

## Sergei V. Kalinin

**Work:** Oak Ridge National Laboratory  
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### PROFESSIONAL EXPERIENCE

**June 2014 – present** Director, Institute for Functional Imaging of Materials, ORNL

**Oct. 2007 – present** co-theme leader for Electronic and Ionic Functionality (previously Functional Imaging on the Nanoscale), Center for Nanophase Materials Sciences, ORNL

**Jan 2013 – present** adjunct professor, Sung Kyun Kwan University, South Korea

**Dec 2010 – present** joint faculty, Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville

**Dec 2009 – present** adjunct faculty, Department of Materials Science and Engineering, Pennsylvania State University

**Fall 06 – present** Adjunct Associate Professor, Department of Materials Science and Engineering, University of Tennessee, Knoxville

**Fall 05 – present** Adjunct Assistant Professor, Department of Materials Science and Engineering, North Carolina State University

**Oct. 04 – present** Research Staff Member, Oak Ridge National Laboratory

**Oct. 02 – Oct. 2004** Eugene P. Wigner Fellow, Oak Ridge National Laboratory

**Sept. 02** Ph.D., Department of Materials Science and Engineering, University of Pennsylvania, Thesis: *Nanoscale Electric Phenomena in Oxide Materials by Scanning Probe Microscopy*, Advisor: Prof. Dawn A. Bonnell, **GPA** 4.0/4.0

**Jan. 1998** M.S. summa cum laude, Department of Materials Science, Moscow State University, RUSSIA, Thesis: *Cryosol synthesis of nanocomposite materials*, Advisor: Prof. Alexey A. Vertegel, **GPA** 5.0/5.0, ranked first in class for the whole period of education

### RESEARCH INTERESTS

Coupling between electromechanical, electrical, and transport phenomena on the nanoscale in functional oxides and biological systems. Emergent phenomena in nanostructures transition metal oxides. Electrostatic and electromechanical interactions in liquids, biosystems, and molecular systems. Local probes of photoelectric phenomena in ferroelectrics, photovoltaic, and electroluminescent materials. Developing novel SPM techniques, mathematical analysis of SPM data, quantitative measurements of local properties by SPM.

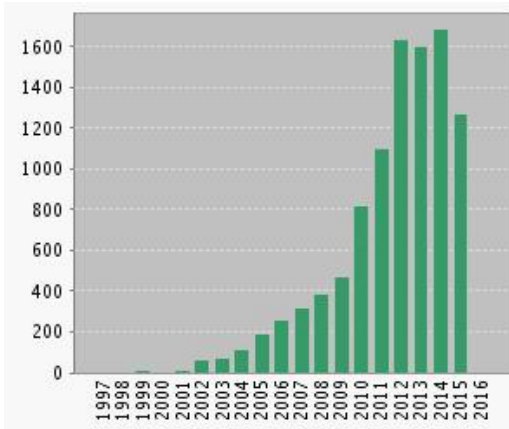
## HONORS AND AWARDS

- Fellow, American Physical Society, **2015**
- Fellow, AVS, **2015**
- IEEE Senior member, **2015**
- Medal for Scanning Probe Microscopy, Royal Microscopical Society, **2015**
- ORNL Distinguished Scientist Award, **2013**
- ORNL Team Award in Science and Technology (led the team), **2011**
- Microscopy Today Innovation Award for “Electrochemical Strain Microscopy”, **2011**
- Roland B. Snow Award, American Ceramics Society, **2010**
- Presidential Early Career Award for Scientists and Engineers (PECASE), **2009**
- R&D 100 Award for “Ztherm Modulated Thermal Analysis” (with M. Nikiforov and S. Jesse, ORNL, and A. Gannepali and R. Proksch, Asylum Research), **2010**
- Microscopy Today Innovation Award for “Adaptive Band Excitation Method in Scanning Probe Microscopy”, **2010**
- Significant Event Award, ORNL **2010**
- 2010 IEEE-UFFC Ferroelectrics Young Investigator Award, **2010**
- Burton medal for Young Investigator, Microscopy Society of America, **2010**
- ISIF Young Investigator Award, **2009**
- Robert L. Coble Award for Young Scholars, American Ceramic Society, **2009**
- Southeast FLC Excellence in Technology Transfer Award for “Adaptive Band Excitation Method and Controller in Scanning Probe Microscopy”, **2008**
- R&D 100 Award for “Adaptive Band Excitation Method and Controller in Scanning Probe Microscopy” (with S. Jesse, ORNL, and R. Proksch, Asylum Research), **2008**
- Peter Mark Memorial Award for Young Scientists, AVS: Science and Technology Society, **2008**
- Cosslett Award for Best Invited Paper of Microbeam Analysis Society (principal S. Jesse). **2008**
- CNMS Division Director Award, **2007** and **2009**
- ORNL Director Award for Outstanding Team Accomplishment in Science and Technology (led the team), **2006**
- Team Scientific Research Award from ORNL (led the team), **2006**
- ORNL Early Career Accomplishment Award for Science and Technology, **2005**
- Ross Coffin Purdy Award of American Ceramic Society, **2003**
- Wigner Fellowship of Oak Ridge National Laboratory, **2002**
- MRS best poster award (**Fall 2009**, **Spring 2005**, **Fall 2003**)
- AVS Graduate Student Award, **2002**
- MRS Gold Graduate Student Award - **Fall 2001** Meeting

- MRS Silver Graduate Student Award - **Fall 1999 Meeting, Fall 2000 Meeting**
- Ceramographics Contest at 2000 ACerS meeting (2nd and 3d award in Problem Solving and 3d award in Scanning Probe Microscopy sections)
- Bochvar Prize for excellence in studies (Moscow State University) **1998**
- Novoselova prize for best student research work in Inorganic Chemistry, MSU, **1997**
- Soros undergraduate student fellowship **1994/1995, 1995/1996 and 1996/1997**
- Moscow State University Lomonosov Scholarship for Excellency in Studies, **1996/1997**
- State Scholarship for Young Scientists from Russian Academy of Sciences, **1994-1996**

## PUBLICATIONS

In total, >440 peer-reviewed papers (2 *Science*, 1 *Nature*, 6 *Nature Mat.*, 4 *Nature Nanotech.*, 1 *Nature Chem.*, 2 *Nature Phys.*, 12 *Nature Comm.*, 6 *Sci. Rep.*, 17 *Phys. Rev. Lett.*, 31 *Adv. (Func., Energy) Mat.*, 2 *PNAS*, 26 *Nano Lett*, 32 *ACS Nano*, 2 *Small*), 20 reviewed papers in conference proceedings, 11 book chapters, 2 books [+2 in Russian], citations >10500, *h* = 51 by ISI (60 by Google Scholar), 6 patents, 7 disclosures, ~170 invited and plenary talks and workshops



## PROFESSIONAL SERVICES

- Editor, *NPJ Computational Materials*, since 2015
- Editorial board, *Advances in Chemical and Structural Imaging*, since 2014
- Editorial advisory board, *ACS Nano*, since 2014
- Co-Technical program chair, ISAF-PFM, Penn State, 2014
- Co-Technical program chair, IEEE-ISAF-PFM, Prague, Czech Republic, 2013
- Member of editorial board, *Applied Physics Letters/Journal of Applied Physics* (since 2012)
- Member of editorial board, *Scientific Reports* (Nature Publishing group)
- Member of editorial board, *Frontiers*
- Conference organizer, MRS 2014 Spring Meeting
- Organizer, PFM School and 12th PFM workshop (ORNL March 2013)
- Co-organizer, 3d International Workshop of Imaging Energy Materials, ORNL 2012
- Co-Organizer, 11<sup>th</sup> Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Aveiro, Portugal 2012 (as a part of ISAF-ECAPD-PFM conference)
- Co-Technical program chair, ISAF-PFM, Vancouver, Canada 2011
- Co-Organizer, 10<sup>th</sup> Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Vancouver, Canada 2011
- IEEE Ferroelectric Committee member, since November 2010

- Organizer, Workshop on Scanning Probe Microscopy for Energy Materials, ORNL, September 2010
- Co-Organizer, 9<sup>th</sup> Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Prague, Czech Republic, September 2010
- Co-Organizer, 8th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Beijing, China 2010
- Volume editor, *MRS Bulletin* 2012.
- Editorial board member, *Nanotechnology*, 2010 – present (2010-2013 – Section editor for patterning and nanofabrication)
- (since 2009 – present) Associate Editor, *J. Appl. Phys.* special volume on Piezoresponse Force Microscopy and Nanoscale Ferroelectrics (Proceedings of PFM Workshop series, 3 published and 1 planned for 2013))
- Organizer, 6th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Oak Ridge, TN, 2009
- Co-Organizer, 5<sup>th</sup> Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, NIMS, Japan, 2009
- Organizer, 4<sup>th</sup> Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Aveiro, Portugal, 2009
- DOE DMSE Panel on Scanning Probe Microscopy, Annapolis, MD, October 2009
- Organizer, 3rd Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Oak Ridge, TN, 2008
- Member of program committee, Non-contact AFM 2008, Madrid, Spain
- Organizer, 2<sup>nd</sup> Workshop on Piezoresponse Force Microscopy, EPFL, Switzerland, May 2008
- DOE DMSE Panel on Long-Range Interactions, Annapolis, MD, October 2007
- Organizer, Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Oak Ridge, TN, 2007
- Member of Editorial Board, *Journal of Nanoelectronics and Optoelectronics*, 2005-present
- Member of publications committee, American Vacuum Society, 2006 - 2013
- Member at large, Nanoscale Science and Technology Division, American Vacuum Society, 2004-2006
- Session chair, “Seeing on the Nanoscale-III”, Veeco Instruments (2005), “Seeing on the Nanoscale-IV” (2006).
- Instructor for Lehigh microscopy course in SPM (2005, 2006)
- MRS Symposium Organizer (Spring 2011, Spring 2009, Fall 2007, Fall 2004 Meeting)
- Member of NSF MRI panel (2004)
- Reviewed manuscripts for Physical Review Letters, Physical Review B, Applied Physics Letters, Journal of Applied Physics, Journal of the American Ceramic Society, Journal of

Physical Chemistry, Journal of Electronic Materials, Nanotechnology, Nano Letters, Applied Physics A, Journal of Materials Research and MRS Symposia Proceedings.

- AVS session chair (2006 Meeting, 2005 Meeting, 2004 Meeting, 2001 Meeting); MRS session chair (Fall 2006 Meeting, Fall 2004 Meeting, Fall 2002 Meeting)

### TEACHING EXPERIENCE

Ph.D. Thesis committee, P. Gupta, Lehigh University

Supervising graduate student, 2 visiting students, and 6 postdocs at ORNL

Development and teaching 2 week course in SPM techniques, UPenn, Spring 2002

Teaching assistant, General Chemistry recitations, UPenn, Spring 2002

Participated in design of laboratory course in SPM in materials science, Spring 2001

Supervised research of 3 undergraduate students at MSU; co-advisor in senior design projects

Developed and taught Intermediate level English language course (Fall 1996, 1997).

### MEMBER

AAAS, IEEE, Materials Research Society, American Vacuum Society, American Ceramic Society, American Physical Society, Electrochemical Society

## LIST OF PUBLICATIONS

### Books

1. (editor) DAWN A. BONNELL AND SERGEI V. KALININ, *Scanning Probe Microscopy for Energy Research*, World Scientific, 2013
2. (editor) SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Functional Imaging of Advanced Materials by Scanning Probe Microscopy*, Springer 2010
3. (editor) SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, II, Springer (2006).
4. (author) S.V. KALININ and V.V. ZAGORSKY, *Handbook on chemistry for secondary school students*, Moscow, Mezhdynarodnaya programma obrazovaniya, 1 ed. –1996, 2ed. –1997 (in Russian)
5. (author) S.V. KALININ, *Concise handbook on chemistry for secondary school students*, Moscow, Kultura i traditsii, 1 ed. - 1993, 2 ed. - 1995. (in Russian)

### Journal Special Issues

6. (editors) N. BASSIRI-GHARB, SERGEI V. KALININ, and N. VALANOOR, *Selected Papers from the Piezoresponse Force Microscopy Workshop Series: Part of the Joint ISAF-ECAPD-PFM 2013 Conference*, special issue of J. Appl. Phys. **116** (2014).

7. **(editors)** J. LI, SERGEI V. KALININ, and A. KHOLKIN, *Selected Papers from the Piezoresponse Force Microscopy Workshop Series: Part of the Joint ISAF-ECAPD-PFM 2012 Conference*, special issue of J. Appl. Phys. **113** (2013).
8. **(organizer)** *Scanning Probe Microscopy in Nanoscale Science Research Centers (NSRC) of the US Department of Energy (DOE)*, special issue of Advanced Functional Materials (2013)
9. **(editors)** S.V. KALININ, Z.G. YE, and A.L. KHOLKIN, *Piezoresponse Force Microscopy and Nanoscale Phenomena in Polar Materials*, special issue of J. Appl. Phys. **112** (2012).
10. **(editors)** S.V. KALININ and A.L. KHOLKIN, *Piezoresponse force microscopy and nanoscale phenomena in polar materials*, special issue of J. Appl. Phys. **110** (2011).
11. **(editor)** SERGEI V. KALININ, J. JOSHUA YANG and ANNA DEMMING, *Non-volatile memory based on nanostructures*, Nanotechnology 25, 24 June 2011
12. **(editors)** S.V. KALININ, N. SETTER, and A.L. KHOLKIN, *Invited Papers from the International Symposium on Piezoresponse Force Microscopy and Nanoscale Phenomena in Polar Materials, Aveiro, Portugal, 2009*, special issue of J. Appl. Phys. **108** (2010).
13. **(editor)** SERGEI V. KALININ, NAVA SETTER and ANDREI KHOLKIN (Eds.), *NanoScale Electromechanics: Principles, Devices, and Applications*, MRS Bulletin, September 2009
14. **(editor)** SERGEI V. KALININ and HIROSHI FUNAKUBO, *Materials*, special issue on "Advances in Ferroelectric & Piezoelectric Materials".
15. **(editor)** S.V. KALININ, B. GOLDBERG, B. HUEY, AND L.M. ENG (Eds.), *Scanning Probe and Other Novel Microscopies of Local Phenomena in Nanostructured Materials*, Mat. Res. Soc. Proceedings Vol. 838E (electronic) (2005).

#### Book chapters

16. S.V. KALININ AND D.A. BONNELL, *The Role of Local Probes in the Next Decade of Energy Research and Development*, in "Scanning Probe Microscopy for Energy Research," edited by D.A. Bonnell and S.V. Kalinin, World Scientific, 2013
17. A. KUMAR, F. CUICCI, A. MOROZOVSKA, S. JESSE, S. KALININ, *Electrochemical Strain Microscopy of Oxygen Ion Conductors: Fuel Cells and Oxide Electronics*, in "Scanning Probe Microscopy for Energy Research," edited by D.A. Bonnell and S.V. Kalinin, World Scientific, 2013
18. T. ARRUDA, N. BALKE, S. JESSE, S. KALININ, *Electrochemical Strain Microscopy of Li-Ion and Li Air Battery Materials*, in "Scanning Probe Microscopy for Energy Research," edited by D.A. Bonnell and S.V. Kalinin, World Scientific, 2013
19. BRIAN J. RODRIGUEZ, ROGER PROKSCH, PETER MAKSYMOVYCH, and SERGEI V. KALININ, *Scanning Probe Microscopy – Forces and Currents in the Nanoscale World*, in "Handbook of Nanoscopy Vol.1", edited by G. van tendeloo, D. van Dyck, and S. Pennycook, Wiley-VCH; 1 edition (May 21, 2012)
20. SERGEI V. KALININ, BRIAN J. RODRIGUEZ, AND A. KHOLKIN, *Piezoresponse Force Microscopy and Spectroscopy*, Springer NanoEncyclopedia,

21. BRIAN J. RODRIGUEZ and SERGEI V. KALININ, *KPFM and PFM of Biological Systems*, in *Kelvin Probe Force Microscopy: Measuring and Compensating Electrostatic Forces* (Springer Series in Surface Sciences), Sascha Sadewasser (Editor), Thilo Glatzel (Editor)
22. R. O'HAYRE, M. LEE, F. PRINZ, and S.V. KALININ, *Scanning Impedance Microscopy and Nanoimpedance Microscopy*, in SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, Springer (2006).
23. A. KHOLKIN, A. ROELOFS, S.V. KALININ, and A. GRUVERMAN, Review of Ferroelectric Domain Imaging by Piezoelectric Force Microscopy, in SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, Springer (2006).
24. A. GRUVERMAN, and S.V. KALININ, *Bioelectromechanical Imaging by Scanning Probe Microscopy: The Galvani Experiment on the Nanoscale*, in SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, Springer (2006).
25. SERGEI V. KALININ and DAWN A. BONNELL, *Scanning Probe Microscopy Of Piezoelectric And Transport Phenomena In Electroceramic Materials*, in NATO ASI Series, P. Vilarinho (Ed.), Kluwer Academic Publishers (2004).
26. SERGEI V. KALININ and DAWN A. BONNELL, *Polarization and Charge Dynamics in Ferroelectric Materials with Scanning Probe Microscopy*, in *Nanoscale Phenomena in Ferroelectric Thin Films*, Ed. S. Hong, Kluwer (2004)
27. SERGEI V. KALININ and DAWN A. BONNELL, *Imaging mechanism and Quantification of Scanning Force Microscopy of Ferroelectric Surfaces*, in *Nanoscale Characterization of Ferroelectric Materials*, Eds. M. Alexe and A. Gruverman, Springer (2004), cond-mat/0301535
28. SERGEI V. KALININ and DAWN A. BONNELL, *Electrostatic and Magnetic Force Microscopy*, in *Scanning Probe Microscopy: Theory, Techniques and Applications*, Ed. D.A. Bonnell, Wiley VCH, 2000

### **Papers: Published**

29. R. VASUDEVAN, L. VLCEK, and S.V. KALININ, *Statistical physics from atomically resolved images*, in preparation
30. R.R. Unocic, A.R. Lupini, A.Y. Borisevich, S.V. Kalinin, and S. Jesse, *Direct Write Liquid STEM Nano-lithography with an Aberration Corrected STEM*, ACS Nano, **under review**
31. R. VASUDEVAN, H. DIXIT, A. TSELEV, L. QIAO, T. MEYER, V. COOPER, P. MAKSYMOVYCH, A. BADDORF, P. GANESH, and S.V. KALININ, *Segregation driven tunable metal-insulator transition on magnetic semiconducting epitaxial manganite thin film surfaces*, submitted.
32. N. BALKE, S. JESSE, P. YU, B. CARMICHAEL, M. B. OKATAN, I. I. KRAVCHENKO, S. V. KALININ, and A. TSELEV, *Quantification of surface displacements and electrostatic forces in dynamic atomic force microscopy*, Nanotechnology.
33. S. SOMNATH, S.V. KALININ, and S. JESSE, *Full Information Acquisition in Piezoresponse Force Microscopy*, Appl. Phys. Lett., in print

34. A. TSELEV, P. YU, S.V. KALININ, and P. MAKSYMOVYCH, *Microwave ac conductivity of domain walls in ferroelectric thin films*, Nature Nanotechnology, under review
35. A. TSELEV, J. VELMURUGAN, A.V. IEVLEV, S.V. KALININ, and A. KOLMAKOV, *Seeing through walls at the nanoscale: microwave microscopy of enclosed objects and processes in liquids*, ACS Nano, under review
36. D.O. ALIKIN, A.V. IEVLEV, S. LUCHKIN, A.P. TURIGIN, V.YA. SHUR, S.V. KALININ, and A.L. KHOLKIN, *Characterization of LiMn<sub>2</sub>O<sub>4</sub> cathodes by electrochemical strain microscopy*, Applied Physics Letters
37. E. STRELCOV, A.V. IEVLEV, A. BELIANINOV, A. TSELEV, A. KOLMAKOV, and S.V. KALININ, *Local coexistence of VO<sub>2</sub> phases revealed by deep data analysis*, Nanoscale, under review
38. V. IBERI, A.V. IEVLEV, I. VLASSIOUK, S. JESSE, S.V. KALININ, D.C. JOY, A.J. RONDINONE, and O.S. OVCHINNIKOVA, *Direct-Write Lithography: Focused Ion Beam-induced Structural Changes in Graphene Devices*, Nanotechnology, under review
39. A.N. MOROZOVSKA, A.V. IEVLEV, V.V. OBUKHOVSKII, Y. FOMICHOV, O.V. VARENYK, V.YA. SHUR, S.V. KALININ, and E.A. ELISEEV, *Self-consistent theory of nanodomain formation on non-polar surfaces of ferroelectrics*, Phys. Rev. B, under review
40. L. COLLINS, S. SOMNATH, N. BALKE, S.V. KALININ, and S. JESSE, *General Mode-KPFM for complete data acquisition on electrodynamic processes*, under preparation
41. S.M. YANG, M. PARANTHAMAN, T.W. NOH, S.V. KALININ, and E. STRELCOV, *Nanoparticle Shape Evolution and Proximity Effects during Tip-Induced Electrochemical Processes*, ACS Nano, in print
42. L. COLLINS, A. BELIANINOV, S. SOMNATH, B.J. RODRIGUEZ, N. BALKE, S.V. KALININ, and S. JESSE, *Multifrequency spectrum analysis using fully digital G Mode-Kelvin probe force microscopy*, Nanotechnology, in print
43. D. GOBELJIC, V.V. SHVARTSMAN, A. BELIANINOV, B. OKATAN, S. JESSE, S. V. KALININ, C. GROH, J. RÖDEL, and D. C. LUPASCU, *Nanoscale Mapping of Heterogeneity of the Polarization Reversal in Lead-Free Relaxor-Ferroelectric Ceramic Composites*, Nanoscale, in print
44. A. KUMAR et al., *Local probing of ferroelectric and ferroelastic switching through stress-mediated piezoelectric spectroscopy*, Advanced Materials Interfaces, in print
45. Y. WU, A.R. CHEW, G.A. ROJAS, G. SINI, G. HAUGSTAD, A. BELIANINOV, S.V. KALININ, H. LI, C. RISKI, J.L. BREDAS, A. SALLEO, and C.D. FRISBIE, *Strain Effects on the Work Function of an Organic Semiconductor*, Nat. Comm., in print
46. A. IEVLEV, S. JESSE, T.J. COHELL, R.R. UNOCIC, V.A. PROTOPODESCU, and SERGEI V. KALININ, *Quantitative Description of Crystal Nucleation and Growth from in Situ Scanning Transmission Electron Microscopy*, ACS Nano, in print
47. A. IEVLEV, M. SUSNER, M. MCGUIRE, P. MAKSYMOVYCH, and S.V. KALININ, *Quantitative analysis of the local phase transitions induced by laser heating*, ACS Nano, in print
48. R.K. VASUDEVAN, H. KHASSAF, Y. CAO, S. ZHANG, A. TSELEV, B. CARMICHAEL, M.B. OKATAN, S. JESSE, L.Q. CHEN, S.P. ALPAY, S.V. KALININ, and N. BASSIRI-GHARB, *Acoustic Detection of Phase Transitions at the Nanoscale*, Adv. Func. Mat., in print



49. A.B. PAPANDREW, Q. LI, M.B. OKATAN, S. JESSE, C. HARTNETT, S.V. KALININ, and R.K. VASUDEVAN, *Electrocatalysis Induced Elasticity Modulation in a Superionic Proton Conductor Probed by Band-Excitation Atomic Force Microscopy*, *Nanoscale*, in print
50. M.A. FRECHERO, M. ROCCI, G. SÁNCHEZ-SANTOLINO, A. KUMAR, J. SALAFRANCA, R. SCHMIDT, M.R. DÍAZ-GUILLÉN, O.J. DURÁ, A. RIVERA-CALZADA, R. MISHRA, S. JESSE, S.T. PANTELIDES, S.V. KALININ, M. VARELA, S.J. PENNYCOOK, J. SANTAMARIA, and C. LEON, *Paving the way to nanoionics: atomic origin of barriers for ionic transport through interfaces*, *Sci. Rep.*, in print
51. **(perspective)** B.G. SUMPTER, R.K. VASUDEVAN, T. POTOK, and S.V. KALININ, *A Bridge for Accelerating Materials by Design*, *NPJ Comp Mat*, in print
52. **(editorial)** L.Q. CHEN, L. CHEN, S.V. KALININ, G. KLIMECK, S. KUMAR, J. NEUGEBAUER, and I. TERASAKI, *Design and Discovery of Materials Guided by Theory and Computation*, *NPJ Comp Mat*, in print
53. A. GIANFRANCESCO, A. TSELEV, A.P. BADDORF, S.V. KALININ, and R.K. VASUDEVAN, *The Ehrlich-Schwoebel Barrier on an oxide surface: A combined Monte-Carlo and in-situ scanning tunneling microscopy approach*, *Nanotechnology*, in print
54. Q. HE, A. BELIANINOV, A. DZIAUGYS, P. MAKSYMOVYCH, Y. VYSOCHANSKII, S.V. KALININ, and A. Y. BORISEVICH, *Antisite Defects in Layered Multiferroic  $\text{CuCr}_{0.9}\text{In}_{0.1}\text{P}_2\text{S}_6$* , *Nanoscale*, in print
55. SERGEI V. KALININ, BOBBY G. SUMPTER, and RICHARD K. ARCHIBALD, *Big-deep-smart data in imaging for guiding materials design*, *Nature Materials* **14**, 973 (2015).
56. S. JESSE, Q. HE, A.R. LUPINI, D.N. LEONARD, M.P. OXLEY, O. OVCHINNIKOV, R. UNOCIC, A. TSELEV, M. FUENTES-CABRERA, B.G. SUMPTER, S.J. PENNYCOOK, S.V. KALININ, and A.Y. BORISEVICH, *Atomic-level sculpting of crystalline oxides: towards bulk nanofabrication with single atomic plane precision*, *Small*, in print
57. S.M. YANG, S. LEE, J. JIAN, W. ZHANG, P. LU, Q. JIA, H. WANG, T.W. NOH, S.V. KALININ, and J. MACMANUS-DRISCOLL, *Strongly enhanced oxygen ion transport through samarium-doped  $\text{CeO}_2$  nanopillars in nanocomposite films*, *Nature Comm.*, in print
58. E. STRELCOV, A. BELIANINOV, Y.H. HSIEH, Y.H. CHU, and S.V. KALININ, *Constraining data mining with physical models: voltage- and oxygen pressure-dependent transport in multiferroic nanostructures*, *Nano Lett.*, in print
59. **(opinion)** SERGEI V. KALININ and ANNA N. MOROZOVSKA, *Focusing light on flexoelectricity*, *Nature Nano*, in print
60. B. WINCHESTER, N. BALKE, X.X. CHENG, A.N. MOROZOVSKA, S.V. KALININ, and L.Q. CHEN, *Electroelastic fields in artificially created vortex cores in epitaxial  $\text{BiFeO}_3$  thin films*, *Appl. Phys. Lett.* **107**, 052903 (2015).
61. N. BALKE, S. JESSE, Q. LI, P. MAKSYMOVYCH, M.B. OKATAN, E. STRELCOV, A. TSELEV, and S.V. KALININ, *Surface and Charge Modified Hysteresis Loops in Ferroelectric Thin Films*, *J. Appl. Phys.* **118**, 072013 (2015).
62. A. TSELEV, A. KLEIN, J. GASSMANN, S. JESSE, Q. LI, S.V. KALININ, and N. BALKE, *Quantitative Nanometer-Scale Mapping of Dielectric Tunability*, *Adv. Mater. Interfaces* 500088 (2015).
63. R.K. VASUDEVAN, S. ZHANG, M.B. OKATAN, S. JESSE, S.V. KALININ, and N. BASSIRI-GHARB, *Multidimensional dynamic piezoresponse measurements: Unraveling local relaxation behavior in relaxor-ferroelectrics via big data*, *J. Appl. Phys.* **118**, 072003 (2015).

64. V.A. BOROVNIKOV, S.V. KALININ, YU. KHAVIN, B. MIRMAN, and E. KARAPETIAN, *Point force and point electric charge applied to the boundary of three-dimensional anisotropic piezoelectric solid*, J. Appl. Phys. **118**, 072009 (2015).
65. O.V. VARENYK, M.V. SILIBIN, D.A. KISELEV, E.A. ELISEEV, S.V. KALININ, and A.N. MOROZOVSKA, *Self-consistent modelling of electrochemical strain microscopy in mixed ionic-electronic conductors: Nonlinear and dynamic regimes*, J. Appl. Phys. **118**, 072015 (2015).
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### Patents

1. RUI SHAO, SERGEI V. KALININ and DAWN A. BONNELL, *Scanning probe microscopy apparatus and techniques*, Patent Application **20050262930**
2. D.A. BONNELL, A.T. JOHNSON S.V. KALININ, M. FREITAG, and, *Carbon Nanotube Calibration Standard for Electrostatic Scanning Probe Microscopies*, US Patent **6,720,553**
3. D.A. BONNELL, R.A. ALVAREZ, and S.V. KALININ, *Directed Assembly of Nanometer Scale Molecular Devices*, US Patent **6,982,174**
4. D.A. BONNELL, S.V. KALININ, and R.A. ALVAREZ, *Spatially resolved electromagnetic property measurement*, US Patent **6,873,163**,
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8. **(R&D100 Award)** S. JESSE and S.V. KALININ, *Adaptive Band Excitation Method in Scanning Probe Microscopy*, US Patent 7,775,086 B2, filed Sept. 1, 2006, issued Aug. 17, 2010, **licensed by Asylum Research Corporation, 13/886,748. 12/792,477**

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10. S.V. KALININ, S. JESSE, P. MAKSYMOVYCH, M. NIKIFOROV, and A.P. BADDORF, *Rapid Functional Recognition in Scanning Probe Microscopy*, patent disclosure submitted
11. M. NIKIFOROV, S.V. KALININ, S. JESSE, *Spatially Resolved Quantitative Mapping of Thermomechanical Properties and Phase Transition Temperatures Using Scanning Probe Microscopy*, patent disclosure submitted
12. S.V. KALININ, N. BALKE, A. KUMA, N.J. DUDNEY, and S. JESSE, *Real Space Mapping of Ionic Diffusion and Electrochemical Activity in Energy Storage and Conversion Materials*, US Patent 8,719,961 B2, granted May 6, 2014
13. SERGEI V. KALININ, N. BALKE, A. BORISEVICH S. JESSE, P. MAKSYMOVYCH, Y. KIM, and E. STRELCOV, *Real space mapping of oxygen vacancy diffusion and electrochemical transformations by hysteretic current reversal curve measurements*, US Patent, 8,752,211
14. H.N. LEE, S.V. KALININ, H.J. JEEN, W.S. CHOI, L. JIANG, S. DONG, Y. KIM, M.G. HAN, Y. ZHU, E. DAGOTTO, and T. EGAMI, *Colossal Tunneling Electroresistance Induced by Interfacial Phase Transitions in Ultrathin Oxide Heterostructures*, patent disclosure submitted
15. L. COLLINS, B. RODRIGUEZ, S. JESSE, and S.V. KALININ, *Electrochemical Force Microscopy*, patent disclosure submitted
16. S. JESSE, A. BELIANINOV, and S.V. KALININ, *Full Information Acquisition in Scanning Probe Microscopy*, patent disclosure submitted
17. (submitted) S.V. KALININ, P. MAKSYMOVYCH, and A. TSELEV, *Methods for Detection and Quantification of Conductance and Dielectric Permittivity*, 201503548, DOE 138,181
18. (submitted) S.V. KALININ, P. MAKSYMOVYCH, and A. TSELEV, *Method of Creating Electronically Conducting Ferroelectric Domain Wall Circuits*, 201503547, DOE S-138,180,
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#### **Invited talks - Conferences**

1. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Materials Research Meeting, Boston, December 2015
2. S.V. KALININ *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Materials Research Meeting, Boston, December 2015
3. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Microscopy and Microanalysis Conference, Manchester, UK
4. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, MRS Spring meeting, San Francisco, CA



5. S.V. KALININ *Deep Data in Nanoscience: Exploring Local Structure-Property Relationships by Scanning Probe Microscopy*, MRS Fall meeting, Boston, MA
6. S.V. KALININ *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, International Materials Research Council Meeting, Cancun, Mexico, August 2014
7. S.V. KALININ *Atomic View at Oxide Surfaces: Physics and Electrochemistry*, International Conference on Physics of Semiconductors, Austin, TX, August 2014
8. S.V. KALININ *Mapping Oxygen Vacancy Dynamics and Reactivity in Solids at the Nanometer and Atomic Scales*, Gordon's Research Conference on Solid State Studies in Ceramics, South Hadley, MA, July 2014
9. S.V. KALININ *Physical and Electrochemical Phenomena on Oxides Surfaces with Atomic Resolution: Merging In-Situ PLD-STM Studies with Deep Data*, Spring MRS Meeting, San Francisco, 2014
10. S.V. KALININ *Probing Local Ionic Dynamics in Functional Oxides: From Nanometer to Atomic Scale*, American Physical Society, Denver, March 2014
11. A.V. IEVLEV, E. STRELCOV, S. JESSE, A.N. MOROZOVSKA, E.A. ELISEEV, Y.V. PERSHIN, A. KUMAR, I.I. KRAVCHENKO, V.YA. SHUR AND S.V. KALININ, *Intermittency, quasiperiodicity, and chaos during ferroelectric domain switching*, Fundamental Physics of Ferroelectrics, Washington DC, February 2014
12. S.V. KALININ, "Electrochemical Force and Strain Microscopies: Window in Nanoscale Electrochemistry" Gordon Research Conference on Electrochemistry, Ventura, January 6 2014
13. S.V. KALININ, E. STRELCOV, A. BELIANINOV, and S. JESSE, *Big Data in Nanoscience: Exploring Dynamic Phenomena in Solids by Multidimensional Scanning Probe Microscopy*, MRS Fall Meeting 2014
14. S.V. KALININ, S. JESSE, and N. BALKE, *In-situ Electrochemistry at the End of the Tip*, MRS Fall Meeting 2014
15. S.V. KALININ, A. TSELEV, Z. GAI, R.K. VASUDEVAN, A. BELIANINOV, P. MAKSYMOVYCH, and A.P. BADDORF, *Atomic view on the surface electrochemistry of oxides*, MRS Fall Meeting 2014
16. S.V. KALININ, A. MOROZOVSKA, and V. SHUR, *Interplay of polarization dynamic and surface electrochemistry in ferroelectrics: from ionic transport to chaotic dynamics and fractal growth*, International Symposium on Applied Ferroelectrics, Prague, July 2013
17. **(keynote)** S.V. KALININ, *Imaging and spectroscopy in PFM*, 2013 International Tutorial Workshop on Piezoresponse Force Microscopy and Nanoscale Electromechanics of Polar Materials, July 6-8, 2013, Nanjing University, Nanjing, China
18. S.V. KALININ, A. TSELEV, Z. GAI, P. MAKSYMOVYCH, M. PAN, and A.P. BADDORF, *Probing coupled metal-insulator and ferroic transitions from atomistic to mesoscopic scales: in-situ PLD-STM study*, International Conference on Materials for Advanced Technologies, June 300-July 5, Singapore
19. **(keynote)** S.V. KALININ, *Surface electrochemical phenomena in oxide thin films: from ionic transport to chaotic dynamic in ferroelectric domain switching*, International Conference on Materials for Advanced Technologies, June 300-July 5, Singapore

20. S.V. KALININ, *Emergent mesoscopic lengthscales in disordered systems*, MRS Spring Meeting, San Francisco, April 2013
21. S.V. KALININ, *Mapping electrochemical functionality in oxides on mesoscopic and atomic scales*, Argonne January 2013
22. S.V. KALININ, *Static and dynamics conductance of topological defects in ferroelectrics*, MRS Fall 2012
23. S.V. KALININ, *Static and dynamics conductance of topological defects in ferroelectrics*, AVS Meeting, Tampa, FL
24. S.V. KALININ, *Band Excitation SPM*, Multifrequency conference, Madrid, Spain, October 2012
25. S.V. KALININ, L.Q. CHEN, A. MOROZOVSKA, AND A. BORISEVICH, *Linking Mesoscopic and Atomic Scale Behaviors in Disordered Ferroelectrics*, "International Workshop on Relaxor Ferroelectrics", Shloss Edesheim, Germany 2012
26. S.V. KALININ, *Emergent SPM Modes and their Application to Energy and Memory Materials*, SMASIS, September 2012
27. (DOE Contractor meeting), *Probing Coupled Metal-Insulator and Ferroic Transitions from the Atomistic to Mesoscopic Scales*, DOE Contractor Meeting, Gaithersburg, MD
28. (**plenary**) S.V. KALININ, *Static and dynamics conductance of topological defects in ferroelectrics*, ISAF-ECAPD 2012, Aveiro, Portugal
29. SERGEI V. KALININ, AMIT KUMAR, STEPHEN JESSE, and ALBINA BORISEVICH, *Electrochemical Strain Microscopy: Challenges and Opportunities in Probing Electrochemical Reactivity of Solids below 10 nm level*, Workshop on solid state ionics, Heidelberg, Germany July 2012
30. S.V. KALININ, *Probing bias-induced phase transitions and electrochemical reactions on a single defect level*, ASM Local, May 21, 2012
31. S.V. KALININ, *Electrochemical Strain microscopy: probing batteries and fuel cells on the nanoscale*, Gordon's research conference on batteries, 2012
32. S.V. KALININ, P. MAKSYMOVYCH, N. BALKE, A. BORISEVICH, L.Q. CHEN, and A.N. MOROZOVSKA, *Static and dynamics conductance of topological defects in ferroelectrics*, Fundamental Physics of Ferroelectrics, Argonne 2012
33. S.V. KALININ, *Probing local bias-induced transitions: the case for 6D SPM*, MRS Fall Meeting 2011
34. S.V. KALININ, S.V. Kalinin, S. Jesse, A. Kumar, D.N. Leonard, and A. Y. Borisevich *nome*, *Probing oxygen vacancy dynamics on the nanoscale – from fuel cells to ferroelectrics*, MRS Fall Meeting 2011
35. S.V. KALININ, *Role of ionic phenomena in electromechanical SPM of correlated oxides*, MRS Spring Meeting 2011.
36. S.V. KALININ, *Probing local ionic motion and conductivity phenomena in correlated oxides*, Heraus Seminar, Bad Honneff, Germany January 2011.
37. S.V. KALININ, *Probing and controlling bias-induced phase transitions on the nanoscale: from local Preisach densities to switching at a single defect*, EMA2011, January 2011.

38. S.V. KALININ, *Mapping Ionic dynamics and electrochemical reactivity on the nanometer scale*, MRS Fall, 2010
39. S.V. KALININ, *Mapping Ionic dynamics and electrochemical reactivity on the nanometer scale*, AVS 2010, Albuquerque, October 2010.
40. S.V. KALININ, *Recent Advanced in Piezoresponse Force Microscopy*, ESFD-PFM, Czech Republic, September 2010
41. **(plenary)** S.V. KALININ, *A Biased View on the Nanoworld: From Ferroelectrics and Multiferroics to Energy Storage Materials*, ISAF 2010, Edinburgh, Scotland
42. S.V. KALININ, *Artificial Intelligence Methods in Scanning Probe Microscopy*, MRS Spring, 2010
43. S.V. KALININ, *Nanoscale Electromechanics: from Ferroelectrics to Energy Storage Materials*, APS March Meeting, 2010
44. S.V. KALININ, *Electromechanics on a Nanoscale: Hidden Dimension(s) of Scanning Probe Microscopy*, MRS Fall, 2009
45. S.V. KALININ, *Probing Bias-Induced Phase Transitions in Ferroelectrics and Energy Storage Materials on a Single Defect Level*, MRS Fall, 2009
46. S.V. KALININ, *Spatially resolved spectroscopy of ferroelectric polarization switching on a single defect level*, ACerS 2009
47. S.V. KALININ, *Surface-and Temperature Induced Phase Transitions on Relaxor Surfaces by SPM*, IMF-ISAF 2008, Xi'an, China
48. S.V. KALININ, *Probing Local Bias-Induced Phase Transitions by SPM*, ISPM 2009, Madrid, Spain
49. S.V. KALININ, *Probing Thermodynamics and Kinetics of Phase Transitions and Order Parameter Dynamics in complex materials on a single defect level*, NSRC Contractors Meeting, Annapolis, MD June 2009
50. S.V. KALININ, *Probing the Role of Single Defects on Polarization Switching in Ferroelectric and Multiferroic Materials*, MST 2008, Pittsburg, PA
51. S.V. KALININ, *Multidimensional SPM of Phase Transitions and Order Parameter Dynamics in complex materials*, DOE Contractors Meeting, Warrenton, PA
52. **(Peter Mark award talk)** S.V. KALININ, *Probing the Order Parameter Dynamics and Energy Dissipation on a Single Defect Level: Hidden Dimensions of Scanning Probe Microscopy*, AVS Meeting, Boston, MA
53. S.V. KALININ, *Multidimensional SPM of Phase Transitions and Order Parameter Dynamics in complex materials*, BES DMSE Workshop Frontiers of Atomic-Scale Functionality Imaging, Annapolis, MD
54. S.V. KALININ, *Electromechanical Imaging of Biological Systems with Sub-10 nm Resolution*, ISE 14, September 2008, Tokyo, Japan
55. S.V. KALININ, *Electromechanics on the Nanoscale: A Hidden Dimension of Scanning Probe Microscopy*, PiezoSalon, September 2008, Tokyo, Japan

56. S.V. KALININ, *Nanoscale Electromechanics: Phenomena, Devices, and Applications*, Gordons Research Conference on Microfabrication, Tinton School, NH, July 12-16, 2008
57. S.V. KALININ, *PFM<sup>2</sup>: Probing the Role of Single Defects on Polarization Switching in Ferroelectric and Multiferroic Materials*, ISAF 2008
58. S.V. KALININ, *Spectroscopic Studies of Defect-Mediated Polarization Dynamics on the Nanoscale: Intrinsic Switching, Landauer Centers, and Hysteresis Loop Fine Structure*, MRS Fall Meeting, 2007
59. S.V. KALININ, *Electromechanical and Energy Dissipation Imaging of Polarization Dynamics in Ferroelectric PVDF Films*, APS March Meeting, 2007
60. S.V. KALININ, *The Hunt for the Snark: Real Space Imaging of Microstructural Origins of Landauer Paradox*, International Conference for Young Scientists, NIMS, Japan, February 2007.
61. S.V. KALININ, *The Hunt for the Snark: Real Space Imaging of Spatial and Energy Distribution of Nucleation Centers in Ferroelectrics*, Fundamental Physics of Ferroelectrics 2007, Williamsburg, VA, February 2007.
62. S.V. KALININ, *Electromechanics on the nanoscale: A new dimension in Scanning Probe Microscopy*, International Symposium on Scanning Probe Microscopy 14, Japan 2006.
63. S.V. KALININ, *Electromechanics on the Nanoscale: Imaging, Spectroscopy, and Control of Ferroelectric Materials and Devices*, Mat Sci. Tech., Fall 2006, Cincinnati, OH.
64. S.V. KALININ et al. *Interaction of Order Parameters and Energy Dissipation in Strongly Correlated Oxides by Scanning Probe Microscopy*, Surface and Interface Science at the Atomic Scale, DOE Program Meeting, Warrenton, VA October 29, 2006
65. S.V. KALININ, *Electromechanics on the Nanoscale: a New Dimension in Scanning Probe Microscopy*, UK SPM 2006, UK, June 2006
66. **(plenary talk)** S.V. KALININ, *Electromechanical Phenomena on the Nanoscale: polarization dynamics, patterning, and molecular orientation imaging*, 12<sup>th</sup> US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Annapolis, MD, November 6–9, 2005.
67. **(press luncheon talk)** SERGEI KALININ, BRIAN RODRIGUEZ, and ALEXEI GRUVERMAN, *Recreating Galvani's Experiment at the Nanoscale*, AVS 52nd international symposium and exposition press luncheon, Monday October 31, 2005, Boston, MA.
68. SERGEI V. KALININ, *A Biased View on the Nanoworld: From Perovskites to Proteins*, AMS Meeting, Knoxville, TN June 2005
69. S.V. KALININ, *Electromechanical Phenomena on the Nanoscale: from Perovskites to Proteins*, American Ceramics Society Meeting, April 13, 2005
70. S.V. KALININ, J. SHIN, A.P. BADDORF, R.J. HARRISON and V. MEUNIER, *Transport imaging in 1D structures: from nanowires to nanotubes*, Materials Research Society Spring Meeting, March 2005.
71. S.V. KALININ, V. MEUNIER, S. JESSE, J. SHIN, A.P. BADDORF, R.J. HARRISON, and D.B. GEOHEGAN, *Electronic Transport in Individual Carbon Nanotubes and Nanotube Networks by Scanning Probe Microscopy*, Microscopy and Microanalysis 2004, Savannah, Georgia, August 1-5, 2004

72. S.V. KALININ, J. SHIN, A.P. BADDORF, V. MEUNIER, and R.J. HARRISON, *Electronic properties of individual defects in carbon nanotubes and semiconductor nanowires by Scanning Probe Microscopy*, American Ceramics Society Meeting April 2004, Indianapolis, IN

### Invited talks – Workshops and Tutorials

73. TBD – MPI Halle
74. **(1 lecture, 50 min, workshop organizer)** S.V. KALININ, *Electrochemical Strain Microscopy*, ORNL ESM Workshop, September 2014
75. **(2 lectures, 50 min, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Imaging and Spectroscopic Modes*, ISAF-PFM School, March 2014
76. **(3 lectures, 50 min, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, ORNL PFM School, March 2013
77. **(2 tutorial)** S.V. KALININ, *Piezoresponse Force Microscopy and Spectroscopy*, MRS Fall Meeting, Boston November 2012
78. **(tutorial)** S.V. KALININ, *Emergent SPM Modes and their Application to Energy and Memory Materials*, ISAF-ECAPD, Aveiro July 2012
79. **(tutorial)** S.V. KALININ, *Piezoresponse Force Microscopy and Spectroscopy*, Nanomotion workshop at ISAF-ECAPD, Aveiro July 2012
80. **(tutorial)** S.V. KALININ, *Imaging energy materials by SPM*, ISAF meeting, Vancouver, July 2011.
81. **(tutorial)** S.V. KALININ, *Imaging energy materials by SPM*, MRS Spring meeting, 2011.
82. **(keynote)** S.V. KALININ, *Electrochemical Strain Microscopy – Probing Ionic Flows and Reactivity on the Nanoscale*, Vanderbilt University Nano day, October 27, 2010
83. S.V. KALININ, *Hidden Dimensions of Scanning Probe Microscopy*, AVS ASSD meeting, Albuquerque, October 2010
84. **(2 lectures, 50 min, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 9<sup>th</sup> PFM workshop and ISFD conference, Prague, Czech Republic, September 2010
85. **(3 lectures, 40 min, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 8<sup>th</sup> PFM workshop, Beijing, China, August 2010
86. S.V. KALININ, *Mapping defect dynamics by SPM*, Argonne workshop on defect control, July 2010
87. S.V. KALININ, *Spectroscopic Imaging of Polarization Dynamics in Ferroelectric Materials*, MRS 2009 Fall Meeting, Boston, MA
88. **(1 lectures, 1.5 hour, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 6<sup>th</sup> PFM workshop, ORNL, September 2009
89. **(3 lectures, 1 hour each, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 5<sup>th</sup> PFM workshop, NIMS, Japan, August 2009

90. **(3 lectures, 1 hour each, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 4<sup>th</sup> PFM workshop and conference at Aveiro, Portugal, June 2009
91. S.V. KALININ, *Probing Thermodynamics and Kinetics of Phase Transitions and Order Parameter Dynamics in complex materials on a single defect level*, Stanford NSEC Workshop, April 2009
92. **(3 lectures, 1.5 hour each, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Workshop at CNMS User meeting, Oak Ridge, September 2008
93. **(6 lectures, 45 min. each, workshop co-organizer with Nava Setter)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Workshop at EPFL, Switzerland, June 2008
94. S.V. KALININ, *Probing Electromechanical Energy Conversion on the Nanoscale – Recent Progress and Limitations*, DARPA MTO workshop, San Francisco, March 2008.
95. S.V. KALININ, *Piezoresponse Force Microscopy of Nanoscale Ferroelectrics: Imaging, Modification, and Spectroscopy*, MRS 2007 Fall Meeting, Boston, MA
96. **(3 lectures, 1.5 hour each, workshop organizer)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Workshop at CNMS User meeting, Oak Ridge, October 2007
97. **(10 hour workshop)** S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Intel Corporation, San Jose, CA, August 24, 2006.
98. **(1 hour workshop)** S.V. KALININ, *Nanoelectromechanics of Piezoresponse Force Microscopy: Application to Biological and Macromolecular Systems*, APS March Meeting, DPOLY, 2007
99. **(2 hour workshop)** S.V. KALININ, *Recent Advances in Local Studies of Low-Dimensional Ferroelectrics*, NIMS, Japan, February 2007.
100. S.V. KALININ, *Local Probing of Polarization Dynamics in Low-Dimensional Ferroelectrics*, Meeting of the International Technology Roadmap for Semiconductors of the Emerging Research Materials Work Group on Dynamic Properties of Correlated Electron State Materials, Stanford University, Palo Alto, CA, November 15.
101. *Scanning Probe Microscopy of Nanoscale Electrostatic Properties of Ceramics*, Seminar and Workshop on Electrical Characterization Techniques by Scanning Probe Microscopy, April 25, 2000, Princeton Materials Institute, Princeton, NJ

#### **Invited talks – Seminars**

102. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, University of Tennessee-Knoxville, October 2015
103. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, BNL CFN Seminar, October 2015
104. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, BNL CFN Seminar, October 2015

105. S.V. KALININ, *Data Needs for Scientific Facilities: Electron and Scanning Probe Microscopies*, ASCR Workshop, September 2015
106. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Northwestern University ChiMAD seminar, September 2015
107. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, ANL, September 2015
108. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, UC Berkeley, September 2015
109. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, LBL, September 2015
110. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Queens University Belfast, UK
111. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, University College Dublin, Ireland
112. S.V. KALININ, *Imaging in information dimension*, Physical Sciences Directorate Advisory Meeting, Spring 2015
113. S.V. KALININ, *Deep Data in Scanning Probe Microscopy*, Materials Science Division Seminar Series, Spring 2014
114. S.V. KALININ, *Electrochemistry on the Nanoscale: The Force Dimension*, CalTech, January 9, 2014
115. S.V. KALININ, *Electrochemistry on the Nanoscale: The Force Dimension*, UPenn, December 2013
116. S.V. KALININ, *Electrochemistry on the Nanoscale: From Surface Ionic Transport to Chaos in Domain Switching*, Drexel, December 2013
117. S.V. KALININ, *Electrochemical Strain Microscopy of Li-ion and Oxygen conductors*, MPI Stuttgart (J. Maier group), October 2012
118. S.V. KALININ, *Electrochemical Strain Microscopy: How I stopped Doing Physics and Started to Love Electrochemistry*, Rutgers LSM symposium , February 2012
119. S.V. KALININ, *Materials Science on a Single Defect Level: Mapping Bias-induced Transformation in Ferroelectric and Electrochemical Systems*, University of Pennsylvania NBIC meeting, 2012
120. S.V. KALININ, *Electrochemical Strain Microscopy of Energy materials*, Caltech, May 2011
121. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping ionic flows and electrochemical reactivity on the nanoscale*, West Virginia U. March 2011
122. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping ionic flows and electrochemical reactivity on the nanoscale*, University of Pennsylvania, February 2011
123. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping ionic flows and electrochemical reactivity on the nanoscale*, Sandia National Laboratory, October 2010
124. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping electrochemical reactivity at the 10 nm lengthscale*, Heyrovsky institute, September 2010

125. S.V. Kalinin, *Electromechanics on the Nanoscale: from Ferroelectrics and Multiferroics to Energy Storage Materials*, Argonne, June 2010
126. S.V. Kalinin, *Novel Applications of Piezoresponse Force Microscopy: from Ferroelectrics and Multiferroics to Energy Storage Materials*, Simon Fraser University, April 2010
127. S.V. Kalinin, *Mapping Li-ion dynamics on the Nanoscale: Novel Applications of Piezoresponse Force Microscopy*, LBL, April 2010
128. S.V. Kalinin, *Mapping Li-ion dynamics on the Nanoscale: Novel Applications of Piezoresponse Force Microscopy*, IBM Almaden, April 2010
129. S.V. KALININ, *Spatially-resolved Spectroscopic Probing of Polarization Switching in Ferroelectrics and Multiferroics on a Single Defect Level*, Tokyo Institute of Technology, Japan August 2009.
130. S.V. KALININ, *Direct Imaging of Bias-Induced Phase Transitions on a Single Defect Level*, Argonne CNM, November 2008.
131. S.V. KALININ, *Direct Imaging of Phase Transformations and Energy Dissipation in Ferroelectric Materials on a Single Defect Level*, Penn State, June 2008.
132. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials*, RTW Aachen, June 2008
133. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials*, MPI Halle, June 2008
134. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials*, University of Geneva, Switzerland, May 2008
135. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials*, EPFL, Switzerland, May 2008
136. S.V. KALININ, *Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, Physics Department, Vanderbilt University, April 2008
137. S.V. KALININ, *Direct Imaging of Nucleation Centers and Energy Dissipation in Ferroelectric Materials*, University of Minnesota, February 2008
138. S.V. KALININ, *Direct Imaging of Nucleation Centers and Energy Dissipation in Ferroelectric Materials*, Penn State, December 2007.
139. S.V. KALININ, *The Hunt for the Snark: Microstructural Origins of Landauer Paradox*, Argonne User Meeting, May 2007.
140. S.V. KALININ, *The Hunt for the Snark: Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, Physics Department, Vanderbilt University, April 2007
141. S.V. KALININ, *Electromechanics on the Nanoscale: A New Dimension in Scanning Probe Microscopy of Biomaterials*, Biology Department, Vanderbilt University, April 2007
142. S.V. KALININ, *Electromechanics on the Nanoscale – A New Dimension in the Scanning Probe Microscopy*, BioSecurity and Nanoscience Directorate, Lawrence Livermore National Laboratory, April 2007
143. S.V. KALININ, *The Hunt for the Snark: Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, IBM-Almaden, April 2007



144. S.V. KALININ, *The Hunt for the Snark: Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, Molecular Foundry Seminar, Lawrence Berkeley Laboratory, April 2007
145. S.V. KALININ, *The Hunt for the Snark: Real Space Imaging of Microstructural Origins of Landauer Paradox*, Department of Materials Science, University of Tokyo, Japan, December 2006.
146. S.V. KALININ, *Electromechanics on the nanoscale: A new dimension in Scanning Probe Microscopy*, NCSU NIRT Meeting, September 2006.
147. S.V. KALININ, *Electromechanical Imaging by Scanning Probe Microscopy: Galvani's experiment on the Nanoscale*, South Carolina Bioengineering School, Clemson University, Greenville, SC, June 16, 2006
148. S.V. KALININ, *Electromechanics on the Nanoscale: a New Dimension in Scanning Probe Microscopy*, Leeds University, June 2006.
149. S.V. KALININ, *Electromechanics on the Nanoscale: Imaging, Spectroscopy, and Control of Ferroelectric Materials and Devices*, University of Nebraska-Lincoln, April 28, 2006
150. S.V. KALININ, *A Biased View on the Nanoworld: Transport and Electromechanics on the Nanoscale*, University of Nebraska-Lincoln, April 27, 2006
151. S.V. KALININ, *Electromechanical Imaging of Calcified and Connective Tissues*, University of Pennsylvania, Dental School, January 2006
152. S.V. KALININ, *Electromechanical Imaging of Calcified and Connective Tissues: from Bones to Butterflies*, University of Pennsylvania, Dept. Mat. Sci., January 2006
153. S.V. KALININ, *A Biased View on the Nanoworld: Electromechanical Imaging of Perovskites and Proteins*, Brown University, Department of Mechanical Engineering, December 2005.
154. S.V. KALININ, *Nanoelectromechanical Imaging: From Bone to Ceramics*, Tufts University, Department of Mechanical Engineering, November 10, 2005
155. S.V. KALININ, *A Biased View on the Nanoworld: From Complex Oxides to Biosystems*, Suffolk University, Fall 2005
156. S.V. KALININ, *Probing Nanoscale Electromechanical Phenomena in Inorganic and Biological Systems*, Asylum Research, January 2006
157. S.V. KALININ, *A Biased View on the Nanoworld: From Perovskites to Proteins*, MIT, Boston, MA, April 8, 2005
158. S.V. KALININ, *Bioelectromechanical Imaging by Scanning Probe Microscopy: Repeating Galvani's Experiment on the Nanoscale*, Rutgers University, Piscataway, NJ, April 6, 2005
159. S.V. KALININ, *A Biased View on the Nanoworld: From Perovskites to Proteins and Back*, Drexel University, Philadelphia, PA, April 5, 2005
160. S.V. KALININ, *Nanoelectromechanics of Scanning Probe Microscopy: From Perovskites to Proteins and Back*, University of Pennsylvania, Philadelphia, PA, April 4, 2005
161. S.V. KALININ, *Nanoelectromechanics of Scanning Probe Microscopy: from Perovskites to Proteins*, North Carolina State University, Raleigh, NC, November 12, 2005

162. S.V. KALININ, *Local mechanical and electromechanical behavior by SPM: Repeating Galvani's experiment on molecular level*, ORNL Life Sciences Division Seminar, November 8, 2004
163. S.V. KALININ, *A Biased View of the Nanoworld: Transport, Defects and Ferroelectrics*, National Institute of Standards and Technology, April 2004
164. *A Biased View on the Nanoworld: Nanoscale Electric Phenomena by Scanning Probe Microscopy*, Georgia Institute of Technology, Materials Science Department, April 2003
165. *Nanoscale Electric Phenomena by Scanning Probe Microscopy*, Oak Ridge National Laboratory, Solid State Division, February 2002
166. *Nanoscale Electric Phenomena by Scanning Probe Microscopy*, Lawrence Livermore National Laboratory, February 2002
167. *Nanoscale Electric Phenomena by Scanning Probe Microscopy*, North Carolina State University, Physics Department, February 2002
168. *Nanoscale Phenomena in Ferroelectric Oxides*, Cornell University, Applied Engineering Physics Department, Craighead group, January 2002

#### Conference Proceedings

1. S.V. KALININ, S. JESSE, A.Y. BORISEVICH, H.N. LEE, B.J. RODRIGUEZ, J. HANSON, A. GRUVERMAN, E. KARAPETIAN, and M. KACHANOV, *Recent developments in Electromechanical Probing on the Nanoscale: Vector and Spectroscopic Imaging, Resolution, and Molecular Orientation Mapping*, extended abstract for 12<sup>th</sup> US-Japan Workshop on Ferroelectric Materials, to be published
2. V. MEUNIER, S.V. KALININ, and P. LAMBIN, *Theory of Scanning Probe Microscopy of Carbon Nanostructures*, O12.1 in MRS Proceedings 838E, S.V. Kalinin, B. Goldberg, L.M. Eng, B.D. Huey (Eds) (2005 Fall meeting).
3. X. LEI, S. KALININ, Z. HU and D.A. BONNELL, *Ferroelectric Lithography of Multicomponent Nanostructures*, in "Ceramic Nanomaterials and Nanotechnology II", Ceramic Transactions, Volume **148**, M.R. De Guire, M.Z. Hu, Y. Gogotsi, and S.W. Lu, Editors (2004).
4. S.V. KALININ, J. SHIN, M. KACHANOV, E. KARAPETIAN, and A.P. BADDORF, *Piezoresponse Force Microscopy: Fields below the Surface*, in *Ferroelectric Thin Films XII*, ed. by A. Kingon, S. Hoffmann-Eifert, H. Funakubo, V. Joshi, and I. P. Koutsaroff, Materials Research Society, Warrendale, PA. (2003 Fall meeting).
5. SERGEI V. KALININ and DAWN A. BONNELL, *Temperature-dependent polarization and electric potential on ferroelectric BaTiO<sub>3</sub> (100) surface*, in "Dielectric Materials and Devices", Eds. K.M. Nair, A.S. Bhalla, T.K. Gupta, *et al*, Proceedings of 102 American Ceramic Society Meeting, 2002.
6. SERGEI V. KALININ and DAWN A. BONNELL, *Scanning Impedance Microscopy: from impedance spectra to impedance images*, Mater. Res. Soc. Symp. Proc. Vol. 699, (Electrically Based Microstructural Characterization III), R1.2, in print.

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