic Society* 2010-present

Associate Editor for the *Journal of Electronic Materials* 2013-15

Associate Editor for a Special Issue of the *Transactions of the IEEE-UFFC* 2010

Editor for *Ceramic Transactions v249 and v252, Processing and Properties of Advanced Ceramics and Composites VI and VII*

Peer Reviewer for >30 journals including *Adv. Mater.*, *Phys. Rev. Lett.*, *Appl. Phys. Lett.*, *J. Appl. Phys.*, *J. Am. Ceram. Soc.*, *J. Am. Chem. Soc.*, *J. Mater. Res.*, *Acta Mater.*, and *ACS Nano*

Refereed Publications (h index = 17), <*per-article citations to date*>

49. S. Manna, P. Gorai, G.L. Brennecka, C. Ciobanu, and V. Stevanović, "Large Piezoelectric Response of van der Waals Layered Solids," *J. Mater. Chem. C*, **6** 11035-44 (2018). doi <1>

48. K.R. Talley, S.L. Millican, J. Mangum, S. Siol, C.B. Musgrave, B. Gorman, A.M. Holder, A. Zakutayev, and G.L. Brennecka, "Implications of Heterostructural Alloying for Enhanced Piezoelectric Performance of (Al,Sc)N," *Phys. Rev. Mater.* **2**[6] 063802 (2018). doi

47. D. Wu, Y. Chen, S. Manna, K. Talley, A. Zakutayev, C.V. Ciobanu, P. Constantine, G.L. Brennecka, and C.E. Packard, "Effects of composition and phase on elastic modulus in (Al,Sc)N thin films with efficient removal of substrate effects," *IEEE trans. UFFC* , **65**[11] 2167-75 (2018). doi

46. C.-F. Chen, G.L. Brennecka, R.A. Synowicki, E.L. Tegmeier, M.J. Brand, J. Montalvo, J. Ivy, N. Cherepy, Z.M. Seely, and S.A. Payne, "Transparent Polycrystalline $Gd_2Hf_2O_7$ Ceramics," *J. Am. Ceram. Soc.*, **101**[9], 3797-3807 (2018). doi

45. S. Manna, K.R. Talley, A. Zakutayev, P. Gorai, G.L. Brennecka, V. Stevanović, and C.V. Ciobanu, "Enhanced piezoelectric response of AlN via CrN alloying," *Phys. Rev. Appl.*, **9** 034026 (2018). doi <1>

44. C.-F. Chen, R.A. Synowicki, M.J. Brand, E.L. Tegtmeier, J.D. Montalvo, J. Ivy, G.L. Brennecka, Z. Seeley, N.J. Cherepy, and S.A. Payne, "Processing and Characteristics of Transparent Gd_3TaO_7 Polycrystalline Ceramics," *J. Am. Ceram. Soc.*, **101**[5] 1847-56 (2017). doi <1>

43. S. Manna, G.L. Brennecka, V. Stevanovic, and C.V. Ciobanu, "Tuning the piezoelectric and mechanical properties of the AlN system via alloying with YN and BN," **highlighted as *SciLight* and *Editor's Pick***, *J. Appl. Phys.*, **122** 105101 (2017). doi <3>

42. B.M. Foley, E.A. Paisley, C.B. DiAntonio, T. Chavez, M.A. Blea-Kirby, G.L. Brennecka, J.T. Gaskins, J.F. Ihlefeld, and P.E. Hopkins, "Phonon Scattering Mechanisms Dictating the Thermal Conductivity of Lead Zirconate Titanate ($PbZr_{1-x}Ti_xO_3$) Thin Films Across the Compositional Phase Diagram," **highlighted as *Editor's Pick***, *J. Appl. Phys.*, **121**, 205104 (2017). doi <2>

41. C.-F. Chen, G.L. Brennecka, G. King, E.L. Tegtmeier, T. Holesinger, J. Ivy, and P. Yang, "Processing of crack-free high density polycrystalline $LiTaO_3$ ceramics," *J. Mater. Sci: Mater. Electron.*, **28**, 3725-32 (2016). doi <1>

40. M. Beuerlein, N. Kumar, T.-M. Usher, H.J. Brown-Shaklee, N. Raengthon, D.P. Cann, J.L. Jones, I. Reaney, and G.L. Brennecka, "Current Understanding of Structure-Processing-Property Relationships in $BaTiO_3$-Bi(M)O_3 Dielectrics," **Invited Feature Article with Cover Art**, *J. Am. Ceram. Soc.*, **99**[9], 2849-70 (2016). doi <22>

39. W. Meier, K.E. Meyer, D.F. Sava Gallis, M.A. Blea-Kirby, J.R. Roth, D. Felman, T. Breuer, G.J. Denison, F.J. Zutavern, W. Huebner, and G.L. Brennecka, "Highly Textured $BaTiO_3$ via Templated Grain Growth and Resulting Polarization Reversal Dynamics," *J. Am. Ceram. Soc.*, **99**[3], 922-929 (2016). doi <7>

38. M.C. George, M.A. Rodriguez, M.S. Kent, G.L. Brennecka, and P.E. Hopkins, "Thermal conductivity of self-assembling symmetric poly(styrene)-block-poly(methyl methacrylate) thin films," *J. Heat Trans.*, **138**, 024505 (2015). doi <5>

37. J.L. Jones, J.M. LeBeau, J. Nikkel, A. Oni, H. Dycus, C. Cozzan, F.-Y. Lin, A. Chernatynskiy, J.C. Nino, S. Sinnott, S. Mhin, G.L. Brennecka, and J.F. Ihlefeld, "Combined experimental and computational methods reveal the evolution of buried interfaces during synthesis of ferroelectric thin films," *Adv. Mater. Interf.*, **2**[10], 2196 (2015). doi <8>

36. C.D. Landon, R.H.T. Wilke, M.T. Brumbach, G.L. Brennecka, M.A. Blea-Kirby, J.F. Ihlefeld, M. Marinella, and T.E. Beechem, "Thermal Transport in Tantalum Oxide Films for Memristive Applications," *Appl. Phys. Lett.*, **107**, 023108 (2015). doi <7>

35. J.F. Ihlefeld, P.G. Kotula, B.D. Gauntt, D. Gough, G.L. Brennecka, P. Lu, and E.D. Spoerke, "Solution chemistry, substrate, and processing effects on chemical homogeneity in lead zirconate titanate thin films," *J. Am. Ceram. Soc.*, **98**[7], 2028-2038 (2015). doi <7>

34. A. Henriques, J.T. Graham, S. Landsberger, J.F. Ihlefeld, G.L. Brennecka, D.W. Brown, J.S. Forrester, and J.L. Jones, "Crystallographic changes in lead zirconate titanate due to neutron irradiation," *AIP Advances*, **4** 117125 (2014). doi <6>

33. R. Kirchhofer, D.R. Diercks, B.P. Gorman, J.F. Ihlefeld, P.G. Kotula, C.T. Shelton, and G.L. Brennecka, "Quantifying Compositional Homogeneity in $Pb(Zr,Ti)O_3$ Using Atom Probe Tomography," **Invited Feature Article with Cover Art**, *J. Am. Ceram. Soc.*, **97**[9] 2677-97 (2014). doi <19>

32. N. Triamnak, G.L. Brennecka, H.J. Brown-Shaklee, M.A. Rodriguez, and D.P. Cann, "Phase formation of $BaTiO_3$ - $Bi(Zn_{1/2}Ti_{1/2})O_3$ perovskite ceramics," *J. Ceram. Soc. Jpn.*, **122**[4] 260-266 (2014). doi <16>

31. S. Mhin, K. Nittala, J. Lee, D.S. Robinson, J.F. Ihlefeld, G.L. Brennecka, L.M. Sanchez, R.G. Polcawich, and J.L. Jones, "Phase and Texture Evolution in Chemically Derived PZT Thin Films on Pt Substrates," *J. Am. Ceram. Soc.*, **97**[9] 2973-9 (2014). doi <8>

30. R.J. Bondi, M.P. Desjarlais, A.P. Thompson, G.L. Brennecka, and M.J. Marinella, "Electrical Conductivity in Oxygen-Deficient Phases of Tantalum Pentoxide from First-Principles Calculations," *J. Appl. Phys.*, **114** 203701 (2013). doi <26>

29. R. Kirchhofer, D.R. Diercks, B.P. Gorman, and G.L. Brennecka, "Atomic scale composition profiling of ferroelectrics via laser-pulsed atom probe tomography and cross-correlative transmission electron microscopy," *Microscopy and Microanalysis* 19(S2), 980-1 (2013). doi <3>

28. N.W. Moore, H.J. Brown-Shaklee, M.A. Rodriguez, and G.L. Brennecka, "Optical anisotropy near the relaxor-ferroelectric phase transition in lanthanum lead zirconate titanate," *J. Appl. Phys.*, **114** 053515 (2013). doi <4>

27. S. Mhin, C. Cozzan, J.L. Jones, K. Nittala, P. Wanninkhof, J.F. Ihlefeld, and G.L. Brennecka, "Effect of Switching Atmospheric Conditions During Crystallization on the Phase Evolution of Solution-Derived Lead Zirconate Titanate Thin Films," *J. Am. Ceram. Soc.*, **96**[9] 2706-2709 (2013). doi <7>

26. K. Nittala, S. Mhin, K.M. Dunnigan, D.S. Robinson, J.F. Ihlefeld, P.G. Kotula, G.L. Brennecka, and J.L. Jones, "Phase and texture evolution in solution deposited lead zirconate titanate thin films: Formation and role of the Pt_3Pb intermetallic phase," *J. Appl. Phys.*, **113** 244101 (2013). doi <18>

25. L.J. Small, M.T. Brumbach, C.A. Apblett, J.F. Ihlefeld, G.L. Brennecka, and D.J. Duquette, "On the Degradation Processes of Thin Film PZT in 0.1 N H_2SO_4," *J. Electrochem. Soc.*, **160**[3] C128-c135 (2013). doi <1>

24. J.T. Graham, G.L. Brennecka, P. Ferreira, L.J. Small, D. Duquette, C.A. Apblett, S. Landsberger, and J.F. Ihlefeld, "Neutron irradiation effects on domain wall mobility and reversibility in lead zirconate titanate thin films," *J. Appl. Phys.*, **113**, 124104 (2013). doi <20>

23. N. Raengthon, H.J. Brown-Shaklee, G.L. Brennecka, and D.P. Cann, "Dielectric Properties of $BaTiO_3$ - $Bi(Zn_{1/2}Ti_{1/2})O_3$ - $NaNbO_3$ Solid Solutions," *J. Mater. Sci.*, **48**, 031401 (2012). doi <27>

22. N. Raengthon, V.J. DeRose, G.L. Brennecka, and D.P. Cann, "Defect Mechanisms in High Resistivity $BaTiO_3$ - $Bi(Zn_{0.5}Ti_{0.5})O_3$ Ceramics," *Appl. Phys. Lett.*, **101**, 112904 (2012). doi <22>

21. K. Nittala, S. Mhin, J.L. Jones, D.S. Robinson, J.F. Ihlefeld, and G.L. Brennecka, "*In situ* X-ray diffraction of solution-derived ferroelectric thin films for quantitative phase and texture evolution measurement," *J. Appl. Phys.*, **112**, 104109 (2012). doi <11>

20. C.T. Shelton, P.G. Kotula, G.L. Brennecka, P.G. Lam, K.E. Meyer, J.-P. Maria, B.J. Gibbons, and J.F. Ihlefeld, "Chemically Homogeneous Complex Oxide Thin Films Via Improved Substrate Metallization," **Featured on the Journal Cover**, *Adv. Funct. Mater.*, **22**[11] 2295-2302 (2012). doi <56>

19. L.J. Small, C.A. Apblett, J.F. Ihlefeld, G.L. Brennecka, and D. Duquette, "Electrochemical Response of Ferroelectric $PbZr_{0.52}Ti_{0.48}O_3$ Thin Films," *J. Electrochem. Soc.*, **159** [8], C357-C363 (2012). doi <3>

18. C.-F. Chen, A. Llobert, G.L. Brennecka, R.T. Forsyth, D.R. Guidry, P.A. Papin, and R.J. McCabe, "Powder Synthesis and Hot-Pressing of a $LiTaO_3$ Ceramic," *J. Am. Ceram. Soc.*, **95** [9], 2820-6 (2012). doi <6>

17. L.J. Small, A. Cook, C.A. Apblett, J.F. Ihlefeld, G.L. Brennecka, and D. Duquette, "An Automated Electrochemical Probe for Evaluation of Thin Films," *J. Electrochem. Soc.*, **159**[4] F87-F90 (2012). doi <5>

16. K. Nittala, G.L. Brennecka, B.A. Tuttle and J.L. Jones, "Phase evolution in solution deposited Pb deficient PLZT thin films," *J. Mater. Sci.*, **46**[7], 2148-54 (2011). doi <13>

15. J. Graham, S. Landsberger, P.J. Ferreira, J.F. Ihlefeld, and G.L. Brennecka, "Neutron flux characterization techniques for radiation effects studies," *J. Radioanal. Nucl. Chem.*, **291**[2] 503-7 (2012). doi <7>

14. J.F. Ihlefeld, S.H. Baek, C.M. Folkman, J.F. Carroll III, G.L. Brennecka and C.-B. Eom, "Effect of domain structure on dielectric nonlinearity in epitaxial $BiFeO_3$ films," *Appl. Phys. Lett.*, **97** 262904 (2011). doi <22>

13. G.L. Brennecka, J.F. Ihlefeld, J.-P. Maria, B.A. Tuttle and P.G. Clem, "Processing Technologies for High Permittivity Thin Films in Capacitor Applications," **Invited Feature Article with Cover Art**, *J. Am. Ceram. Soc.,* **93**[12] 3935-54 (2010). doi <99>

12. G.L. Brennecka, C.M. Parish, B.A. Tuttle, and L.N. Brewer, "Reversibility of the Perovskite-to-Fluorite Phase Transformation in Lead-Based Thin and Ultrathin Films," *Adv. Mater.*, **20**[8] 1407-11(2008). doi <62>

11. J. Sigman, G.L. Brennecka, P.G. Clem, and B.A. Tuttle, "Advances in the Fabrication of Perovskite Based High-Value Integrated Capacitors by Chemical Solution Deposition," *J. Am. Ceram. Soc.*, **91**[6] 1851-7 (2008). doi <54>

10. C.M. Parish, G.L. Brennecka, B.A. Tuttle, and L.N. Brewer, "Quantitative X-ray Spectrum Imaging of Lead Lanthanum Zirconate Titanate PLZT Thin-Films," *J. Am. Ceram. Soc.*, 91[11] 3690-7 (2008). doi <33>

9. C.M. Parish, G.L. Brennecka, B.A. Tuttle, and L.N. Brewer, "Quantitative Chemical Analysis of Fluorite-to-Perovskite Transformations in (Pb,La)(Zr,Ti)O_3," *J. Mater. Res.*, 23[11] 2944-53 (2008). doi <10>

8. G.L. Brennecka, C.M. Parish, B.A. Tuttle, and L.N. Brewer, "Multilayer Thin and Ultrathin Film Capacitors Fabricated by Chemical Solution Deposition," *J. Mater. Res.*, **23**[1] 176-81 (2008). doi <26>

7. G.L. Brennecka and D.A. Payne, "Densification and Grain Growth for Powder-Derived Ta_2O_5–TiO_2 Ceramics," *J. Ceram. Soc. Jpn.*, **115**[10] 678-82 (2007). **Featured on front cover.** doi

6. G.L. Brennecka and B.A. Tuttle, "Fabrication of Ultrathin Film Capacitors by Chemical Solution Deposition," *J. Mater. Res.*, **22**[10] 2868-74 (2007). doi <44>

5. G.L. Brennecka, D.A. Payne, H. Hellwig, P. Sarin and W.M. Kriven, "Phase transformations in the High Temperature Form of Pure and TiO_2-stabilized Ta_2O_5," *J. Am. Ceram. Soc.*, **90**[9] 2947-53 (2007). doi <15>

4. G.L. Brennecka and D.A. Payne, "Preparation of dense Ta_2O_5-based ceramics by a coated-powder method for enhanced dielectric properties," *J. Am. Ceram. Soc.*, **89**[7] 2089-95 (2006). doi <11>

3. G.L. Brennecka, W. Huebner, B.A. Tuttle and P.G. Clem. "Use of stress to orient tetragonal (40/60) PZT thin films and resulting electrical properties," *J. Am. Ceram. Soc.*, **87**[8] 1459-65 (2004). doi <51>

2. P.G. Clem, N.S. Bell, G.L. Brennecka, B.H. King and D.B. Dimos, "Micropen printing of electronic components," p229-59 in *Direct Write Methods for Rapid Prototyping and Sensors.* Edited by A. Pique and D. B. Chrisey. Academic Press, San Diego, 2002. doi <6>

1. T.J. Boyle, P.G. Clem, B.A. Tuttle, G.L. Brennecka, J.T. Dawley, M.A. Rodriguez, T.D. Dunbar and W.F. Hammetter, "Lanthanide series doping effects in lead zirconate titanate (PLnZT) thin films," *J. Mater. Res.*, **17**[4] 871-8 (2002). doi <33>

Patents and Applications

4. S. Manna, G.L. Brennecka, V. Stevanovic, and C.V. Ciobanu, "Tuning the Piezoelectric and Mechanical Properties of the AlN System via Alloying with YN and BN," United States Provisional Patent Application #16/158,826 (2018).

3. G.L. Brennecka, S.F. Glover, G.E. Pena, and F.J. Zutavern, "Ferroelectric Opening Switch," United States Provisional Patent Application #15137539 (2016).

2. G.L. Brennecka, H.J. Brown-Shaklee, D.P. Cann, N. Raengthon, and N. Kumar, "Thermally Stable High Performance Dielectrics," United States Patent Application #0071646 A1 (2016).

1. J.C. Neely, J. Flicker, S.F. Glover, and G.L. Brennecka "Low-Inductance Direct Current Power Bus," United States Patent #10,084,310 B1 (2018).

Conference Proceedings and Other Publications

33. J.M. Ivy and G.L. Brennecka, "Templated Grain Growth of Prototype Ferroelectrics for Fundamental Domain Dynamics Studies," Proceedings of the 18th US-Japan Seminar on Advanced Dielectrics and Piezoelectrics, Santa Fe, NM (2017).

32. K.R. Talley, S. Manna, A. Zakutayev, C. Packard, C. Ciobanu, and G.L. Brennecka, "Combinatorial Studies on the Effect of Boron Addition to the Aluminum-Scandium Nitride System," Proceedings of the 18th US-Japan Seminar on Advanced Dielectrics and Piezoelectrics, Santa Fe, NM (2017).

31. B.M. Cox, J.S. Pelz, and G.L. Brennecka, "Critical Evaluation of Multi-Material Additively Manufactured TiO_2 and $BaTiO_3$ Electrical Ceramics for Functionally Graded Materials Applications," Proceedings of the 13th International Conference and Exhibition on Ceramic Interconnect and Ceramic Microsystems Technologies, co-organized by the International Microelectronics and Packaging Society (IMAPS) and the American Ceramic Society (ACerS), Tsukuba, Japan (2017).

30. M. Kuzara, A. Mattern, D. Hoook, and G.L. Brennecka, "Importance of Reaction Pathways in Microstructure Development of xBi($Zn_{0.5}Ti_{0.5}$)O_3-*(1-x)*$BaTiO_3$ Ceramics", Proceedings of the 17th US-Japan Seminar on Advanced Dielectrics and Piezoelectrics, Matsumoto, Japan (2015).

29. G.L. Brennecka, B. Winchester, "Simulation Studies of Nucleation of Ferroelectric Polarization Reversal," SAND2014-16529 (2014).

28. G.L. Brennecka, "For materials world, and those in it, the future looks bright," *Am. Ceram. Soc. Bull.*, **93**[2] 14-15 (2014).

27. G.L. Brennecka, F.J. Zutavern, G.J. Dension, G.E. Peña, S.F. Glover, M.B. Sinclair, and M.A. Blea-Kirby, "Controlled Polarization Reversal for Ferroelectric Opening Switches," SAND2013-10422 (2013).

26. G.L. Brennecka, H.J. Brown-Shaklee, N. Raengthon, M.A. Blea-Kirby, and D.P. Cann, "Capacitor Development for Reliable High Temperature Operation in Inverter Applications," Proceedings of the Electrical Energy Storage Applications and Technologies (EESAT) international conference, San Diego, CA (2013).

25. H.J. Brown-Shaklee, J.J. Borchardt, N. Raengthon, D.P. Cann, and G.L. Brennecka, "Pulse discharge behavior of relaxor dielectric multilayer ceramic capacitors," Proceedings of the 16th US-Japan Seminar on Dielectric and Piezoelectric Materials, Raleigh, NC (2013).

24. D.P. Cann, N. Raengthon, H.J. Brown-Shaklee, and G.L. Brennecka, "$BaTiO_3$-Bi($Zn_{1/2}Ti_{1/2}$)O_3 Relaxor Materials for Advanced Capacitor Applications," Proceedings of the 16th US-Japan Seminar on Dielectric and Piezoelectric Materials, Raleigh, NC (2013).

23. J.F. Ihlefeld, P.G. Kotula, B. Gauntt, D.V. Gough, G.L. Brennecka, B.B. McKenzie, A. Allen, M.A. Blea-Kirby, H.J. Brown-Shaklee, and E.D. Spoerke, "Substrate and Solution Chemistry Effects on Chemical Homogeneity in $PbZr_{0.52}Ti_{0.48}O_3$ Thin Films on Platinized Silicon Substrates," Proceedings of the 16th US-Japan Seminar on Dielectric and Piezoelectric Materials, Raleigh, NC (2013).

22. R. Kirchhofer, D. R. Diercks, B. P. Gorman, and G. Brennecka,"Atomic Scale Composition Profiling of Ferroelectrics via Laser-Pulsed Atom Probe Tomography and Cross-correlative Transmission Electron Microscopy," *Microsc. Microanal.*, **S2** (2013).

21. F.J. Zutavern, G.L. Brennecka, S.F. Glover, G.E. Pena, G.J. Dension, and J.M. Rudys, "A Testbed for High Voltage, High Bandwidth Characterization of Nonlinear Dielectrics," *Proceedings of the 19th IEEE Pulsed Power Conference*, San Francisco, CA (2013).

20. N.W. Moore and G.L. Brennecka, "Optical Properties of PZT Ferroelectrics through Thermally-Driven Phase Transformations," SAND2013-5228 (2013).

19. M.S. Kent, J.G. Cordaro, G.L. Brennecka, and M.C. George, "Triblock polymers for nanoporous membranes: Characterization of phase behavior," SAND2012-10859 (2012).

18. J.F. Ihlefeld, G.L. Brennecka, L.J. Small, C.A. Apblett, B.A. Tuttle, P. Mahoney, J.L. Jones, K. Nittala, S.W. Mhin, K. Dunnigan, D. Duquette, S. Calabrese, S. Landsberger, P. Ferreira, J. Graham, and D.S. Robinson, "Enabling Self-Powered Ferroelectric Nanosensors: Fundamental Science of Interfacial Effects Under Extreme Conditions", SAND2012-7797 (2012).

17. G.L. Brennecka and K. Fox, "Back to School: Revived EIC boosts Society's education efforts," *Am. Ceram. Soc. Bull.*, **92**[2] 14 (2013).

16. D.B. Burckel, C.-Y.P. Yang, E.L. Yang, C.A. Steinhaus, and G.L. Brennecka, "Integration of Block-Copolymer with Nano-Imprint Lithography: Pushing the Boundaries of Emerging Nano-Patterning Technology," SAND2012-8414 (2012).

15. J.T. Graham, S. Landsberger and G.L. Brennecka, "Ferroelectric Changes in Neutron Irradiated Lead Zirconate Titanate," *Trans. Am. Nucl. Soc.*, **104**, 241-2 (2011).

14. G.L. Brennecka, K.E. Meyer, Y.H. Jeon, D. Shahin, H.J. Brown-Shaklee, B. Gibbons, and J.F. Ihlefeld, "Minimizing Voltage Tuning for Enhanced High Field Energy Storage," Proceedings of the 15$^{\text{th}}$ US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Kagoshima, Japan (2011).

13. J.F. Ihlefeld, C.T. Shelton, P.G. Kotula, G.L. Brennecka, P.G. Lam, K.E. Meyer, J.P. Maria, and B. Gibbons, "Chemically Homogeneous Ferroelectric Thin Films via Improved Substrate Metallization," Proceedings of the 15$^{\text{th}}$ US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Kagoshima, Japan (2011).

12. G.L. Brennecka and B. Fahrenholtz, "Replace yourself: Some student advisors' perspectives on ceramic education," *Am. Ceram. Soc. Bull.*, **89**[5] 35 (2010).

11. G.L. Brennecka, B.A. Tuttle, J. Stevens, A. Gin, and D. Scrymgeour, "Nanopatterned Ferroelectrics for Ultrahigh Density Rad-Hard Nonvolatile Memories," SAND2010-7085 (2010).

10. K. Reed, J. Rudys, G. Pena, S. Glover, G. Brennecka, and B. Tuttle, "Ferroelectric Opening Switches for Large Scale Pulsed Power Drivers" SAND2009-7527 (2009).

9. G.L. Brennecka, C.M. Parish, J.L. Jones, B.A. Tuttle, J.S. Wheeler, and J.G. Ekerdt, "Chemical, Phase, and Interface Effects in Solution-Based Fabrication of Ferroelectric Thin Film Capacitors," Proceedings of the 14$^{\text{th}}$ US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Welches, OR (2009).

8. G.L. Brennecka, C.M. Parish, D.A. Scrymgeour, B.A. Tuttle, L.N. Brewer and J.G. Ekerdt, "Micro- and nano-patterning of solution-derived functional electronic ceramics," *Microscopy and Microanalysis*, **14** [suppl. 2] 1432-33 (2008).

7. C.M. Parish, G.L. Brennecka, B.A. Tuttle and L.N. Brewer, "Quantitative STEM-EDS spectrum imaging of phase transformations in (Pb,La)(Zr,Ti)O_3," *Microscopy and Microanalysis*, **14** [suppl. 2] 1434-35 (2008).

6. G.L. Brennecka, C.M. Parish, B.A. Tuttle, M.A. Rodriguez, L.N. Brewer and J.S. Wheeler, "Recent Advances in the Fabrication of Solution-Derived Thin and Ultrathin Multilayer Capacitors," *IEEE Internat. Symp. Appl. Ferroelec. (ISAF)*. Santa Fe, NM (2008).

5. J. Sigman, P.G. Clem, G.L. Brennecka and B.A. Tuttle, "Fabrication of (Ba,Sr)TiO_3 high-value integrated capacitors by chemical solution deposition," *IEEE Internat. Symp. Appl. Ferroelec. (ISAF)*. Santa Fe, NM (2008).

4. G.L. Brennecka, B.A. Tuttle, C.M. Parish, L.N. Brewer, B.B. McKenzie, and M.A. Rodriguez, "Fabrication of Ultrathin Integrated Multilayer Capacitors by Chemical Solution Deposition," Proceedings of the 13$^{\text{th}}$ US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Awaji City, Hyogo, Japan (2007).

3. G.L. Brennecka and D.A. Payne, "Densification and grain growth in powder-derived Ta_2O_5-based dielectrics," *Proc. of the 9^{th} International Ceramic Processing Science Symposium.* Coral Gables, FL (2006).

2. B.A. Tuttle, G.L. Brennecka, D.P. Williams, M.A. Rodriguez, T.J. Headley and J.S. Wheeler, "High energy density PLZT thin film capacitors"; *Ceramic Transactions, v162, Advanced Dielectric, Piezoelectric, and Ferroelectric Thin Films.* Proc. of the 106^{th} Annual Meeting of the American Ceramic Society, p.17-25 (2005).

1. D.A. Payne, G.L. Brennecka, D.L. West and J.U. Knickerbocker, "Processing of textured ceramics for electrical applications," p199-207 in *Processing of Electroceramics.* Edited by M. Kosec, D. Kuscer and B. Malic. Jozef Stefan Institut, 2003.

Invited Conference Talks

31. G.L. Brennecka "*Insert cliché here...*: Extracting Needles of Useful Guidance from Haystacks of Career Advice," Invited talk at the Fall Meeting of the Materials Research Society, Boston, MA (2018).

30. G.L. Brennecka "Computationally-Guided Development of Improved Nitride Piezoelectrics," Invited talk at the 2018 ISAF-FMA-AMF-AMEC-PFM Joint Conference, Hiroshima, Japan (2018).

29. G.L. Brennecka "DMREF: COUPLED: Computation of Undiscovered Piezoelectrics and Linked Experiments for Design," Invited talk at the 2018 Materials Genome Initiative Principal Investigators Meeting, College Park, MD (2018).

28. G.L. Brennecka "Combinatorial studies of the aluminum- scandium-boron nitride system," Invited talk at the 2018 PiezoMEMS Workshop, Orlando, FL (2018).

27. G.L. Brennecka, "Templated Grain Growth of Prototype Ferroelectrics for Fundamental Domain Dynamics Studies," Invited talk at the 18^{th} US-Japan Seminar on Advanced Dielectrics and Piezoelectrics, Santa Fe, NM (2017).

26. G.L. Brennecka, "Computationally Guided Development of Nitride Piezoelectrics," Invited talk at the Center for Dielectrics and Piezoelectrics Fall 2017 Meeting, Albuquerque, NM (2017).

25. G.L. Brennecka and M.A. Beuerlein, "Processing and Base-Metal Integration of Bi(M)O_3-$BaTiO_3$ Dielectrics," Invited talk at the 12^{th} Pacific Rim Conference on Ceramic and Glass Technology (PacRim 12), Waikoloa, HI (2017).

24. G.L. Brennecka, "Processing and Integration Science of Capacitors Based on Bi(M)O_3-$BaTiO_3$ Dielectrics for High Field and/or High Temperature Operation," Invited talk at the International Conference on Advanced Ceramics and Composites, Daytona Beach, FL (2017).

23. G.L. Brennecka, "Ferroelectric Domain Wall Dynamics Under High Power Drive Conditions," Invited talk at the 53^{rd} Annual Technical Meeting of the Society of Engineering Science, College Park, MD (2016).

22. G.L. Brennecka, "Functional Complex Oxide Thin Films for Integrated Dielectric and Piezoelectric Applications," Invited talk at the Fall meeting of the European Materials Research Society, Warsaw, Poland (2016).

21. G.L. Brennecka, "Chemical heterogeneity in electroceramics: the good, the bad, and the difficult to characterize!", Invited talk at Composites at Lake Louise, Lake Louse, Alberta, CA (2015).

20. G.L. Brennecka, "Importance of Reaction Pathways in Microstructure Development of xBi($Zn_{0.5}Ti_{0.5}$)O_3-*(1-x)*$BaTiO_3$ Ceramics", Invited talk at the 17th US-Japan Seminar on Advanced Dielectrics and Piezoelectrics, Matsumoto, Japan (2015).

19. G.L. Brennecka, "Capacitor Development for Reliable High Temperature Operation in Inverter Applications," Keynote address of the *Advances in Polar, Magnetic and Semiconductor Materials: Extending Temperature Limits* Symposium of Materials Science and Technology (MS&T'15), Columbus, OH (2015).

18. G.L. Brennecka, H.J. Brown-Shaklee, N. Raengthon, N. Triamnak, D.P. Cann, M.A. Blea-Kirby, and S.Atcitty, "Capacitor Development for Reliable High Temperature Operation in Inverter Applications," Presented at MS&T'14, Pittsburgh, PA (2014).

17. G.L. Brennecka, H.J. Brown-Shaklee, N. Raengthon, N. Triamnak, D.P. Cann, and S. Atcitty, "Capacitor Development for Reliable High Temperature Operation in Inverter Applications," Presented at the TMS Spring Meeting, San Diego, CA (2014).

16. G.L. Brennecka, H.J. Brown-Shaklee, J.J. Borchardt, N. Raengthon, and D.P. Cann, "Pulse discharge behavior of relaxor dielectric multilayer ceramic capacitors," Presented at the 16th US-Japan Seminar on Dielectric and Piezoelectric Materials, Raleigh, NC (2013).

15. G.L. Brennecka, J.F. Ihlefeld, K. Nittala, K.E. Meyer, C.T. Shelton, L.J. Small, and J.L. Jones, "Chemical and Thermal Effects on Phase Evolution and Cation Gradients in Solution-Derived Thin Film Ferroelectrics," Presented at the International Symposium on Integrated Functionalities, Grapevine, TX (2013).

14. G.L. Brennecka and J.F. Ihlefeld, "Chemical and Thermal Effects on Phase Evolution and Cation Gradients in Solution-Derived Thin Film Ferroelectrics," Presented at the 37th International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL (2013).

13. G.L. Brennecka, J.F. Ihlefeld, K. Nittala, J.L. Jones, M.C. George, L.D. Williamson, and P.F. Nealey, "Chemical, Phase, and Interface Effects in Solution-Based Fabrication of Continuous and Nanopatterned Thin Film Ferroelectrics," Presented at the Spring 2012 meeting of the Materials Research Society, San Francisco, CA (2012).

12. G.L. Brennecka, J.F. Ihlefeld, K. Nittala, S. Mhin, J.L. Jones, and C.T. Shelton, "Chemical, Phase, and Interface Effects in Solution-Based Fabrication of Thin Film Ferroelectrics," Presented at Interfacial Phenomena in Nanostructured Materials and Devices, Telluride, CO (2012).

11. G.L. Brennecka, K.E. Meyer, Y.H. Jeon, D.I. Shahin, H.J. Brown-Shaklee, B. Gibbons, and J.F. Ihlefeld "Minimizing Voltage Tuning for Enhanced High Field Energy Storage," Presented at the 15th US-Japan Seminar on Dielectric and Piezoelectric Materials, Kagoshima, Japan (2011).

10. G.L. Brennecka, J.F. Ihlefeld, C.T. Shelton, P.G. Kotula, P.G. Lam, K.E. Meyer, J.P. Maria, and B. Gibbons, "Chemically Homogeneous Ferroelectric Thin Films via Improved Substrate Metallization," Presented at the 15th US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Kagoshima, Japan (2011).

9. G.L. Brennecka, K.E. Meyer, H.J. Brown-Shaklee, D.I. Shahin, M.C. George, and J.F. Ihlefeld "Oxide Nanocomposites for Tailored Dielectric Responses," Presented at Composites at Lake Louise, Lake Louise, Canada (2011).

8. G.L. Brennecka, J.F. Ihlefeld, K. Nittala, J.L. Jones, C.T. Shelton, and J.-P. Maria, "Chemical, Phase, and Interface Effects in Solution-Based Fabrication of Continuous and Nanopatterned Thin Film Ferroelectrics," Fall meeting of the European Materials Research Society 2011, Warsaw, Poland (2011).

7. G.L. Brennecka, J.L. Jones, K. Nittala, S. Ji, and P.F. Nealey, "Fabrication, Patterning, and Integration of Functional Nanoscale Electronic Oxides," Presented at MS&T 2010, Houston, TX (2010).

6. G.L. Brennecka, K. Nittala, J.L. Jones, P. Lu, C.M. Parish, and B.A. Tuttle, "Materials Processing Challenges and Advances for PZT-Based PiezoMEMS," 2010 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, State College, PA (2010).

5. G.L. Brennecka, K.E. Meyer, P.A. Mahoney, B.A. Tuttle, J.L. Jones, K. Nittala, P.F. Nealey, and S. Ji, "Fabrication, Patterning, and Integration of Functional Nanoscale Electronic Oxides," Presented at Composites at Lake Louise, Lake Louse, Alberta, Canada (2009).

4. G.L. Brennecka, C.M. Parish, J.L. Jones, B.A. Tuttle, J.S. Wheeler, and J.G. Ekerdt, "Chemical, Phase, and Interface Effects in Solution-Based Fabrication of Ferroelectric Thin Film Capacitors," **Plenary talk** presented at the 14$^{\text{th}}$ US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Welches, OR (2009).

3. G.L. Brennecka, J.S. Wheeler, C.M. Parish, B.A. Tuttle, A. Gin, and J.G. Ekerdt, "Electrical Ceramics: Functional at Fifty (and Fewer) Nanometers," Presented at the 110$^{\text{th}}$ Annual Meeting of the American Ceramic Society, combined with MS&T'08, Pittsburgh, PA (2008).

2. G.L. Brennecka and D.A. Payne, "Tantalizing Ceramics: Elucidation of Unusual Behavior in Ta_2O_5," Presented at the 109$^{\text{th}}$ Annual Meeting of the American Ceramic Society, combined with MS&T'07, Detroit, MI (2007).

1. G.L. Brennecka, B.A. Tuttle, C.M. Parish, L.N. Brewer, B.B. McKenzie, and M.A. Rodriguez, "Fabrication of Ultrathin Integrated Multilayer Capacitors by Chemical Solution Deposition," Presented at the 13$^{\text{th}}$ US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Awaji City, Hyogo, Japan (2007).

Invited Seminars

25. G.L. Brennecka, "Coupled High Throughput Computation and Experimentation for Rapid Screening and Development of New Piezoelectric Nitrides," invited seminar in the Materials Science and Engineering department at Iowa State University, Ames, IA (2018).

24. G.L. Brennecka, "Electrical ceramics, the unsung heroes of modern communications" invited seminar for the Osher Lifelong Learning Institute, Golden, CO (2018).

23. G.L. Brennecka, "Coupled High Throughput Computation and Experimentation for Rapid Screening and Development of New Piezoelectric Nitrides," invited seminar in the Materials Science and Engineering department at Case Western Reserve University, Cleveland, OH (2018).

22. G.L. Brennecka, "Coupled High Throughput Computation and Experimentation for Rapid Screening and Development of New Piezoelectric Nitrides," invited seminar in the Chemical Engineering and Materials Science department at the University of Minnesota, Minneapolis, MN (2018).

21. G.L. Brennecka, "Coupled High Throughput Computation and Experimentation for Rapid Screening and Development of New Piezoelectric Nitrides," invited seminar in the Materials Science department at the North Carolina State University, Raleigh, NC (2018).

20. G.L. Brennecka, "Coupled High Throughput Computation and Experimentation for Rapid Screening and Demonstration of New Piezoelectric Nitrides," invited seminar at the Laboratory for Physical Sciences, University of Maryland, College Park, MD (2017).

19. G.L. Brennecka, "Rethinking Materials Processing," presented as part of *Frontiers of Materials Science: A Decadal Study*, organized by the National Academies, Golden, CO (2017).

18. G.L. Brennecka, "Function from frustration: Taking advantage of complexity, heterogeneity, and nonlinearity in electrical ceramics," Student-selected invited seminar for the Materials Engineering department at Purdue University, West Lafayette, IN (2016).

17. G.L. Brennecka, "Function from frustration: Taking advantage of complexity, heterogeneity, and non-linearity in electrical ceramics," Invited seminar for the MSE department at Missouri S&T, Rolla, MO (2016)

16. G.L. Brennecka, "Ferroelectric Opening Switches: the promises and challenges of non-linearity," Invited seminar as part of the Power on Demand series at Sandia National Laboratories, Albuquerque, NM (2016).

15. G.L. Brennecka, "Function from frustration: Taking advantage of complexity, heterogeneity, and non-linearity in electrical ceramics", Invited seminar in the department of Mechanical Engineering, West Virginia University (2016).

14. G.L. Brennecka, "Chemical heterogeneity in electroceramics: the good, the bad, and the difficult to characterize!", Invited seminar at the Rocky Mountain section of ASM, Golden, CO (2016).

13. G.L. Brennecka, "Chemical heterogeneity in electroceramics: the good, the bad, and the difficult to characterize!", Invited seminar at the National Renewable Energy Laboratory, Golden, CO (2015).

12. G.L. Brennecka, J.F. Ihlefeld, and H.J. Brown-Shaklee, "Chemical heterogeneity in electroceramics: the good, the bad, and the difficult to characterize!," Presented as part of the Materials Science and Engineering Seminar Series at Drexel University, Philadelphia, PA (2015).

11. G.L. Brennecka, J.F. Ihlefeld, and H.J. Brown-Shaklee, "Chemical heterogeneity in electroceramics: the good, the bad, and the difficult to characterize!," Presented as part of the Materials Science and Engineering Seminar Series at Boise State University, Boise, ID (2015).

10. G.L. Brennecka, "Advances in Solution-Derived Piezoelectric Thin Films," Presented as part of the Mechanical Engineering Seminar Series at the Colorado School of Mines, Golden, CO (2014).

9. G.L. Brennecka, H.J. Brown-Shaklee, N. Raengthon, N. Triamnak, J.J. Borchardt, M.A. Blea-Kirby, and D.P. Cann, "High Reliability Ceramic Capacitors based on Temperature- and Voltage-Stable Relaxor Dielectrics," Presented as part of the Chemical Engineering Department Seminar Series at New Mexico State University, Las Cruces, NM (2013).

8. G.L. Brennecka, J.F. Ihlefeld, K. Nittala, J.L. Jones, M.C. George, L.D. Williamson, and P.F. Nealey, "Chemical, Phase, and Interface Effects in Solution-Based Fabrication of Continuous and Nanopatterned Thin Film Ferroelectrics," Presented as part of the Materials Science and Engineering Department Seminar Series at the New Mexico Institute of Mining and Technology, Socorro, NM (2012).

7. G.L Brennecka, "Patterning and Integration of Ferroelectrics and other Functional Nanostructures," Presented as part of the University of Illinois at Urbana-Champaign Materials Science and Engineering Department Colloquium, Urbana, IL (2010).

6. G.L Brennecka, "Patterning and Integration of Ferroelectrics and other Functional Nanostructures," Presented as part of the Clemson University Chemical Engineering Department Seminar Series, Clemson, SC (2010).

5. G.L. Brennecka, "Combined Lithography for Versatile Nanoscale Patterning and Integration," Presented as a Seminar to the University of Houston Chemical and Biological Engineering Department, Houston, TX (2010).

4. G.L. Brennecka, "Frontiers in Ceramics: You *can* teach old rocks new tricks," Presented to the Condensed Matter and Materials Research Committee of the **National Research Council**, Washington, DC (2010).

3. G.L. Brennecka, "Continuous and Nanopatterned Ferroelectric Thin Films: Big Impact from Small Science", Seminar presented to the Materials Science and Engineering Department at the University of Florida, Gainesville, FL (2009).

2. G.L. Brennecka, "Functional Solution-Derived Nanoscale Electronic Oxides," Invited Seminar at the NASA Glenn Research Center in Cleveland, OH (2008).

1. G.L. Brennecka, "Electroceramic Solutions: From Nanometers to MegaAmperes," Invited Seminar for the Materials Science and Engineering Department at Missouri S&T, Rolla, MO (2008).