

Jianhua (Joshua) Yang

201G Marcus Hall, Natural Resources Rd.
Amherst, MA 01003-9292

Tel: 413-5454514
jjyang@umass.edu

Employment Experience:

Professor, 2015-
The Department of Electrical and Computer Engineering
University of Massachusetts, Amherst

Principal Researcher, 2012-2015
Responsibility: Leading the materials team
Senior Researcher, Researcher, Research Associate (post-doctoral), 2007-2012
Hewlett-Packard Labs, Palo Alto, CA

R&D Engineer, 2000-2001
Huawei Technologies Co., Ltd., a world-leading telecommunication solution provider

Education:

Ph. D., M.S., Materials Science Program, 2007
University of Wisconsin – Madison
Advisor: Y. Austin Chang (Deceased, member of National Academy of Engineering)
Thesis: Engineering and Characterizing Nanoscale Multilayers for Magnetic Tunnel Junctions (MTJs)

B.S. Mechanical Engineering, 1997
Southeast University, Nanjing, China

Selected publications: (from over 90 peer-refereed technical articles; *corresponding author)

Invited review articles:

- **J. Joshua Yang***, Dmitri B. Strukov and Duncan R. Stewart, “Memristive devices for computing”, *Nature Nanotechnology* 8, 13 (2013). (>570 citations)
- **J. Joshua Yang***, I. Inoue, C. S. Hwang and T. Mikolajick, “Metal oxide memories based on thermochemical and valence change mechanisms”, *MRS Bulletin* 37, 131 (2012).

Other journal articles:

1. **J. Joshua Yang**, M. D. Pickett, X. Li, D. A. A. Ohlberg, D. R. Stewart, and R. S. Williams “Memresistive switching mechanism for metal/oxide/metal nano-devices” *Nature Nanotechnology* 3, 429 (2008). (>1400 citations)
2. **J. Joshua Yang**, F. Miao, D. Ohlberg, D. Stewart, R. S. Williams “Electroforming mechanism of metal/oxide/metal memristive switches”, *Nanotechnology* 20, 215201(2009). (**The Most read and cited paper published in this journal since 2009**).
3. J. Borghetti, G. S. Snider, P. J. Kuekes, **J. Joshua Yang**, D. R. Stewart and R. S. Williams “‘Memristive’ switches enable ‘stateful’ logic operations via material implication”, *Nature* 464, 873 (2010).
4. **J. Joshua Yang**, J. Borghetti, D. Murphy, D. R. Stewart and R. S. Williams “A family of electronically reconfigurable nanodevices”, *Advanced Materials* 21, 3754 (2009).
5. **J. Joshua Yang**, J. P. Strachan, Q. Xia, D. A. A. Ohlberg, P. J. Kuekes, R. D. Kelley, W. F. Stickle, D. R. Stewart, G. Medeiros-Ribeiro, R. S. Williams, “Diffusion of adhesion layer metals controls nanoscale memristive switching”, *Advanced Materials* 22, 4034 (2010).
6. **J. Joshua Yang**, C.-X. Ji, X. Ke, M. S. Rzchowski, and Y. A. Chang, “Over 70% tunneling magnetoresistance at room temperature for a CoFe and AlOx based magnetic tunnel junction”, *Applied Physics Letters* 89, 202502 (2006).
7. **J. Joshua Yang***, M.-X. Zhang, John Paul Strachan, Feng Miao, Matthew D. Pickett, Ronald D. Kelley, G. Medeiros-Ribeiro, R. Stanley Williams “High switching endurance in TaOx memristive devices”, *Applied Physics Letters* 97, 232102 (2010).
8. **J. Joshua Yang***, M.-X. Zhang, M. D. Pickett, F. Miao, J. P. Strachan, W. Li, W. Yi, D. A. A. Ohlberg, B. J. Choi, W. Wu, J. H. Nickel, G. Medeiros-Ribeiro and R. Stanley Williams, “Engineering nonlinearity into memristors for passive crossbar applications”, *Applied Physics Letters* 100, 113501 (2012).

9. F. Miao, J. P. Strachan, **J. Joshua Yang***, M.-X. Zhang, I. Goldfarb, A. C. Torrezan, P. Eschbach, R. D. Kelley, G. Medeiros-Ribeiro and R. S. Williams “Anatomy of a nanoscale conduction channel reveals the mechanism of a high-performance memristor”, *Advanced Materials* 23, 5633 (2012).
10. B. J. Choi, A. C. Torrezan, K. J. Norris, F. Miao, J. P. Strachan, M.-X. Zhang, D. A. A. Ohlberg, N. P. Kobayashi, **J. Joshua Yang,*** and R. S. Williams, “Electrical performance and scalability of Pt dispersed SiO₂ nanometallic resistance switch”, *Nano Letters* 13, 3217 (2013).

Patents:

70 Granted patents (see detailed publication list) and **over 70** pending patents (documents available upon request) with USPTO. Two patents on MRAM were licensed by Intel for **millions of dollars** through UW-Madison and the patents on ReRAM/Memristor were **transferred** to SK-hynix (2nd largest memory manufacturer in the world) for memory development.

Selected Invited Talks: (from over **50** invited talks)

1. *International Symposium on Materials for Enabling Nanodevices (ISMEN)*, UCLA, CA (2010). **(Plenary)**
2. *The 11th Non-Volatile Memory Technology Symposium (NVMTS)*, Shanghai, China (2011). **(Keynote)**
3. *The 224th Electrochemical Society Meeting, ULSI Process Integration Symposium.*, CA (2013). **(Keynote)**
4. *Special Lecture, AirForce Research Lab*, Rome, NY (2013). **(Chief Scientist Lecture Series)**
5. *The IEEE International Symposium on Circuits and Systems (ISCAS), FEST 2014*, Australia. **(Keynote)**
6. *Advances in ReRAM : Materials and Interfaces 2015*, Crete, Greece. **(Keynote)**
7. *International Workshop on Information Storage/10th International Symposium on Optical Storage (IWIS/ISOS 2016)*, Changzhou, China. **(Keynote)**
8. *MRS Spring meeting, 2014 (invited talk); MRS Fall meetings, 2014, 2015, 2016 (Invited talks)*

Academic Activities:

Associate Editor: *APPLIED PHYSICS A: Materials Science & Processing*

Conference Chair: The 8th and 10th IEEE Nanotechnology Symposiums on “Emerging Non-volatile Memory Technologies” 2012, and “2D Devices and Materials” 2014, respectively.

Program/technical committees:

- The IEEE International Electron Devices Meeting (IEDM), 2014, 2015.
- The IEEE Symposium on Computational Intelligence for Security and Defense Applications, (CISDA) 2015. (International Advisory Board)
- 5th International Conference on Smart and Multifunctional Materials, Devices, Structures in CIMTEC 2016. (International Advisory Board)
- The IEEE Silicon Nanoelectronics Workshop (SNW) 2014
- The IEEE Non-Volatile Memory Technology Symposium (NVMTS). 2011-2015
- The International Conference on Advances in Circuits, Electronics and Micro-electronics
- Elected officer, The IEEE Nanotechnology Council (SF and Bayarea) 2011-2014

Books (Ed.):

- “Non-volatile memory based on nanostructures” (*NANOTECHNOLOGY* special issue);
- “Memristive and resistive devices and systems” (*APPLIED PHYSICS A* Special Issue).

Detailed list of Patents, Presentations and Publications by J. Joshua Yang

Patents Granted:

1. United States Patent US7,450,352, 2008, "Fabrication of magnetic tunnel junctions with epitaxial and textured ferromagnetic layers", Y. A. Chang, and **J. Joshua Yang**.
2. United States Patent US7,579,042, 2009, "Methods for the fabrication of thermally stable magnetic tunnel junctions", Y. A. Chang, **J. Joshua Yang** and P. F. Ladwig.
3. United States Patent US7,985,962, 2011, "Memristive device", A. M. Bratkovski, D. Ohlberg, **J. Joshua Yang**.
4. United States Patent, US8,093,575, 2011, "Memristive device with a bi-metallic electrode", Q. Xia, X. Li, **J. Joshua Yang**.
5. United States Patent, US8,063,395, 2011, "Memristor amorphous metal alloy electrodes", Q. Xia, **J. Joshua Yang**, S. Y. Wang.
6. United States Patent US8,207,593, 2012, "Memristor having a nanostructure in the switching material" A. M. Bratkovski, **J. Joshua Yang**, Q. Xia.
7. United States Patent US8,203,171, 2012, "Defective graphene-based memristor" **J. Joshua Yang**, F. Miao, W. Wu, S.-Y. Wang, R. S. Williams.
8. United States Patent US8,207,520, 2012, "Programmable crosspoint device with an integral diode" **J. Joshua Yang**, G. M. Ribeiro, R. S. Williams.
9. United States Patent US8,283,649, 2012, "Memristor with a non-planar substrate" A. M. Bratkovski, S.-Y. Wang, **J. Joshua Yang**, M. Stuke.
10. United States Patent US8,264,868, 2012, "Memory array with metal-insulator transition switching devices" G. M. Ribeiro, Pickett, Matthew, **J. Joshua Yang**.
11. United States Patent US8,259,485, 2012, "Multilayer structures having memory elements with varied resistance of switching layers" **J. Joshua Yang**, J. P. Strachan, W. Wu.
12. United States Patent US8,294,132, 2012, "Graphene memristor having modulated graphene interlayer conduction" F. Miao, **J. Joshua Yang**, W. Wu, S.-Y. Wang, R. S. Williams.
13. United States Patent US8,226,3521, 2012, "Memristors with an electrode metal reservoir for dopants" **J. Joshua Yang**, W. Yi, M. Stuke, S.-Y. Wang.
14. United States Patent US8,225,8304, 2012, "Guided mode resonator based raman enhancement apparatus" W. Wu, Q. Xia, J. Li, **J. Joshua Yang**.
15. United States Patent US8,226,4724, 2012, "Changing a memristor state" F. Miao, **J. Joshua Yang**, G. M. Ribeiro, R. S. Williams.
16. United States Patent USPTO US8,324,976 B2, 2012, "Oscillator circuitry having negative differential resistance" J. Borghetti, M. D. Pickett, G. Medelros-Ribeiro, W. Yi, **J. Joshua Yang**, M. Zhang.
17. United States Patent US8,385,101, 2013, "Memory resistor having plural different active materials" **J. Joshua Yang**, M. Zhang, R. S. Williams.
18. United States Patent USPTO US8,415,652, 2013, "Memristors with a switching layer comprising a composite of multiple phases" **J. Joshua Yang**, G. M. Ribeiro, R. S. Williams.
19. United States Patent USPTO US8,437,172, 2013, "Decoders using memristive switches" M. Fiorentino, W. M. Tong, P. J. Kuekes, **J. Joshua Yang**.
20. United States Patent USPTO US8,437,072, 2013, "Individually addressable nano mechanical actuator and contact switch by redox reaction in a crossbar array" **J. Joshua Yang**, R. S. Williams, W. M. Tong.
21. United States Patent USPTO US8,450,711, 2013, "Semiconductor memristor devices" R. S. Williams, **J. Joshua Yang**, D. R. Stewart.
22. United States Patent USPTO US8,455,852, 2013, "Controlled placement of dopants in memristor active regions" N. J. Quitoriano, P. J. Kuekes, **J. Joshua Yang**.
23. United States Patent USPTO US8,487,289, 2013, "Electrically actuated device" **J. Joshua Yang**, M. Zhang, G. Medelros-Ribeiro.
24. United States Patent USPTO US 8,525,146, 2013, "Electrical circuit component" W. Wu, M. D. Pickett, **J. Joshua Yang**, Q. Xia, G. Medeiros Ribeiro.
25. United States Patent USPTO US8,525,553, 2013, "Negative differential resistance comparator circuits" M. D. Pickett, **J. Joshua Yang**, M. Zhang.

-
26. United States Patent USPTO US8,519,372, 2013, "Electroforming-free nanoscale switching device" **J. Joshua Yang**, S.-Y. Wang, R. S. Williams, A. Bratkovski, G. Medeiros Ribeiro.
 27. United States Patent USPTO US8,530,873, 2013, "Electroforming free memristor and method for fabricating thereof" **J. Joshua Yang**, G. Medeiros Ribeiro, R. S. Williams.
 28. United States Patent USPTO US8,546,785, 2013, "Memristive device" **J. Joshua Yang**, F. Miao, W. Wu, S.-Y. Wang, R. S. Williams.
 29. United States Patent USPTO US8,575,585, 2013, "Memristive device" **J. Joshua Yang**, Q. Xia, A. A. Bratkovski.
 30. United States Patent USPTO US8,570,138, 2013, "Resistive Switches" **J. Joshua Yang**, D. B. Strukov, S. Y. Wang.
 31. United States Patent USPTO US8,586,959, 2013, "Memristive switch device" M. D. Pickett, **J. Joshua Yang**, D. B. Strukov.
 32. United States Patent USPTO US8,587,985, 2013, "Memory array with graded resistance lines" **J. Joshua Yang**, J. P. Strachan, W. Wu, Janice H. Nickel.
 33. United States Patent USPTO US8,710,483 B2, 2014, "Memristive junction with intrinsic rectifier" J. Joshua Yang, J. P. Strachan, M. D. Pickett.
 34. United States Patent USPTO US8,710,865, 2014, "Field-programmable analog array with memristors" **J. Joshua Yang**, M. S. Qureshi, G. Medeiros-Ribeiro, R. S. Williams.
 35. United States Patent USPTO US8,711,594, 2014, "Asymmetric switching rectifier" M.-X. Zhang, **J. Joshua Yang**, R. S. Williams.
 36. United States Patent USPTO US8,737,113, 2014, "Memory resistor having multi-layer electrodes" **J. Joshua Yang**, W. Wu, R. Gilberto-Ribeiro.
 37. United States Patent USPTO US8,766,228 B2, 2014, "Electrically actuated device and method of controlling the formation of dopants therein" **J. Joshua Yang**, D. Stewart, P. J. Kuekes, W. M. Tong.
 38. United States Patent USPTO US8,767,438, 2014, "Memelectronic Device" **J. Joshua Yang**, B. J. Choi, M.-X. Max Zhang, G. Medeiros-Ribeiro, R. S. Williams.
 39. United States Patent USPTO US8,766,231, 2014, "Nanoscale Electronic Device with Barrier Layers" Wei Yi, **J. Joshua Yang**, G. Medeiros-Ribeiro.
 40. United States Patent USPTO US8,779,409, 2014, "Low energy memristors with engineered switching channel materials" **J. Joshua Yang**, M.-X. Zhang, G. Medeiros-Ribeiro, R. S. Williams.
 41. United States Patent USPTO US8,779,848, 2014, "Two terminal memcapacitor device" M. D. Pickett, J. Borghetti, **J. Joshua Yang**.
 42. United States Patent USPTO US8,891,284, 2014, "Memristors based on mixed-metal-valence compounds" R. S. Williams, **J. Joshua Yang**, M. D. Pickett, G. Medeiros-Ribeiro, J. P. Strachan.
 43. United States Patent USPTO US8,809,158, 2014, "Device having memristive memory" M. D. Pickett, **J. Joshua Yang**, G. Medeiros-Ribeiro.
 44. United States Patent USPTO US8,829,581, 2014, "Resistive memory devices" S. Y. Wang, **J. Joshua Yang**, A. A. Bratkovski, R. S. Williams.
 45. United States Patent USPTO US8,923,034, 2014, "Multi-level memory cell with continuously tunable switching" Y. Wei, F. Miao, **J. Joshua Yang**.
 46. United States Patent USPTO US8,872,153, 2014, "Device structure for long endurance memristors" **J. Joshua Yang**, M.-X. Zhang, R.S. Williams.
 47. United States Patent USPTO US8,882,217, 2014, "Printhead assembly including memory elements" P. V. Lea, G. M. Ribeiro, M. D. Pickett, **J. Joshua Yang**.
 48. United States Patent USPTO US8,879,300, 2014, "Switchable two-terminal devices with diffusion/drift species" **J. Joshua Yang**, W. Wu, Q. Xia.
 49. United States Patent USPTO US8,878,342, 2014, "Using alloy electrodes to dope memristors" N. J. Quitoriano, D. Ohlberg, P. J. Kuekes, **J. Joshua Yang**.
 50. United States Patent USPTO US8,890,106, 2014, "Hybrid circuit of nitride-based transistor and memristor" **J. Joshua Yang**, G. Medeiros-Ribeiro, B. J. Choi, R. S. Williams.

51. United States Patent USPTO US8,912,520, 2014, “Nanoscale switching device” **J. Joshua Yang**, M. D. Pickett, G. Medeiros-Ribeiro.
52. United States Patent USPTO US8,921,960, 2015, “Memristor cell structures for high density arrays” **J. Joshua Yang**, M. X. Zhang, G. Medeiros-Ribeiro, R. S. Williams.
53. United States Patent USPTO US8,923,034, 2015, “Multi-level memory cell with continuously tunable switching” W. Yi, F. Miao, **J. Joshua Yang**.
54. United States Patent USPTO US9,082,533, 2015, “Memristive element based on hetero-junction oxide” **J. Joshua Yang**, M. X. Zhang, R. S. Williams.
55. United States Patent USPTO US9,159,476 B2, 2015, “Negative differential resistance device” **J. Joshua Yang**, M. X. Zhang, R. S. Williams.
56. United States Patent USPTO US9,000,411 B2, 2015, “Memristor devices configured to control bubble formation” Z. Li, A. M. Bratkovski, **J. Joshua Yang**.
57. United States Patent USPTO US8,766,228, 2014, “Electrically actuated device and method of controlling the formation of dopants therein” **J. Joshua Yang**, D. R. Stewart, P. J. Kuekes, W. M. Tong.
58. United States Patent USPTO US9,024,285, 2015, “Nanoscale switching devices with partially oxidized electrodes” **J. Joshua Yang**, G. M. Ribeiro, R. S. Williams.
59. United States Patent USPTO US13/881452, 2015, “Memristive devices and memristors with ribbon-like junctions and methods for fabricating the same” H. S. Cho, **J. Joshua Yang**, J. H. Nickel.
60. United States Patent USPTO US9,041,157, B2, “Method for doping an electrically actuated device” W. Wu, S. V. Mathai, S.-Y. Wang, **J. Joshua Yang**.
61. United States Patent USPTO US9,040,948 B2, 2015, “Nanoscale switching device” G. Medeiros-Ribeiro, J. H. Nickel, **J. Joshua Yang**.
62. United States Patent USPTO US9,082,972 B2, 2015, “Bipolar resistive switch heat mitigation” J. P. Strachan, G. Medeiros Ribeiro, **J. Joshua Yang**, W. Yi.
63. United States Patent USPTO US9,196,354, 2015, “Memory resistor adjustment using feedback control” J. P. Strachan, J. Borghetti, M. D. Pickett, G. Ribeiro, **J. Joshua Yang**.
64. United States Patent USPTO US9,184,213, 2015, “Nanoscale switching device” **J. Joshua Yang**, D. B. Strukov, W. Wu.
65. United States Patent USPTO US9,184,382, 2015, “Memristive devices with layered junctions and methods for fabricating the same” M. D. Pickett, **J. Joshua Yang**, G. Medeiros-Ribeiro.
66. United States Patent USPTO US9,178,153, 2015, “Memristor structure with a dopant source” M. X. Zhang, **J. Joshua Yang**, R. S. Williams.
67. United States Patent USPTO US9,171,613, 2015, “Memristors with asymmetric electrodes” A. M. Bratkovski, **J. Joshua Yang**, S.-Y. Wang, M. Stuke.
68. United States Patent USPTO US9,165,645, 2015, “High-reliability high-speed memristor” F. Miao, **J. Joshua Yang**, J. P. Strachan, W. Yi, G. Medeiros-Ribeiro, R. S. Williams.
69. United States Patent USPTO US8,982,601 B2, 2015, “Switchable junction with an intrinsic diode formed with a voltage dependent resistor” **J. Joshua Yang**, J. P. Strachan, J. Borghetti, M. D. Pickett.
70. United States Patent USPTO US 2014/0167042 A1, 2015, “Memristors having mixed oxide phases” **J. Joshua Yang**, M. X. Zhang, F. Miao.

Over 70 *patents pending with USPTO (documents available upon request)*

Publications:

1. **J. Joshua Yang***, Dmitri B. Strukov and Duncan R. Stewart, 2013, “Memristive devices for computing”, *NATURE NANOTECHNOLOGY*, 8, 13.
2. **J. Joshua Yang**, M. D. Pickett, X. Li, D. A. A. Ohlberg, D. R. Stewart, and R. S. Williams, 2008, “Memresistive switching mechanism for metal/oxide/metal nano-devices” *NATURE NANOTECHNOLOGY*, 3, 429.
3. **J. Joshua Yang**, J. Borghetti, D. Murphy, D. R. Stewart and R. S. Williams, 2009, “A family of electronically reconfigurable nanodevices”, *ADVANCED MATERIALS*, 21, 3754.
4. **J. Joshua Yang***, J. P. Strachan, Q. Xia, D. A. A. Ohlberg, P. J. Kuekes, R. D. Kelley, W. F. Stickle, D. R. Stewart, G. Medeiros-Ribeiro, R. S. Williams, 2010, “Diffusion of adhesion layer metals controls nanoscale memristive switching”, *ADVANCED MATERIALS*, 22, 4034.
5. **J. Joshua Yang**, F. Miao, D. Ohlberg, D. Stewart, R. S. Williams, 2009, “Electroforming mechanism of metal/oxide/metal memristive switches”, *NANOTECHNOLOGY*, 20, 215201. (most read and cited paper among all papers published in Nanotechnology during 2008-2010)
6. **J. Joshua Yang***, H. Xiang, C.-x. Ji, W. F. Stickle, D. R. Stewart, D. A. A. Ohlberg, R. S. Williams, Y. A. Chang, 2009, “Origin of inverse tunneling magnetoresistance in a symmetric junction revealed by delaminating the buried electronic interface”, *APPLIED PHYSICS LETTERS*, 95, 233117.
7. **J. Joshua Yang**, C.-X. Ji, X. Ke, M. S. Rzechowski, and Y. A. Chang, 2006, “Over 70% tunneling magnetoresistance at room temperature for a CoFe and AlO_x based magnetic tunnel junction”, *APPLIED PHYSICS LETTERS*, 89, 202502.
8. **J. Joshua Yang**, A. K. Bengtson, C.-X. Ji, D. Morgan, and Y. A. Chang, 2008, “Crystal structure effect of ferromagnetic electrode on tunneling magnetoresistance”, *ACTA MATERIALIA*, 56, 1491.
9. **J. Joshua Yang***, A. K. Bengtson, C.-X. Ji, D. Morgan, and Y. A. Chang, 2008, “Origin of the dependence of magnetoresistance on the composition of Co_{100-x}Fe_x electrodes in magnetic tunnel junctions”, *JOURNAL OF APPLIED PHYSICS*, 103, 056102.
10. **J. Joshua Yang**, Y. Yang, F. Liu, B. B. Pant, A. E. Schultz, and Y. A. Chang, 2006, “Thickness determination of ultra-thin oxide films and its application in magnetic tunnel junctions”, *JOURNAL OF ELECTRONIC MATERIALS*, 35, 2142.
11. **J. Joshua Yang**, Y. Yang, K. Wu, Y. Austin Chang, 2005, “The formation of amorphous alloy oxides as barriers used in magnetic tunnel junctions”, *JOURNAL OF APPLIED PHYSICS*, 98, 074508.
12. **J. Joshua Yang**, P. F. Ladwig, Y. Yang, C.-X. Ji, and Y. Austin Chang, F. X. Liu, B. B. Pant, and A. E. Schultz, 2005, “Oxidation of tunnel barrier metals in magnetic tunnel junctions”, *JOURNAL OF APPLIED PHYSICS*, 97, 10C918.
13. **Joshua Yang**, 2006, “Engineering and Characterizing Nanoscale Multilayers for Magnetic Tunnel Junctions”, *Ph D Thesis, the University of Wisconsin – Madison*.
14. **J. Joshua Yang**, C.-X. Ji, Y. Yang, H. Xiang and Y. A. Chang, 2008, “Epitaxial growth and surface roughness control of ferromagnetic thin films on Si by sputter-deposition”, *JOURNAL OF ELECTRONIC MATERIALS*, 37, 355.
15. **J. Joshua Yang**, C. J. Rawn, C.-X. Ji, Y. A. Chang, Y. Chen, R. Ragan, D. A. A. Ohlberg, R. S. Williams, 2006, “Thermal expansion coefficients of rare earth metal disilicides and their influence on the growth of disilicide nanowires”, *APPLIED PHYSICS A-MATER*, 82, 39.
16. **J. Joshua Yang***, N. P. Kobayashi, J. P. Strachan, D. A. A. Ohlberg, Matthew D. Pickett, J. Borghetti, Z. Li, G. Ribeiro-Medeiros, R. S. Williams, 2011, “Dopant control by atomic layer deposition in oxide films for memristive switches”, *CHEMISTRY OF MATERIALS*, 23, 123.
17. **J. Joshua Yang***, John Paul Strachan, Feng Miao, M.-X. Zhang, Matthew D. Pickett, Wei Yi, Douglas A. A. Ohlberg, G. Medeiros-Ribeiro, R. Stanley Williams, “Metal/TiO₂ interfaces for memristive switches”, 2010, *APPLIED PHYSICS A*, 102, 785.
18. **J. Joshua Yang**, “Engineering and Characterizing Nanoscale Multilayers for Magnetic Tunnel Junctions”, 2007, *Ph.D Thesis, UW-Madison*.

19. **J. Joshua Yang***, M.-X. Zhang, John Paul Strachan, Feng Miao, Matthew D. Pickett, Ronald D. Kelley, G. Medeiros-Ribeiro, R. Stanley Williams, "High switching endurance in TaOx memristive devices", 2010, *APPLIED PHYSICS LETTERS* 97, 232102.
20. **J. Joshua Yang***, R. Stanley Williams, "Memristive devices in computing system: promises and challenges", 2013, *ACM JOURNAL ON EMERGING TECHNOLOGIES IN COMPUTING SYSTEMS*, 9, 11-1. (invited review)
21. **J. Joshua Yang***, I. Inoue, C. S. Hwang and T. Mikolajick, "Metal oxide memories based on thermochemical and valence change mechanisms", *MRS BULLETIN*, 37, 131. (invited review)
22. **J. Joshua Yang**, M.-X. Zhang, M. D. Pickett, F. Miao, J. P. Strachan, W. Li, W. Yi, D. A. A. Ohlberg, B. J. Choi, W. Wu, J. H. Nickel, G. Medeiros-Ribeiro and R. Stanley Williams, "Engineering nonlinearity into memristors for passive crossbar applications", 2012, *APPLIED PHYSICS LETTERS*, 100, 113501.
23. **J. Joshua Yang***, B. J. Choi, M.-X. Zhang, A. C. Torrezan, J. P. Strachan and R. S. Williams, "Memristive devices for computing: mechanisms, applications and challenges", 2013, *ECS Transactions* 58, 9.
24. **J. Joshua Yang***, M.-X. Zhang, F. Miao, J. P. Strachan, A. C. Torrezan, M. D. Pickett, W. Yi, B. J. Choi, J. H. Nickel, G. Medeiros-Ribeiro and R. S. Williams, "Oxide based memristive devices", 2012, *Proceeding of IEEE International Conference on Solid-State and Integrated Circuit Technology 2012 (ICSICT2012)*.
25. **J. Joshua Yang***, M.-X. Zhang, B. J. Choi, J. P. Strachan, K. J. Norris, N. P. Kobayashi, R. S. Williams, "Materials perspective of memristive devices", 2014, *Proceeding of The IEEE International Symposium on Circuits and Systems 2014*.
26. F. Miao[¥], J. P. Strachan[¥], **J. Joshua Yang^{¥*}**, M.-X. Zhang, I. Goldfarb, A. C. Torrezan, P. Eschbach, R. D. Kelley, G. Medeiros-Ribeiro and R. S. Williams*, 2011, "Anatomy of a nanoscale conduction channel reveals the mechanism of a high-performance memristor" *ADVANCED MATERIALS*, 23, 5633. (* corresponding author)
27. F. Miao, **J. Joshua Yang***, J. Borghetti, G. Medeiros-Ribeiro, and R. S. Williams, 2011, "Observation of two resistance switching modes in TiO₂ memristive devices electroformed at low current" *NANOTECHNOLOGY*, 22, 254007. (* corresponding author; ¥ equal contributions)
28. B.J. Choi., **J. Joshua Yang*** J. H. Nickel, J. P. Strachan, M. D. Pickett, and R. Stanley Williams, "Nitride Memristors", 2012, *APPLIED PHYSICS A*, 109, 1. (* corresponding author)
29. B. J. Choi, A. C. Torrezan, K. J. Norris, F. Miao, J. P. Strachan, M.-X. Zhang, D. A. A. Ohlberg, N. P. Kobayashi, **J. Joshua Yang*** and R. S. Williams, "Electrical performance and scalability of Pt dispersed SiO₂ nanometallic resistance switch", 2013, *NANO LETTERS*, 13, 3217. (* corresponding author)
30. B. J. Choi, N. Ge, **J. Joshua Yang***, M.-X. Zhang, J. P. Strachan, R. S. Williams, K. Norris, N. Kobayashi, "New materials for memristive switching", 2014, *ISCAS 2014: IEEE International Symposium on Circuits and Systems*, June 1-5, 2014, Melbourne, Australia, 2808-2811.
31. J. Borghetti, G. S. Snider, P. J. Kuekes, **J. Joshua Yang**, D. R. Stewart and R. S. Williams, 2010, " 'Memristive' switches enable 'stateful' logic operations via material implication", *NATURE*, 464, 873.
32. Sergei Kalinin, **J. Joshua Yang** and Anna Demming, 2011, "Non-volatile memory based on nanostructures" *NANOTECHNOLOGY*, 22, 250201.
33. J. J. Blackstock, C. L. Donley, W. F. Stickle, D. A. A. Ohlberg, **J. Joshua Yang**, D. R. Stewart, and R. S. Williams, 2008, "Oxide and Carbide Formation at Titanium/Organic Monolayer Interfaces", *JOURNAL OF AMERICAN CHEMICAL SOCIETY*, 130, 4041.
34. Q. Xia, **J. Joshua Yang**, W. Wu, X. Li and R. S. Williams, 2010, " Self-aligned memristive cross-point arrays fabricated with one nanoimprint lithography step" *NANO LETTERS*, 10, 2909.

35. J. P. Strachan, **J. Joshua Yang**, G. Medeiros-Ribeiro, D. Stewart, and R. S. Williams, 2009, "Structural and chemical characterization of TiO₂ memristive devices by spatially-resolved NEXAFS studies", *NANOTECHNOLOGY*, 20, 485701.
36. R. Münstermann, **J. Joshua Yang**, J. P. Strachan, G. Medeiros-Ribeiro, R. Dittmann, and R. Waser, 2010, "Morphological and electrical changes in TiO₂ memristive devices induced by electroforming and switching", *PHYS. STATUS. SOLIDI RRL*, 4, 16.
37. W. M. Tong, **J. Joshua Yang**, P. J. Kuekes, D. R. Stewart, R. S. Williams, E. DeIonno, E. E. King, S. C. Witzak and J. V. Osborn, 2010, " Radiation hardness of TiO₂ memristive junctions" *IEEE TNS*, 57, 1640.
38. P. F. Ladwig, **J. Joshua Yang**, Y. A. Chang, F. Liu, B. B. Pant, A. E. Schultz, 2005, "Selective oxidation of an individual layer in a magnetic tunnel junction through the use of thermodynamic control", *APPLIED PHYSICS LETTERS*, 87, 061901.
39. F. Miao, **J. Joshua Yang**, J. P. Strachan D. Stewart, R. S. Williams and C. N. Lau, 2009, " Force modulation of tunnel gaps in metal oxide memristive nanoswitches ", *APPLIED PHYSICS LETTERS*, 95, 113503.
40. M. L. Huang, **J. Joshua Yang**, Y. A. Chang, R. Ragan, Y. Chen, D. A. A. Ohlberg, R. S. Williams, 2004, "Phase stabilities of ternary rare earth metal disilicides", *APPLIED PHYSICS A*, 78, 1.
41. C. Ji, **J. Joshua Yang**, A. K. Bengtson, D. Morgan, H. Xiang, Y. A. Chang, M. S. Rzechowski, 2009, "Effect of tetragonal lattice distortion of Co₇₀Fe₃₀ on the tunneling magnetoresistance of AlO_x", *APPLIED PHYSICS A*, 97, 73.
42. J P. Strachan, M. D. Pickett, **J. Joshua Yang**, S. Aloni, A. L. D. Kilcoyne, G. Medeiros-Ribeiro, and R. S. Williams, 2010, "Direct identification of the conducting channels in a functioning memristive device", *ADVANCED MATERIALS*, 22, 3573.
43. Y. Yang, Y. A. Chang, **J. Joshua. Yang**, C.-X. Ji, P. F. Ladwig, F. Liu, B. B. Pant and A. E. Schultz, 2005, "Thermal stability of the interfaces between Co, Ni and Fe based ferromagnets in contact with selected nitrides MN (M = Al, B, Nb, Ta, Ti and V)", *JOURNAL OF APPLIED PHYSICS*, 98, 053907.
44. C.-X. Ji, M. L. Huang, **J. Joshua Yang**, Y. A. Chang, R. Ragan, Y. Chen, D. A. A. Ohlberg, R. S. Williams, 2004, "Vacancy concentrations in binary rare-earth disilicides with the aluminum diboride structure", *APPLIED PHYSICS A*, 78, 287.
45. J. P. Strachan, D. B. Strukov, J. Borghetti, **J. Joshua Yang**, G. Medeiros-Ribeiro, R. S. Williams, 2011, "The switching location of a bipolar memristor: chemical, thermal and structural mapping", *NANOTECHNOLOGY*, 22, 254015.
46. Q. Xia, W. Robinett, M. W. Cumbie, N. Banerjee, T. J. Cardinali, **J. Joshua Yang**, W. Wu, X. Li, W. M. Tong, D. B. Strukov, G. S. Snider, G. Medeiros-Ribeiro, and R. S. Williams, 2009, " Memristor-CMOS hybrid integrated circuits for reconfigurable logic" *NANO LETTERS*, 9, 3640.
47. R. Ragan, Y. Chen, D. A.A. Ohlberg, **J. Joshua Yang** and Y. A. Chang, 2003, "Engineering densely packed arrays of rare earth silicide nanowires on Si(001)", *IEEE-NANO 2003*, 2, 208.
48. C-X. Ji, , F. Lu, Y. A. Chang, **J. Joshua Yang**, M. Rzechowski , 2008, "Growth and physical property of epitaxial Co₇₀Fe₃₀ thin film on Si substrate via TiN buffer", *APPLIED PHYSICS LETTERS*, 92, 022504.
49. H. Xiang, C.-X. Ji, **J. Joshua Yang**, Y. Austin Chang, 2010, "Compositional effect of bcc Co_{100-x}Fe_x electrodes on magnetoresistance in AlO_x-based magnetic tunnel junctions" *APPLIED PHYSICS A*, 98, 707.
50. J. L. Borghetti, D. B. Strukov, M. D. Pickett, **J. Joshua Yang** and R. S. Williams, 2009, "Electrical transport and thermometry of electroformed titanium dioxide memristive switches" *JOURNAL OF APPLIED PHYSICS*, 106, 124504.
51. M. Pickett, D. Strukov , J. L. Borghetti , **J. Joshua Yang** , G. Snider , D. R. Stewart and R. S. Williams, 2009, "Switching dynamics in a titanium dioxide memristive device" *JOURNAL OF APPLIED PHYSICS* 106, 074508.
52. C. X. Ji, P. E. Ladwig, R. D. Ott, Y. Yang, **J. Joshua Yang**, Y. A. Chang, E. S. Linville, J. Gao, and B. B. Pant, 2006, "An investigation of phase transformation behavior in sputter-

-
- deposited PtMn thin films”, *JOURNAL OF THE MINERALS METALS AND MATERIALS SOCIETY*, 58, 50.
53. Q. Xia, M. D. Pickett, J. Borghetti, **J. Joshua Yang**, X. Li, W. Wu, G. Medeiros-Ribeiro and R. S. Williams, 2011, “Impact of geometry on the performance of memristive nanodevices” *NANOTECHNOLOGY*, 22, 254026.
 54. Q. Xia, W. M. Tong, W. Wu, **J. Joshua Yang**, X. Li, W. Robinett, T. Cardinali, M. Cumbie, J. E. Ellenson, P. Kuekes, R. S. Williams, “On the integration of memristors with CMOS using nanoimprint lithography”, 2009, *PROCEEDINGS OF THE SPIE*, 7271, 727106.
 55. D. Strukov, D. Stewart, J. Borghetti, X. Li, M. Pickett, G. Medeiros-Ribeiro, W. Robinett, G. Snider, J. Strachan, W. Wu, Q. Xia, **J. Joshua Yang**, R. S. Williams, “Hybrid CMOS/Memristor circuits”, 2010, *ISCAS 2010: IEEE INTERNATIONAL SYMPOSIUM ON CIRCUITS AND SYSTEMS* proceeding, 1967.
 56. Wei Yi, Frederick Perner, M. Shakeel Qureshi, Hisham Abdalla, Matthew D. Pickett, **J. Joshua Yang**, Gilberto Medeiros-Ribeiro, R. Stanley Williams, “Feedback write scheme for memristive switching devices”, 2010, *APPLIED PHYSICS A*, 102, 973.
 57. Q. Xia, M. D. Pickett, **J. Joshua Yang**, X. Li, W. Wu, G. Medeiros-Ribeiro and R. S. Williams, “Two- and Three-Terminal Resistive Switches: Nanometer-scale Memristors and Memistors”, 2011, *ADVANCED FUNCTIONAL MATERIALS*, 21, 2660.
 58. M. D. Pickett, J. Borghetti, **J. Joshua Yang**, G. Medeiros-Ribeiro and R. S. Williams, “Coexistence of memristance and negative differential resistance in a nanoscale metal-oxide-metal system”, 2011, *ADVANCED MATERIALS*, 23, 1730.
 59. P. Fernández-Siles, B. S. Archanjo, D. L. Baptista, **J. Joshua Yang**, B. R. A. Neves, G. Medeiros-Ribeiro, “Nanoscale Lateral switchable rectifiers fabricated by Local Anodic Oxidation”, 2011, *JOURNAL OF APPLIED PHYSICS*, 110, 024511.
 60. G. Medeiros Ribeiro, **J. Joshua Yang**, Janice Nickel, Antonio Torrezan, John Paul Strachan and R. Stan Williams, “Designing memristors: physics, materials science and engineering”, 2012, *INTERNATIONAL SYMPOSIUM ON CIRCUITS AND SYSTEMS (ISCAS 2012)* 2513.
 61. C. J. Xue, Y. Zhang, Y. Chen, G. Sun, **J. Joshua Yang**, H. Li, “Emerging Non-Volatile Memories: Opportunities and Challenges”, 2011, *PROCEEDING OF CODES+ISSS 2011*, 325-334.
 62. G. Medeiros-Ribeiro, J. H. Nickel, **J. Joshua Yang**, “Progress in CMOS-memristor integration”, 2011, *PROCEEDING OF THE INTERNATIONAL CONFERENCE ON COMPUTER-AIDED DESIGN (ICCAD)*.
 63. F. Miao, W. Yi, I. Goldfarb, **J. Joshua Yang**, M.-X. Zhang, M. D. Pickett, J. P. Strachan, G. Medeiros-Ribeiro, and R. S. Williams, “Continuous electrical tuning of chemical composition of TaOx-based memristors”, 2012, *ACS NANO*, 6, 2312.
 64. F. Y. Shi, H. Xiang, **J. Joshua Yang**, M. S. Rzchowski, Y. A. Chang, and P. M. Voyles, “Inverse TMR in a nominally symmetric CoFe/AlOx/CoFe junction induced by interfacial Fe3O4 investigated by STEM-EELS”, 2012, *JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS*, 324, 1837.
 65. L. Hyung Dong, S. G. Kim, K. Cho, H. Hwang, H. Choi, J. Lee, S. H. Lee, H. J. Lee, J. Suh, S. Chung, Y. S. Kim, K. S. Kim, W. S. Nam, J. T. Cheong, J. T. Kim, S. Chae, E. Hwang, S. N. Park, Y. S. Sohn, C. G. Lee, H. S. Shin, K. J. Lee, K. Hong, H. G. Jeong, K. M. Rho, Y. K. Kim, J. Nickel, **J. Joshua Yang**, H. S. Cho, F. Perner, R. S. Williams, J. H. Lee, S. K. Park, and S. Hong, “Integration of 4F2 selector-less crossbar array 2Mb ReRAM based on transition metal oxides for high density memory applications”, 2012, *VLSI Technology (VLSIT) 2012 Symposium on* 151-152.
 66. L. Zhang, Z. Chen, **J. Joshua Yang**, B. Wysocki, N. McDonald, and Y. Chen, “A compact modeling of TiO₂-TiO_{2-x} memristor”, 2013, *APPLIED PHYSICS LETTERS*, 102, 103503.
 67. J. P. Strachan, A. C. Torrezan, F. Miao, M. D. Pickett, **J. Joshua Yang**, W. Yi, G. Medeiros-Ribeiro, and R. S. Williams, “State Dynamics and Modeling of Tantalum Oxide Memristors”, 2013, *IEEE TRANSACTIONS ON ELECTRON DEVICES*, 60, 2194.

68. P. R. Mickel, A. J. Lohn, B. J. Choi, **J. Joshua Yang**, M.-X. Zhang, M. J. Marinella, C. D. James, and R. S. Williams, "A physical model of switching dynamics in tantalum oxide memristive devices", 2013, *APPLIED PHYSICS LETTERS*, 102, 223502.
69. I. Goldfarb, D. A. A. Ohlberg, J. P. Strachan, M. D. Pickett, **J. Joshua Yang**, G. Medeiros-Ribeiro, and R. S. Williams, "Band offsets in transition-metal oxide heterostructures," 2013, *JOURNAL OF PHYSICS: D*, 46, 295303.
70. I. Goldfarb, F. Miao, **Joshua Yang**, W. Yi, J. Strachan, M. X. Zhang, M. Pickett, G. Medeiros-Ribeiro, and R. Williams, "Electronic structure and transport measurements of amorphous transition-metal oxides: observation of Fermi glass behavior," 2012, *APPLIED PHYSICS A*, 107, 1.
71. W. Yi, S. E. Savel'ev, G. Medeiros-Ribeiro, F. Miao, J. Joshua Yang, A. M. Bratkovsky, and R. S. Williams, "Quantized conductance, switching instability and noise in tantalum oxide memristors, 2013, *NATURE COMMUNICATION*, under review.
72. J.-W. Han, B. J. Choi, **J. Joshua Yang**, D.-I Moon, Y.-K. Choi, R. S. Williams and M. Meyyappan, "A replacement of high-k process for CMOS transistor by atomic layer deposition", 2013, *SEMICONDUCTOR SCIENCE AND TECHNOLOGY*, 28, 082003.
73. J. P. Strachan, **J. Joshua Yang**, L. A. Montoro, C. A. Ospina, A. J. Ramirez, A. L. D. Kilcoyne, G. Medeiros-Ribeiro, and R. S. Williams, " Characterization of electroforming-free titanium dioxide memristors", 2013, *BEILSTEIN JOURNAL OF NANOTECHNOLOGY*, 4, 467-473.
74. W. G. Kim, H. M. Lee, B. Y. Kim, K. H. Jung, T. G. Seong, S. Kim, H. C. Jung, H. J. Kim, J. H. Yoo, H. D. Lee, S. G. Kim, S. Chung, K. J. Lee, J. H. Lee, H. S. Kim, S. H. Lee, **J. Joshua Yang**, Y. Jeon, and R. S. Williams, "NbO₂-based Low Power and Cost Effective 1S1R Switching for High Density Cross Point ReRAM Application", 2014, VLSI Technology (VLSIT) 2012 Symposium on 151-152.
75. L. Zhang, N. Ge, **J. Joshua Yang**, Z. Li, R. S. Williams, and Y. Chen, "Low voltage two-state-variable memristor model of vacancy-drift resistive switches", 2015, *APPLIED PHYSICS A (invited paper)*, 119, 1-9.
76. N. Ge, M-X Zhang, L. Zhang, **J. Joshua Yang***, Z. Li, and R. S. Williams, "Electrode-material dependent switching in TaOx memristors", 2014, *SEMICOND. SCI. TECHNOL.* 29, 104003.
77. K. J. Norris, **J. Joshua Yang**, N. P. Kobayashi, "TEM and EELS Study on TaOx-based Nanoscale Resistive Switching Devices", 2015, *MRS Proceeding*, 1805.
78. K. J. Norris, **J. Joshua Yang**, N. P. Kobayashi, "Structural and Chemical Analysis of Nanoscale Resistive Switching Devices: Assessment on Nonlinear Properties", 2015, *MRS Proceeding*, 1805.
79. M. Wang, X. Lian, Y. Pan, B. Wang, J. Joshua Yang, F. Miao, and D. Xing, "A selector device based on graphene-oxide heterostructures for memristor crossbar applications", 2015, *APPLIED PHYSICS A* 120, 403-407.
80. B. J. Choi, J. Zhang, K. Norris, G. Gibson, K. M. Kim, W. Jackson, M. Zhang, Z. Li, **J. Joshua Yang***, and R. Stanley Williams, "Trilayer Tunnel Selectors for Memristor Memory Cells", 2015, *ADVANCED MATERIALS (accepted)*.
81. B. J. Choi, A. C. Torrezan, J. P. Strachan, P. G. Kotula, A. J. Lohn, M. J. Marinella, R. S. Williams and **J. Joshua Yang***, "High-speed and low-energy nitride memristors", 2015, *ADVANCED FUNCTIONAL MATERIALS (submitted)*.
82. K. M. Kim, **J. Joshua Yang**, E. Merced, C. Graves, S. Lam, N. Davila, M. Hu, N. Ge, Z. Li, R. S. Williams, and C. S. Hwang, "Low Variability Resistor-Memristor Circuit Masking the Actual Memristor States", 2015, *ADVANCED ELECTRONIC MATERIALS* 1, 1500095.
83. **J. Joshua Yang***, G. Medeiros-Ribeiro, "Oxide Based Memristive Nanodevices", 2015, In *Emerging Non-Volatile Memories* (pp. 219-256). Springer US).
84. J. Zhang, K. Norris, K. Samuels, N. Ge, M. Zhang, J. Park, R. Sinclair, G. Gibson, **J. Joshua Yang**, Z. Li and R. S. Williams, "Electron Energy-Loss Spectroscopy (EELS) Study of NbOx Film for Resistive Memory Applications", 2015, *MICROSCOPY AND MICROANALYSIS*, 21, 285.

85. X. Liu; M. Mao, H. Li, Y. Chen, H. Jiang, J. Joshua Yang, Q. Wu, M. Barnell, "A heterogeneous computing system with memristor-based neuromorphic accelerators", 2015, in *High Performance Extreme Computing Conference (HPEC), 2014 IEEE*, pp.1-6, 9-11.
86. K. M. Kim, J. Joshua Yang, J. P. Strachan, E. M. Grafals, N. Ge, N. D. Melendez, Z. Li, and R. S. Williams, "Voltage divider effect for the improvement of variability and endurance of TaOx memristor", 2015, *SCIENTIFIC REPORTS (accepted)*.
87. Z. Wang, H. Jiang, **J. Joshua Yang**, and Qiangfei Xia, "A physical model for the coexistence of unipolar and bipolar resistive switching and the polarity change in transition metal oxides", 2015, *to be submitted*.
88. W. Yi, S. E. Savel'ev, G. Medeiros-Ribeiro, F. Miao, M.-X. Zhang, **J. Joshua Yang**, A. M. Bratkovsky, and R. S. Williams, "Enhanced noise at quantum conductance in memristors", 2015, *NATURE COMMUNICATION (accepted)*.
89. C. Li, L. Han, H. Jiang, M. Jang, **J. Joshua Yang**, H. L. Xin and Q. Xia, "3-Dimensional Crossbar Arrays of Self-rectifying Si/SiO₂/Si Memristors", 2015, *NATURE COMMUNICATION (under review)*.
90. R. Waser, D. Ielmini, H. Akinaga, H. Shima, H.-S. P. Wong, **J. Joshua Yang**, S. Yu, "Introduction to nanoionic elements for information technology", *Resistive switching – from fundamentals of nanoionic redox processes to memristive device applications*, (Chapt. 1, P1, Wiley-VCH).
91. B. J. Choi, A. C. Torrezan, J. P. Strachan, P. G. Kotula, A. J. Lohn, M. J. Marinella, R. S. Williams and **J. Joshua Yang***, "High-speed and low-energy nitride memristors", 2015, *ADVANCED FUNCTIONAL MATERIALS (submitted)*.
92. X. Liu, M. Mao, B. Liu, B. Li, Y. Wang, H. Jiang, M. Barnell, Q. Wu, **J. Joshua Yang**, H. Li, Y. Chen, "Harmonica: A Framework of Heterogeneous Computing Systems with Memristor-based Neuromorphic Computing Accelerators", *IEEE TRANSACTIONS ON CAS I* 2016. (*accepted*)
93. H. Jiang, L. Han, P. Lin, Z. Wang, M. H. Jang, J. Joshua Yang, H. Xin, and Q. Xia, "Sub-10 nm Ta channel responsible for superior performance of a HfO₂ memristor", *Nano Letters* (under review) 2016.
94. M. Hu, J. P. Strachan, Z. Li, E. M. Grafals, N. Davila, C. Graves, S. Lam, N. Ge, R. S. Williams, **J. Joshua Yang**, "Dot-Product Engine for Neuromorphic Computing: Programming 1T1M Crossbar to Accelerate Vector-Matrix Multiplication", *the 53rd Design Automation Conference (DAC)*, 2016. (*accepted*)

Invited Talks:

1. **J. Joshua Yang**, 2009, *The 10th Non-volatile memory technology symposium (NVMTS09)*, Portland, Oregon.
2. **J. Joshua Yang**, "Oxide based memristive nanodevices", 2009, *International Conference on Communications, Circuits and Systems 2009 (ICCCAS 2009)* San Jose, California.
3. **J. Joshua Yang**, "Oxide based memristive junctions: switching, forming and device family", 2009, *Seminar*, University of California, Santa Cruz, California.
4. **J. Joshua Yang**, Seminar, 2009, Seoul National University, Korea.
5. **J. Joshua Yang**, M. D. Pickett, F. Miao, J. Borghetti, D. A. A. Ohlberg, D. R. Stewart, G. M. Ribeiro, and R. S. Williams, "Metal/oxide/metal memristive devices", 2009, *The 7th International Conference on Advanced Materials and Devices (ICAMD 2009)*, Jeju island, KOREA.
6. **J. Joshua Yang**, "Resistance Memory Nanoelectronics", May/2009, *Invited Lecture*, UCSC-NASA Ames Research Center, Mountain View, California.
7. **J. Joshua Yang**, R. S. Williams, "The memristor at age 40", 2010, *International Symposium on Materials for Enabling Nanodevices*, UCLA, California. (**Plenary talk**)
8. **J. Joshua Yang**, "Applications and property engineering of memristive nanodevices", 2010, *Advances in nonvolatile memory materials and devices*, Suzhou, China.
9. **J. Joshua Yang**, "Memristive Nanodevices", 2010, *Seminar*, Peking University, Beijing, China.

10. **J. Joshua Yang**, J. P. Strachan, J. Borghetti, M. D. Pickett, Q. Xia, D. A. A. Ohlberg, D. R. Stewart, G. M. Ribeiro, and R. S. Williams, "Engineering control and applications of oxide based nano-switches", 2010, *International Symposium on Integrated Functionalities (ISIF 2010)*, San Juan, Puerto Rico.
11. **J. Joshua Yang**, "Oxide based nanoswitches", 2010, *Seminar*, Chinese Academy of Science, Beijing, China.
12. **J. Joshua Yang**, "Engineering control over device properties of memristors for immediate applications", 2010, *Julius Springer Forum on Applied Physics*, Stanford University, CA.
13. **J. Joshua Yang**, M. -X. Zhang, J. P. Strachan, J. Borghetti, M. D. Pickett, F. miao, Q. Xia, D. A. A. Ohlberg, J. H. Nickel, G. M. Ribeiro, R. S. Williams "Recent progress on oxide based memristive devices in HP", 2011, *Non-volatile memories workshop*, University of California - San Diego, California.
14. **J. Joshua Yang**, "Memristors in Computing: Promises and Challenges", 2011, *seminar*, IEEE Computer Society, San Jose California.
15. **J. Joshua Yang**, "Metal oxide based nonvolatile memories - promises and challenges", 2011, *IEEE Electronic Device Society*, Santa Clara, California.
16. **J. Joshua Yang**, "Promises and challenges of Memristive switches", 2011, *11th Non-Volatile Memory Technology Symposium*, Shanghai, China. **(Keynote)**
17. **J. Joshua Yang**, "Oxide based memristive devices", 2011, *Frontier of Functional-Oxide Nano Electronics workshop*, Tsukuba, Japan.
18. **J. Joshua Yang**, "Memristive Nanodevices: mechanism, promises and challenges", 2012, *Seminar*, University of Pittsburgh, Pittsburgh, Pennsylvania.
19. **J. Joshua Yang**, "Oxide based Memristive Nanodevices", 2012, *Seminar*, Michigan State University, East Lansing, Michigan.
20. **J. Joshua Yang**, "Mermistor technology development", 2012, *seminar*, Finisar corp. Sunnyvale California.
21. **J. Joshua Yang**, "Oxide based memristive devices", 2012, *IEEE International Conference on Solid-State and Integrated Circuit Technology*, 2012, Xi'an, China.
22. **J. Joshua Yang**, "TaOx based memristive devices", 2012, *12th Non-Volatile Memory Technology Symposium*, Singapore.
23. **J. Joshua Yang**, "Memristive Nanodevices: Mechanisms, Applications and Challenges", 2012, *IEEE SINGAPORE REL/CPMT/ED CHAPTER*, Singapore.
24. **J. Joshua Yang**, "TaOx Memristive Nano-devices: Mechanism, Applications and Challenges", 2012, *Advanced Memory Workshop*, NCCAVS Thin Film Users Group, California.
25. **J. Joshua Yang**, "Memristive nanodevices for computing", 2013, *The 57th International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication (EIPBN)*, Tennessee.
26. **J. Joshua Yang** "The Memristor" *LASERION international workshop*, 2013, Munich, Germany.
27. **J. Joshua Yang** "Memristive Devices for Computing", 2013, *IEEE SCV Electron Devices Society*, Santa Clara, California.
28. **J. Joshua Yang** "Memristive nanodevices: mechanisms, promises and challenges", 2013, *seminar*, University of California, Berkeley, California.
29. **J. Joshua Yang** "Memristive Devices for Computing", 2013, *The 224th Electrochemical Society Meeting, ULSI Process Integration Symposium*, San Francisco, California. **(Keynote)**
30. **J. Joshua Yang**, *Special Lecture*, AirForce Research Lab, Rome, New York (2013). **(Chief Scientist Lecture Series)**
31. **J. Joshua Yang**, "Memristive Nanodevices", *Nano and Giga 2014*, Phoenix, Arizona.
32. **J. Joshua Yang**, "Memristive materials and Devices", 2014, *Seminar*, Tsinghua University, Beijing, China.
33. **J. Joshua Yang**, "Challenges and Materials Solutions for Memristive Devices (ReRAM)", *MRS Spring 2014*, San Francisco, California.
34. **J. Joshua Yang**, "The material perspective ReRAM" *The IEEE International Symposium on Circuits and Systems (ISCAS)*, FEST 2014, Melbourne, Australia. **(Keynote)**

-
35. **J. Joshua Yang**, "Tutorial on Memristive devices" *the 29th Symposium on on Microelectronics Technology and Devices, 2014 (SBMICRO 2014, Chip in Aracaju)*, Aracaju, Brazil.
 36. **J. Joshua Yang**, "Memristive Devices for Computing" *Global Forum on Nanoelectronic Manufacturing: From Materials to Systems*, 2014 Mumbai, India.
 37. **J. Joshua Yang**, "Challenges and solutions of memristors for Neuromorphic Computing" *the International Symposium on Neuromorphic Systems and Cyborg Intelligence*, 2014, Hangzhou, China.
 38. **J. Joshua Yang**, "Materials Perspective of Memristive Devices", 2014, *IEEE International Conference on Solid-State and Integrated Circuit Technology*, 2014, Guilin, China.
 39. **J. Joshua Yang**, "Challenges and Solutions for Memristive Devices", *The AVS 61st International Symposium & Exhibition*, 2014, Baltimore, Maryland.
 40. **J. Joshua Yang**, "RRAM tutorial", *MRS Fall Meeting 2014*, Boston, Massachusetts.
 41. **J. Joshua Yang**, "Resistance switching: applications, mechanisms and challenges", 2015, *Seminar*, HGST, San Jose, California.
 42. **J. Joshua Yang**, "Memristive Devices (ReRAM): Challenges and Possible Solutions", *MRS Fall Meeting 2015*, Boston, Massachusetts.
 43. **J. Joshua Yang**, "Promises and challenges of memristive devices", *15th INTERNATIONAL CONFERENCE ON NANOTECHNOLOGY (IEEE Nano 2015)* 2015, Rome, Italy.
 44. **J. Joshua Yang**, "Memristive nanodevices for computing - challenges and solutions", *China Semiconductor Technology International Conference 2015 (IEEE CSTIC 2015)* 2015, Shanghai, China.
 45. **J. Joshua Yang**, "Memristive nanodevices for computing - challenges and solutions", *Advances in ReRAM : Materials and Interfaces 2015*, Crete, Greece. **(Keynote)**
 46. **J. Joshua Yang**, "Challenges and possible solutions for memristive devices", *15th Non-Volatile Memory Technology Symposium (IEEE NVMTS 2015)*, 2015 Beijing, China.
 47. **J. Joshua Yang**, "A versatile two-terminal device enables different applications of resistance switches" *The IEEE International Symposium on Circuits and Systems (ISCAS)*, 2016, Montréal, Canada.
 48. **J. Joshua Yang**, "Materials issues in memristive devices", *145th TMS annual meeting*, 2016, Nashville, Tennessee.
 49. **J. Joshua Yang**, "Different applications of memristors enabled by selector devices", *China Semiconductor Technology International Conference*, 2016, Shanghai, China.
 50. **J. Joshua Yang**, "Memristor Mate devices", *International Workshop on Information Storage/10th International Symposium on Optical Storage (IWIS/ISOS 2016)*, Changzhou, China. **(Keynote)**
 51. **J. Joshua Yang**, "A versatile two-terminal device enables different applications of resistance switches" *The IEEE International Symposium on Circuits and Systems (ISCAS)*, 2016, Montréal, Canada.
 52. **Z. Wang, S. Joshi, J. Joshua Yang J. Joshua Yang**, "Engineered materials for memristor mate" *International Conferences on Modern Materials and Technologies (CIMTEC)*, 2016, Perugia, Italy.
 53. **J. Joshua Yang**, "Engineered materials for memristor mate" *58th Electronic Materials Conference*, 2016, Newark, Delaware.
 54. **J. Joshua Yang**, "non-volatile memories" *230th Meeting of Electrochemical Society*, 2016, Honolulu, Hawaii.
 55. **J. Joshua Yang**, "Emerging Materials and Technologies for Nonvolatile Memories", *MRS Fall Meeting 2016*, Boston, Massachusetts.