

Susan Trolier-McKinstry

Steward Flaschen Professor of Ceramic Science and Engineering and Electrical Engineering
Director, Nanofabrication Facility and W. M. Keck Smart Materials Integration Lab.,
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Professional Preparation

B. S.	Ceramic Science and Engineering	Pennsylvania State University,	1987 (honors)
M. S.	Ceramic Science	Pennsylvania State University	1987
Ph.D.	Ceramic Science	Pennsylvania State University	1992

Appointments

Professor of Electrical Engineering	Pennsylvania State University	2014 – present
Professor of Ceramic Science and Engineering	Pennsylvania State University	2002 – present
Associate Director – Materials Research Lab.	Pennsylvania State University	1999 – 2001
Associate Professor of Ceramic Science & Eng.	Pennsylvania State University	1998 – 2002
Assistant Professor of Ceramic Science & Eng.	Pennsylvania State University	1992 – 1998
Visiting Scientist	Swiss Federal Institute of Tech.	1996 & 2004
Summer Research Faculty Fellow	US Army Research Lab.	Summer 1993
Visiting Research Trainee	Hitachi Central Research Lab.	03-08, 1988

Five Products Related to the Proposed Project

- D. Marincel, H. R. Zhang, A. Kumar, S. Jesse, S. V. Kalinin, W. M. Rainforth, I. M. Reaney, C. A. Randall, and S. Trolier-McKinstry, "Influence of a Single Grain Boundary on Domain Wall Motion in Ferroelectrics," *Adv. Funct. Mat.* **24** (10) 1409-1417 (2014).
- S. H. Baek, J. Park, D. M. Kim, V. Aksyuk, R. R. Das, S. D. Bu, D. A. Felker, J. Lettieri, V. Vaithyanathan, S. S. N. Bharadwaja, N. Bassiri-Gharb, Y. B. Chen, H. P. Sun, C. M. Folkman, H. W. Jang, D. J. Kreft, S. K. Streiffer, R. Ramesh, X. Q. Pan, S. Trolier-McKinstry, D. G. Schlom, M. S. Rzchowski, R. H. Blick, C. B. Eom, "Giant piezoelectricity on Si for hyper-active MEMS," *Science* **334**, 958-961 (2011).
- P. Bintachitt, S. Jesse, D. Damjanovic, Y. Han, I. M. Reaney, S. Trolier-McKinstry, and S. V. Kalinin, "Collective Dynamics Underpins Rayleigh Behavior in Disordered Polycrystalline Ferroelectrics," *Proc. Nat. Acad. Sci. USA* **107** (16) 7219-7224 (2010).
- K. Seal, S. Jesse, M. Nikiforov, S.V. Kalinin, I. Fujii, P. Bintachitt, and S. Trolier-McKinstry, "Spatially Resolved Spectroscopic Mapping of Polarization Reversal in Polycrystalline Ferroelectric Films: Crossing the Resolution Barrier," *Phys. Rev. Lett.* **103**, 057601 (2009).
- S. Trolier-McKinstry and P. Muralt, "Thin Film Piezoelectrics for MEMS," *J. Electroceram.* **12** (1-2) 7-17 (2004).

Five Other Significant Products

- R. G. Polcawich, J. S. Pulskamp, D. Judy, P. Ranade, S. Trolier-McKinstry, M. Dubey, "Surface Micromachined Microelectromechanical Ohmic Series Switch Using Thin-Film Piezoelectric Actuators," *IEEE T-MTT* **55** (12) 2642 – 2654 (2007).
- F. Xu, S. Trolier-McKinstry, W. Ren, and B. Xu, "Domain Wall Motion and its Contribution to the Dielectric and Piezoelectric Properties of Lead Zirconate Titanate Films," *J. Appl. Phys.* **89** (2) 1336-1348 (2001).
- T. M. Shaw, S. Trolier-McKinstry, and P.C. McIntyre, "The Properties of Ferroelectric Films at Small Dimensions," *Annu. Rev. Mater. Sci.* **30** 263-298 (2000).
- J. F. Shepard, Jr., P. J. Moses, and S. Trolier-McKinstry, "The Wafer Flexure Technique for the Determination of the Transverse Piezoelectric Coefficient (d_{31}) of PZT Thin Films," *Sens. Actuators A* **71** 133-138 (1998).
- G. Zavala, J. H. Fendler, and S. Trolier-McKinstry, "Characterization of Ferroelectric Lead Zirconate Titanate Films by Scanning Force Microscopy," *J. Appl. Phys.* **81**(11) 7480-7491 (1997).

Synergistic Activities

Associate editor for Applied Physics Letters

Developed new facilities for measuring the piezoelectric properties ($d_{33,f}$ and $e_{31,f}$) of thin films. These have become one of the standard means of quantifying piezoelectricity in thin films.

Past-President of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society

Vice President of the Materials Research Society, 2016

Board of Directors, Materials Research Society (2011-2013); Meeting Chair, Fall 2003 MRS Meeting

Developed animations of crystal structures now used at >6 Universities in courses. These help illustrate phase transitions, phonons, piezoelectricity, morphology development, and more.

Collaborators & Other Affiliations

Collaborators and Co-Editors V. Aksyuk (NIST), N. Bassiri Gharb (GaTech), S.S.N. Bharadwaja (L-3 Comm), S. Cochran (UDundee), L.E. Cross (PSU), D. Damjanovic (EPFL), C. Demore (U Dundee), E.C. Dickey (NCSU), Y. Ehara (Tokyo Tech), C.-B. Eom (U Wisc.), T. T. Fister (APS), C. M. Folkman (U Wisc.), D.D. Fong (Argonne), I. Fujii (RyukokuU), H. Funakubo (Tokyo Tech), F. Griggio (Intel), V. Gopalan (PSU), Y. Han (U Birmingham), S. Hoffmann-Eifert (Forsc. Julich), S. Jesse (ORNL), T.N. Jackson (PSU), R. Johnson-Wilke (Sandia), P. Jousse (UParis), S. Kalinin (ORNL), H. Kim, S. W. Ko (Xaar), V. Koval, J. Kulik (Osher Lifelong Learning), A. Kumar (ORNL), M.T. Lanagan (PSU), S. Lee (PSU), I. Levin (NIST), J. Li (NCSU), S. G. Lu (PSU), J.-P. Maria (NCSU), G. Martyna (IBM), T.S. Mayer (PSU), G. L. Messing (PSU), R. J. Meyer (PSU), E. Michael (Dow), P. Murali (EPFL), D. Newns (IBM), L. Nicu (CNRS), H. Ogihara (Bosch), O.S. Ovchinnikov (Halliburton), X.Q. Pan (U Mich), N. J. Podraza (UToledo), R. Polcawich (ARL), S. F. Poterala (Channel Tech.), W. Qu (Tsinghua), C. A. Randall (PSU), I.M. Reaney (U Sheffield), W. Ren (Xi'an Jiaotong), P. B. Reid (SAO), M.S. Rzchowski (U Wisc.), D. Saint John (PSU), D. G. Schlom (Cornell), H. M. Schulze (Northrop Grumman), D. Schwartz (SAO), T. Shaw (IBM), T. R. ShROUT (PSU), S.K. Streiffer (Argonne), T. Theis (IBM), K. Wasa (Kyoto U), R. T. H. Wilke (Sandia), C. B. Yeager (PSU), D. Zhao (PSU), W. Zhu (Xi'an Jiaotong)

Graduate Advisors: The late Robert E. Newnham

Thesis Advisor and Postgraduate-Scholar Sponsor:

Thesis Students (50) B. Akkopru (PSU), P. Aungkavattana (MTech, Thailand), N. Bassiri Gharb (GA Tech.), M.D. Biegalski (deceased), P. Bintachitt (Srinakharinwirot U), J. Bock (PSU), T. Borman (PSU), B. Brahmaraoutu (GE), T. Dechakupt (Chiang Mai U), L. Denis (PSU), J. Chan (PSU), A. Dogan, C. Duran (Gebze Inst. Tech.), L. F. Edge (IBM), I. Fujii (Ryokoku U), L. Garten (NREL), B. Gibbons (Oregon SU), F. Griggio (Intel), E. Hong (Lexmark), R. Johnson-Wilke (Sandia), R. Keech (PSU), J. Koh (Corning), J. Lacey (TRW), J. Li, T. N. Liu (PSU), J-P. Maria (NCSU), D. Marincel, E. Michael (Dow), I. G. Mina (Philips), H. Ogihara (Bosch), M. Ozgul (Technical U Istanbul), R. Polcawich (Army Research Lab.), A. Rajashekhar (PSU), P. Rehrig (Saint-Gobain), Edward Sabolsky (West Virginia U), H. Schulze (Northrop Grumman), J. Shepard (IBM), D. Smith, R. Thayer, M. Telli (Celal Bayer Univ.), D. Tinberg, M. Ugorek, M. Wallace (PSU), L.-P. Wang (Intel), A. Welsh (PSU), R. Wolf, F. Xu, J. I. Yang (PSU), C. Yeager (PSU), H. G. Yeo (PSU), H. Yilmaz (Gebze Inst. Tech.), Z. Zhang

Post-Doctoral Scholars from last 5 years (6) S. Bharadwaja (L-3 Comm), E. Dorjpalam (PSU), R. Johnson-Wilke (PSU) S. W. Ko (Xaar), R.H.T. Wilke (Sandia), Z. P. Yao (Harbin)