

**Vivek Subramanian**

**@EPFL:**  
Rue de la Maladière 71  
CH-2000 Neuchâtel,  
Switzerland  
[Vivek.subramanian@epfl.ch](mailto:Vivek.subramanian@epfl.ch)  
Ph: +41 21 695 42 65

**@ Virtual Mailbox**  
13809 Research Blvd Suite 500  
PMB 91298  
Austin, TX 78750, USA  
[viveksub94563@gmail.com](mailto:viveksub94563@gmail.com)  
Ph: +1 510 842 7763

**@ Berkeley**  
[viveks@eecs.berkeley.edu](mailto:viveks@eecs.berkeley.edu)

**Education**

3 / 96 - 6 / 98

**Ph.D. in Electrical Engineering, Stanford University**  
**Stanford, California**

Honors earned: Graduate Fellowship, Eastman Kodak Company

9 / 94 - 3 / 96

**MS in Electrical Engineering, Stanford University**  
**Stanford, California**

8 / 90 - 5 / 94

**BS in Electrical Engineering, Louisiana State University**  
**Baton Rouge, Louisiana**

Honors earned: Summa cum laude, College Honors, Outstanding Senior, Junior and Sophomore, Honors College

**Professional Experience**

2018 - present

**École polytechnique fédérale de Lausanne, Switzerland**

2021 – present: Director, Micromanufacturing Science and Engineering Center (M2C)

2021 – present: Associate Director, Institute of Electrical and Micro Engineering (IEM)

2021 – present: Scientific Board, Swiss National Strategic Focus Area – Advanced Manufacturing (SFA-AM)

8/18 – present: Professor

2000 - present

**Department of Electrical Engineering & Computer Sciences, University of California**  
**Berkeley, CA**

7/20 to date : Adjunct Professor

7/11 – 6/20: Professor

7/05 – 7/11: Associate Professor

7/00-7/05: Assistant Professor

**Honors Earned:**

2015 IEEE Kiyo Tomiyasu Award

Best in session and best in track awards, 2013 IMAPS Microelectronics Conference

Outstanding paper award, 2012 IMAPS Microelectronics Conference

2008 Printed Electronics Champion, Printed Electronics USA Conference

Outstanding Teaching Award, EECS Department, UC Berkeley, 2005

Best paper award, 2004 IEEE Device Research Conference

Nominated to MIT's Technology Review top 100 young innovators list (TR100), 2002

National Science Foundation Young Investigator (CAREER) Award, FY2002,

Nominated to National Academy of Engineering's Frontiers of Engineering, 2002

2002 Paul Rappaport Award for best paper in an IEEE EDS Journal

2009 - 2018

**Professor, World Class University Program, Sunchon National University**  
**Sunchon, Korea**

Principal Investigator leading large research program focused on developing a new department in the area of printed electronics including 9 faculty covering multiple disciplines and 3 different countries

2000 - present

**Independent Consultant**

Consultant to the semiconductor industry and its associated fields in the following areas:

Memory technology and design

Silicon Process Technology

Display / Imager and Flexible Electronics Technology

RFID Technology

Intellectual Property Consulting

Technology Evaluation / Venture Capital due diligence

2014 – 2022	<p><b>Founder and CTO, Locix Inc.</b>  <b>San Bruno, CA</b>  Senior leadership role in venture-funded startup company working on wireless networking</p>
2004 – 2013	<p><b>Founding Scientific Advisor, Kovio, Inc.</b>  <b>Sunnyvale, CA</b>  Scientific advising to printed electronics startup company</p>
2008 – 2011	<p><b>Chief Technical Advisor, QuSwami, Inc.</b>  <b>San Francisco, CA</b>  Scientific advising to energy conversion device startup company</p>
1998-2000	<p><b>Consulting Assistant Professor, Electrical Engineering Department, Stanford University.</b>  <b>Stanford, CA</b>  Advisory role for research group of Prof. Krishna C. Saraswat</p>
1998-2000	<p><b>Visiting Research Engineer, Electrical Engineering Department, University of California.</b>  <b>Berkeley, CA</b>  Research into 25nm MOSFET technologies for giga-scale integration</p>
1998 - 2000	<p><b>Founder, Matrix Semiconductor, Inc.</b>  <b>Santa Clara, CA</b>  Co-founder and technical advisor of startup company working on high-density memory technology</p> <p><b>Honors Earned:</b>  Nominated to Scientific American’s SA50 List for Visionary Technology  Finalist for 2003 World Technology Award for Information Technology Hardware  Winner, 2005 EDN Innovation Award</p>
1998	<p><b>Co-instructor, Electrical Engineering Department, Stanford University.</b>  <b>Stanford, CA</b>  Co-teaching of EE311, Advanced Integrated Circuit Fabrication Processes</p>
1997	<p><b>Intern, Advanced Product Research and Development Laboratory, Motorola Inc.</b>  <b>Austin, TX</b>  Research into process development issues affecting SiGe SEMFET devices</p>
1996	<p><b>Head Teaching Assistant EE410: IC Fabrication Laboratory, Stanford University</b>  <b>Stanford, CA</b>  Coordination and instruction of EE410, graduate level laboratory course.</p>
1994-1998	<p><b>Research Assistant, Electrical Engineering, Stanford University</b>  <b>Stanford, CA</b>  Research into crystallization of amorphous Si and SiGe films using low thermal budget processes.</p> <p><b>Professional Affiliations and Activities</b>  Program Committee, IEEE Electronic Components and Technology Conference, 2014 to 2016  Chair, Scientific Board, iPACK, Royal Institute of Technology (KTH), Sweden, 2011 to 2016  Tampere Institute of Technology Faculty Search Committee, Finland, 2013  University of Oulu Faculty Search Committee, Finland, 2013  Served as external thesis committee member for several universities world-wide, including University of Cape Town (South Africa), Tampere Institute of Technology (Finland), Technical University of Eindhoven (Netherlands), Indian Institute of Science (India), Indian Institute of Technology (India), 2009 to date  Associate Editor, IEEE Journal of Display Technology, 2008 to date  Technical Program Chair, Large Area, Organic, and Printed Electronics Conference, 2012-2013  Scientific Committee, Large Area, Organic, and Printed Electronics Conference, 2009-2011  Scientific Committee, International Conference on Printed and Flexible Electronics, 2009-2013  IEEE Electron Devices Society Organic Electronics Committee, 2003 - 2005 Executive Committee, International Electron Device Meeting, 2003 to 2009 Technical Program Committee, International Electron Device Meeting, 2001-2002 Technical Program Committee member, Device Research Conference, 2000-2002  Technical Program Committee member, VLSI-TSA Conference, 2005  Member, Institute of Electrical and Electronic Engineers</p>

## List of Patents, Publications and Presentations

### Patents

1. “Systems and methods for precise radio frequency localization in the presence of multiple communication paths”, M Seth, L Kong, T Ylamurto, V Subramanian, US Patent 12,108,362
2. “Systems and methods for providing wireless asymmetric network architectures of wireless devices with power management features”, V Subramanian, E Alon, V Pavate, US Patent 11,924,757
3. “Systems and methods for precise radio frequency localization in the presence of multiple communication paths”, M Seth, L Kong, T Ylamurto, V Subramanian, US Patent 11,683,779
4. “Systems and methods for using radio frequency signals and sensors to monitor environments”, T. Bakhishev, V. Subramanian, V. Pavate, T. Ylamurto, US Patent 11,327,147
5. “Systems and methods for using radio frequency signals and sensors to monitor environments”, T. Bakhishev, V. Subramanian, V. Pavate, T. Ylamurto, US Patent 11,276,308
6. “Systems and methods for coarse and fine time of flight estimates for precise radio frequency localization in the presence of multiple communication paths”, M. Seth, L. Kong, T. Ylamurto, V. Subramanian, US Patent 11,228,999
7. “Systems and methods for using radio frequency signals and sensors to monitor environments”, T. Bakhishev, V. Subramanian, V. Pavate, T. Ylamurto, US Patent 11,030,902
8. “Systems and methods for precise radio frequency localization in the presence of multiple communication paths”, M. Seth, L. Kong, T. Ylamurto, V. Subramanian, US Patent 10,757,675
9. “Systems and methods for using ranging to determine locations of wireless sensor nodes based on radio frequency communications between the nodes and various RF-enabled devices”, T. Ylamurto, M. Seth, L. Kong, V. Subramanian, US Patent 10,551,479
10. “Systems and methods for providing communications within wireless sensor networks based on a periodic beacon signal”, T. Ylamurto, V. Pavate, E. Alon, V. Subramanian, US Patent 10,536,901
11. “Systems and methods for using radio frequency signals and sensors to monitor environments”, T. Bakhishev, V. Subramanian, V. Pavate T. Ylamurto, US Patent 10,514,704.
12. “Systems and methods for using radio frequency signals and sensors to monitor environments”, T. Bakhishev, V. Subramanian, V. Pavate T. Ylamurto, US Patent 10,504,364
13. “Systems and methods for coarse and fine time of flight estimates for precise radio frequency localization in the presence of multiple communication paths”, M. Seth, L. Kong, T. Ylamurto, V. Subramanian, US Patent 10,470,156
14. “Methods and apparatus for monitoring wound healing using impedance spectroscopy”, M. Maharbiz, V. Subramanian, A. C. Arias, S. Swisher, A. Liao, M. Lin, F. Pavinatto, Y. Khan, D. Cohen, E. Leeftang, S. Roy, M. Harrison, D. Young, US Patent 10,463,293
15. “Systems and methods for using radio frequency signals and sensors to monitor environments”, T. Bakhishev, V. Subramanian, V. Pavate T. Ylamurto, US Patent 10,156,852.
16. “Systems and methods for determining locations of wireless sensor nodes in a tree network architecture having mesh-based features”, L. Kong, T. Bakhishev, T. Ylamurto, V. Subramanian, M. Seth, US Patent 10,104,508.
17. “Systems and methods for providing wireless asymmetric network architectures of wireless devices with power management features”, V. Subramanian, E. Alon, V. Pavate, US Patent 10,028,220.
18. “Random delay generation for thin-film transistor based circuits”, V Subramanian, M Mao, Z Wang, US Patent 9,985,664
19. “Systems and methods for determining locations of wireless sensor nodes in a network architecture having mesh-based features for localization”, L. Kong, T. Bakhishev, T. Ylamurto, V. Subramanian, M. Seth, US Patent 9,846,220
20. “Systems and methods for determining locations of wireless sensor nodes in a tree network architecture having mesh-based features”, L. Kong, T. Bakhishev, T. Ylamurto, V. Subramanian, M. Seth, US Patent 9,763,054
21. “Through silicon vias and thermocompression bonding using inkjet-printed nanoparticles”, V. Subramanian and J. Sadie, US Patent 9,717,145

22. "Systems and methods for providing wireless asymmetric network architectures of wireless devices with anti-collision features", V. Subramanian, E. Alon, V. Pavate, US Patent 9,706,489
23. "Systems and methods for determining locations of wireless sensor nodes in an asymmetric network architecture", V. Subramanian, E. Alon, V. Pavate, US Patent 9,529,076
24. "Systems and methods for providing wireless sensor networks with an asymmetric network architecture", V. Subramanian, E. Alon, V. Pavate, US Patent 9,380,531
25. "Transparent metal oxide nanoparticle compositions, methods of manufacture thereof and articles comprising the same", V. Subramanian, S. K. Volkman, US Patent 9,343,202
26. "Three-dimensional nonvolatile memory and method of fabrication", M. G. Johnson, T. H. Lee, V. Subramanian, P. M. Farmwald, J. M. Cleeves, US Patent 9,214,243
27. "Dense arrays and charge storage devices", T. H. Lee, V. Subramanian, J. M. Cleeves, I. G. Kouznetsov, M. G. Johnson, P. M. Farmwald, US Patent 9,171,857
28. "Print compatible designs and layout schemes for printed electronics", Z. Wang, V. Subramanian, L. Cleveland, US Patent 9,155,202
29. "Wireless devices including printed integrated circuitry and methods for manufacturing and using the same", P. Smith, C. Choi, V. Pavate, J. M. Cleeves, V. Subramanian, R. Young, V. Biviano, US Patent 9,004,366.
30. "Dense arrays and charge storage devices", T. H. Lee, V. Subramanian, J. M. Cleeves, M. G. Johnson, P. M. Farmwald, I. Kouznetsov, US Patent, 8,981,457.
31. "High reliability surveillance and/or identification tag/devices and methods of making and using the same", V. Subramanian, P. Smith, V. Pavate, A. Kamath, C. Choi, A. Chandra, J. M. Cleeves, US Patent, 8,933,806.
32. "Surveillance devices with multiple capacitors", P. Smith, C. Choi, J. M. Cleeves, V. Subramanian, A. Kamath, S. Molesa, US Patent, 8,912,890.
33. "Pillar-shaped nonvolatile memory and method of fabrication", M. G. Johnson, T. H. Lee, V. Subramanian, P. M. Farmwald, J. M. Cleeves, US Patent 8,897,056
34. "Dense arrays and charge storage devices", T. H. Lee, V. Subramanian, J. M. Cleeves, I. G. Kouznetsov, M. G. Johnson, P. M. Farmwald, US Patent 8,853,765
35. "Dense arrays and charge storage devices", T. H. Lee, V. Subramanian, J. M. Cleeves, I. G. Kouznetsov, M. G. Johnson, P. M. Farmwald, US Patent 8,823,076
36. "Random delay generation for thin-film transistor based circuits", V. Subramanian, M. Mao, Z. Wang, US Patent 8,810,298
37. "Vertically stacked field programmable nonvolatile memory and method of fabrication", M. Johnson, T. Lee, V. Subramanian, M. Farmwald, and J. M. Cleeves, US Patent 8,503,215
38. "Process-variation tolerant series-connected NMOS and PMOS diodes, and standard cells, tags, and sensors containing the same", V. Subramanian, P. Smith, US Patent 8,471,308
39. "Printed compatible designs and layout schemes for printed electronics", Z. Wang, V. Subramanian, L. Cleveland, US Patent 8,383,952
40. "Method for making surveillance devices with multiple capacitors", P. Smith, C. Choi, J. M. Cleeves, V. Subramanian, A. Kamath, S. Molesa, US Patent 8,296,943
41. "High reliability surveillance and/or identification tag/devices and methods of making and using the same", V. Subramanian, P. Smith, V. Pavate, A. Kamath, C. Choi, A. Chandra, and J. M. Cleeves, US Patent 8,264,359
42. "High reliability surveillance and/or identification tag/devices and methods of making and using the same", V. Subramanian, P. Smith, V. Pavate, A. Kamath, C. Choi, A. Chandra, and J. M. Cleeves, US Patent 8,227,320
43. "Vertically stacked field programmable nonvolatile memory and method of fabrication", M. Johnson, T. Lee, V. Subramanian, M. Farmwald, and J. M. Cleeves, US Patent 8208282
44. "Reliable tag deactivation", J. M. Cleeves, V. Subramanian, US Patent 8138921
45. "Combined static and dynamic frequency divider chains using thin film transistors", V. Subramanian, US Patent 8085068

46. "Process-variation tolerant diode, standard cells including the same, tags and sensors containing the same, and methods for manufacturing the same", V. Subramanian, P. Smith, US Patent 7932537
47. "Three terminal nonvolatile memory Device with vertical gated diode", T. H. Lee, V. Subramanian, J. M. Cleeves, M. G. Johnson, P. M. Farmwald, I. G. Kouznetsov, US Patent 7825455
48. "Vertically stacked field programmable nonvolatile memory and method of fabrication", V. Subramanian, J. M. Cleeves, US Patent 7816189
49. "Multi-mode tags and methods of making and using the same", P. Smith, J. M. Cleeves, V. Pavate, V. Subramanian, US Patent 7750792
50. "Method of manufacturing complementary diodes", V. Subramanian, P. Smith, US Patent 7528017
51. "Vertically stacked field programmable nonvolatile memory and method of fabrication", V. Subramanian, J. M. Cleeves, US Patent 7319053
52. "Vertically stacked field programmable nonvolatile memory and method of fabrication", V. Subramanian, J. M. Cleeves, US Patent 7265000
53. "Vertically stacked field programmable nonvolatile memory and method of fabrication", V. Subramanian, J. M. Cleeves, US Patent 7160761
54. "Vertically stacked field programmable nonvolatile memory and method of fabrication", V. Subramanian, J. M. Cleeves, US Patent 7157314
55. "Dense arrays and charge storage devices", T. H. Lee, V. Subramanian, J. M. Cleeves, A. J. Walker, C. Petti, I. Kouznetzov, M. G. Johnson, P. M. Farmwald, B. Herner, US Patent 7129538
56. "Patterning three dimensional structures", C. K. Li, J. N. Knall, M. A. Vyvoda, J. M. Cleeves, V. Subramanian, US Patent 7071565
57. "Monolithic three dimensional array of charge storage devices containing a planarized layer", T. H. Lee, V. Subramanian, J. M. Cleeves, A. J. Walker, C. J. Petti, I. G. Kouznetzov, M. G. Johnson, P. M. Farmwald, and B. Herner, US Patent 6881994
58. "Thermal processing for three dimensional circuits", V. Subramanian, J. M. Cleeves, J. N. Knall, C. K. Li, and M. A. Vyvoda, US Patent 6,770,939
59. "Vertically stacked field programmable nonvolatile memory and method of fabrication", M. G. Johnson, T. H. Lee, V. Subramanian, and P. M. Farmwald, US Patent 6780711
60. "Multigate semiconductor device with vertical channel current and method of fabrication", J. M. Cleeves and V. Subramanian, US Patent 6677204
61. "Thermal processing for three dimensional circuits", V. Subramanian, J. M. Cleeves, J. N. Knall, C. K. Li, and M. A. Vyvoda, US Patent 6624011
62. "Multigate semiconductor device with vertical channel current and method of fabrication", J. M. Cleeves and V. Subramanian, US Patent 6580124
63. "Patterning three dimensional structures", C. K. Li, J. N. Knall, M. A. Vyvoda, J. M. Cleeves, and V. Subramanian, US Patent 6627530
64. "Low cost three-dimensional memory array", M. Johnson, T. Lee, V. Subramanian, P. Farmwald, J. Knall, US Patent 6515888
65. "Integrated circuit structure including three-dimensional memory array", M. Johnson, T. Lee, V. Subramanian, P. M. Farmwald, J. M. Cleeves, US Patent 6385074.
66. "FINFET transistor structures having double gate channel extending vertically from a substrate and methods of manufacture", C. Hu, T-J. King, V. Subramanian, L. Chang, X. Huang, Y-K. Choi, J. T. Kedzierski, N. Lindert, J. Bokor, W-C. Lee, US Patent 6413802
67. "Vertically stacked field programmable nonvolatile memory and method of fabrication", M. Johnson, T. Lee, V. Subramanian, M. Farmwald, and J. M. Cleeves, US Patent 6185122.
68. "Vertically Stacked Field Programmable Nonvolatile Memory and Method of Fabrication", M. Johnson, T. Lee, V. Subramanian, M. Farmwald, and J. M. Cleeves, US Patent 6034882.

69. “Vertically Stacked Field Programmable Nonvolatile Memory and Method of Fabrication”, M. Johnson, T. Lee, V. Subramanian, M. Farmwald, and J. M. Cleaves, US Patent 6351406.
70. “Vertically Stacked Field Programmable Nonvolatile Memory and Method of Fabrication”, M. Johnson, T. Lee, V. Subramanian, M. Farmwald, and J. M. Cleaves, US Patent 6483736.

#### **Invited Magazine Articles, Books, Chapters, and Monographs**

1. Chapter in “Inkjet Technology for Digital Fabrication”, Editors: Ian M. Hutchings, Graham D. Martin, Wiley, ISBN: 978-0470681985
2. Chapter in “Applications of Organic and Printed Electronics: A Technology-Enabled Revolution (Integrated Circuits and Systems), Editor: E. Cantatore, ISB: 978-1-461-43159-6
3. Chapter in “Inkjet-based Micromanufacturing”, Editors: Korvink, Smith, Shin, Wiley, ISBN: 978-3-527-31904-6
4. Chapter in “Organic Electronics II. More Materials and Applications”, Editor: H. Klauk, Wiley, ISBN: 978-3-527-32647-1
5. Chapter in “Transparent Electronics: From Synthesis to Applications”, Editors: A. Facchetti and T. Marks, Wiley, ISBN: 978-0-470-99077-3, 2010.
6. Chapter in “The chemistry of inkjet inks”, Editor: S. Magdassi, World Scientific Publishing Company, ISBN: 978-9812818218, 2009
7. Chapter in “Organic Field-Effect Transistors”, Editors: Z. Bao, and J. Locklin, CRC Press, ISBN: 978-0849380808, 2007
8. “Developments in printed RFID”, V. Subramanian, Pira Publishing, UK, 2006.
9. “3D Chips: Future Possibilities”, V. Subramanian, Silicon India, Feb 2003, pp. 24-25

#### **Invited Conference Presentations**

1. **Invited**, “Materials, Process, and Device Innovations for High-Performance Printed Electronics”, PRINSE’18 – The 5<sup>th</sup> Printed Intelligence Industry Seminar on Manufacturing Solutions for Customer Needs and Vision to the Future, Oulu, Finland, Jan 31-Feb 1, 2018.
2. **Invited**, “Highly scaled gravure printed organic transistors for high-performance printed organic electronics”, High-frequency printed and direct-written organic-hybrid integrated circuits (HEROIC) Workshop, Milan, Italy, Nov 8-10, 2017.
3. **Keynote**, “Printed Electronics: Innovations in Materials, Processes, and Devices”, Association of International Metallizers, Coaters, and Laminators (AIMCAL) R2R Conference USA 2017, Tampa, FL, Oct-15-18, 2017.
4. **Invited**, “High-performance gravure printed organic transistors”, 2017 European Materials Research Society Meeting, Strasbourg, France, May 22-26, 2017
5. **Invited**, “Printed Electronics: Innovations in Materials, Processes, and Devices”, 2017 International Thin Film Transistor Conference (ITC 2017), Austin, TX, February 23-24, 2017.
6. **Invited**, “High-speed Printing of Transistors: From Inks to Devices”, 2016 International Society of Coating Science and Technology Symposium (ISCST), Pittsburgh, PA, September 18-21, 2016.
7. **Keynote**, “Printed Electronics: Innovations in Materials, Processes, and Devices”, 2016 Canadian Printable Flexible Wearable electronics Symposium (CPES2016), April 19-20, Oakville, Canada
8. **Keynote**, “Printed Electronics: Innovations in Materials, Processes, and Device”, 2016 Society of Vacuum Coaters Techcon, Indianapolis, IN, May 10-13, 2016.
9. **Invited**, Subramanian, Vivek, Chung, Seungjun, Grau, Gerd and Scheideler, William J., “71-2: Invited Paper: Printed Transistors and MEMS for Large-Area Electronics”, 2016 Society for Information Display Symposium, San Francisco, May 20-27, 2016.
10. **Keynote**, “Printed Electronics: Innovations in Materials, Processes, and Devices”, 31<sup>st</sup> Philippine Chemistry Congress, Iloilo, Philippines, April 13-15, 2016.
11. **Keynote**, “Advanced Processes, Materials, and Devices for Emerging Printed Electronics Applications”, 3<sup>rd</sup> Swiss Conference on Printed Electronics and Functional Materials, Neuchatel, Switzerland, Oct 1-2, 2015.

12. **Invited**, “High-performance printed organic transistors: Materials, processes, and devices”, V. Subramanian, G. Grau, H. Kang, and R. Kitsomboonloha, 2015 American Chemical Society National Meeting and Exposition, Boston, MA, Aug 17<sup>th</sup>, 2015.
13. **Invited**, Subramanian, Vivek, Jaewon Jang, William Scheideler, and Sarah Swisher. “39.1: Invited Paper: Printed Inorganic Transistors Based on Transparent Oxides.” In SID Symposium Digest of Technical Papers, vol. 46, no. 1, pp. 587-590. 2015.
14. **Plenary**, “Printed Electronics: Advanced Technologies Enabling New Applications”, 2015 Flexible and Printed Electronics Conference, Monterey, CA, February 23-26, 2015.
15. **Invited**, “High-resolution gravure printing of organic thin film transistors for high-performance printed electronic systems”, V. Subramanian, R. Kitsomboonloha, J. Cen, H. Kang, G. Grau, and W. J. Scheideler, Materials Research Society Fall Meeting, Boston, MA, Dec 3, 2014.
16. **Invited**, “Advanced printed electronics technologies for novel ubiquitous human interactive systems”, 2014 CMOS Emerging Technologies Research Symposium, Grenoble, France, July 6-8, 2014.
17. **Invited**, “Printed Electronics: A pathway to functionally-rich systems”, 64<sup>th</sup> annual IEEE Electronic Components and Technology Conference, Orland, FL, May 27, 2014.
18. **Invited**, “Printed Electronics: The Confluence of Printing and Semiconductors”, Canadian Printed Electronics Symposium, Montreal, Canada, April 9, 2013.
19. **Invited** “Modeling, scaling, and integration of gravure printing for fast switching Organic FETs”, V. Subramanian, S. J. S. Morris, H. Kang, Materials Research Society Fall 2012 Meeting, Boston, MA, Nov 25-30, 2012
20. **Invited**, “Printed Nanoparticles as routes to high-performance printed conductors: Synthesis, Printing Processes, and Device Applications”, V. Subramanian, H. Kang, R. Kitsomboonloha, and S. K. Volkman, The 2012 International Conference on Flexible and Printed Electronics ICFPE2012, Tokyo, Japan, September 6th - 8th, 2012
21. **Invited** “Advanced Printing Processes for High-Performance Printed Transistors”, V. Subramanian, Flextech Workshop on Printing Electronics - Ink and Substrate Interactions, Kalamazoo, MI, August 1-2, 2012
22. **Invited** “High-performance Printed Transistors: Materials, Processes, and Devices”, V. Subramanian, 2nd CPEM International Symposium “Organic Semiconductors and Printed Electronics”, Gyeonggi, South Korea, May 10th, 2012.
23. **Invited** “Highly-Scaled Gravure and Inkjet Printed Organic Transistors: Tools, Processes, and Devices”, Hongki Kang & Vivek Subramanian, 2012 Flextech Flexible Electronics and Display Conference, Phoenix, AZ, Feb 5-9, 2012.
24. **Plenary** “Nanomaterials for printed electronics: synthesis, design, and applications”, V. Subramanian, International Conference on Nano Science and Nano Technology, Suncheon, Korea, November 11<sup>th</sup>, 2011.
25. **Invited** “Advances in scaling of printed transistors”, V. Subramanian, International Seminar on Printed Electronics, Seoul, Korea, June 8<sup>th</sup>, 2011.
26. **Invited** “High-Performance Fully Printed Transistors: Materials, Processes, and Device Characteristics”, V. Subramanian, H. Tseng, R. Kitsomboonloha, and A. de la Fuente Vornbrock, 2011 Electrochemical Society Meeting, Montreal, Canada, May 2011
27. **Invited** “From Droplets to Devices: Printed Transistor Processes, Integration, and Characteristics”, Vivek Subramanian, Daniel Soltman, Huai-Yuan Tseng, Rungrot Kitsomboonloha and Alejandro de la Fuente Vornbrock, Materials Research Society Spring Meeting, San Francisco, CA, April 2011
28. **Keynote** “Printed electronics: Innovations in tools, materials, devices, and applications”, V. Subramanian, 2011 Korea Printed Electronics Association (KoPeA) meeting, Seoul, Korea, March 2011
29. **Keynote** “Printed RF tags and sensors: the confluence of printing and semiconductors”, V. Subramanian, F. Liao, and H-Y. Tseng, The European Microwave Integrated Circuits Conference 2010, Paris, France, September 2010.
30. **Invited** “Droplet-on-demand direct patterning of active materials: materials, modeling, and integration”, V. Subramanian, The 2010 IEEE Lithography Workshop, Maui, Hawaii, November 2010
31. **Plenary** “Printed electronics: where are we, and where are we going”, V. Subramanian, 2010 Large Area Organic, and Printed Electronics Convention (LOPE-C), Frankfurt, Germany, June 2010.
32. **Keynote** “Printed RFID: Technology Trends and Outlook”, V. Subramanian, IEEE International Conference on RFID 2010, Orlando, Florida, April 2010.

33. **Invited** “Mechanistic studies on sintering of nanoparticles for formation of solution-processed thin films”, 2010 Spring meeting of the Materials Research Society, San Francisco, CA, April 2010.
34. **Invited** “Printed Electronics: the confluence of printing and semiconductors”, Vivek Subramanian, 2009 International Conference on Flexible and Printing Electronics, Jeju Island, Korea, Nov 2009.
35. **Invited** “Organic Transistor Vapor and Biosensors – Technology Status and Implementation Issues”, Vivek Subramanian, Frank Liao, Lakshmi Jagannathan, Electrochemical Society Meeting, Vienna, Austria, October 2009.
36. **Invited** “Printed transistors for low-cost electronics: the confluence of printing and printable electronic materials”, Vivek Subramanian, Alejandro de la Fuente Vornbrock, Steven Molesa, Daniel Soltman, Huai-Yuan Tseng, and Steven K. Volkman, SPIE Optics + Photonics, August 2-6, 2009, San Diego, CA
37. **Invited** “Printed Zinc Oxide Based Electronics: Materials, Devices, and Outlook”, V. Subramanian, S. K. Volkman, and D. R. Redinger, LOPE-C, June 23-25, 2009, Frankfurt, Germany
38. **Invited** “Printed Devices for Low-Cost Electronics: Technology Status and Outlook”, V. Subramanian, PETEC Inaugural Event, March 17, 2009, Durham, United Kingdom
39. **invited** “Printed Electronic Tags and Sensors for Smart Packaging Applications”, Vivek Subramanian, Josephine Chang, Lakshmi Jagannathan, Frank Liao, Steve Molesa, David Redinger, Daniel Soltman, Huai-Yuan Tseng, Steve Volkman, Shong Yin, 2009 Flexible Electronics and Display Conference, Phoenix, AZ, Feb 2-5, 2009.
40. **invited** “Electronic Nose Sensors for Consumer Packaging”, V. Subramanian, IDTechEx Printed Electronics USA, San Jose, CA, Dec 2-5, 2008.
41. **invited** “Solution-Processed Transparent Transistors for Low-Cost, Flexible Displays”, V. Subramanian, S. K. Volkman, and D. R. Redinger, LEOS 2008: The 21<sup>st</sup> Annual Meeting of the IEEE Lasers and Electro-Optics Society, Newport Beach, CA, 9-13 November, 2008.
42. **invited** “Organic chemical and biosensors for smart packages”, V. Subramanian, IDTechEx Printed Electronics Asia, Tokyo, Japan, Oct 8-9, 2008.
43. **invited** “Printed Electronics for Low-Cost Tags, Displays, and Sensors”, V. Subramanian, 1<sup>st</sup> International Conference on R2R Printed Electronics, Seoul, Korea, April 30-May 2, 2008.
44. **invited** “Printed organic RFID tags: technology, roadmaps, and challenges”, V. Subramanian, 1<sup>st</sup> Plastic Electronics Asia Conference and Showcase, Seoul, Korea, June 24-26, 2008
45. **invited** “Power supply considerations and solutions for printed electronic tags and sensors”, V. Subramanian, IDTechEx Printed Electronics Europe, Dresden, Germany, April 8-9, 2008
46. **invited** “Printed Chemical and Biosensors: Technology, Design and Challenges”, GOSPEL Workshop on Plastic Chemical Sensors, Dresden, Germany, April 9, 2008
47. **Plenary** “Printed Electronics For Low-Cost Electronic Systems: Technology Status and Application Development”, Vivek Subramanian, Josephine B. Chang, Alejandro de la Fuente Vornbrock, Daniel C. Huang, Lakshmi Jagannathan, Frank Liao, Brian Mattis, Steven Molesa, David R. Redinger, Daniel Soltman, Steven K. Volkman, Qintao Zhang, 38<sup>th</sup> European Solid State Device Research Conference, Edinburgh, Scotland, September 15-19, 2008
48. **invited** “Printed Organic Transistors for Low-cost Tags, Displays, and Sensors: Technology, Modeling and Challenges”, Vivek Subramanian, Alejandro de la Fuente Vornbrock, Huai-Yuan Tseng and Shong Yin, Materials Research Society Fall Meeting, Boston, MA, Dec 1-4, 2008.
49. **invited** “Printed Electronics for Low-Cost Tags and Sensors”, Vivek Subramanian, Sixth Annual Workshop on Microelectronics and Electron Devices, April 18, 2008.
50. **invited** “Printed organic RF tags, chemical sensors and biosensors”, Vivek Subramanian, International Symposium for Flexible Electronics and Display, Hsinchu, Taiwan, Nov 18, 2007.
51. **invited** “Printed Tags and Sensors for RFID: Opportunities and Challenges”, Vivek Subramanian, Printed Electronics USA 2007, San Francisco, CA, Nov 14, 2007.
52. **invited** “Printed RFID Tags: Materials, Processes, and Devices”, Vivek Subramanian, Daniel Soltman, Daniel Huang, Steven Molesa, 2007 AiChE Annual Meeting, Salt Lake City, UT, Nov. 8, 2007.
53. **invited** “Printed organic RFID tags: technology, roadmaps, and challenges”, Vivek Subramanian, 3<sup>rd</sup> Global Plastic Electronics Conference and Showcase, Frankfurt, Germany, Oct 30, 2007.

54. **invited** “Printed organic transistors: technology, characteristics, and modeling”, Vivek Subramanian, Alejandro de la Fuente Vornbrock, Daniel Soltman, Huai-Yuan Tseng, and Steve Molesa, 212<sup>th</sup> meeting of the Electrochemical Society, Washington, DC, Oct 8, 2007.
55. **invited** “Printed electronic tags and sensors - device, materials, and circuit issues”, Vivek Subramanian, 2007 Organic Electronics Conference and Exhibition, Frankfurt, Germany, Sept 25, 2007.
56. **invited** “Inkjet printing of transistors, diodes, and passive components for smart tags”, Vivek Subramanian, Innovations in Inkjet: 3<sup>rd</sup> DPI Inkjet Workshop, Eindhoven Institute of Technology, Netherlands, June 28-29, 2007.
57. **invited** “Printed organic transistors”, A. de la Fuente and V. Subramanian, Industry Forum on Printed Electronics, Chicago, IL, April 23-24, 2007
58. **invited** “From Materials to Circuits: Implications of printed materials on printed RFID”, V. Subramanian, 2007 Pira printed RFID conference, Frankfurt, Germany, June 4-6, 2007.
59. **keynote** “Droplet on demand lithography: An enabling technology for low-cost electronics”, V. Subramanian, A. de la Fuente Vornbrock, S. Molesa, D. Redinger, Q. Zhang, and S. K. Volkman, SPIE Advanced lithography, 27<sup>th</sup> February, 2007
60. **invited** “Printed RFID tags: performance needs and technology trends”, V. Subramanian, 2007 IDTechEx Smart labels USA , Boston, MA, Febraury 20-23, 2007.
61. **keynote** “Printed Organic Transistors for low-cost tagging and sensing applications”, V. Subramanian, J. Chang, A. de la Fuente Vornbrock, S. Molesa, D. Soltman, and Q. Zhang. 6<sup>th</sup> International IEEE Conference on Polymers and Adhesives in Microelectronics and Photonics, Tokyo, January 15<sup>th</sup>-18<sup>th</sup>, 2007.
62. **invited** “Nano Inks for Printed RFID”, V. Subramanian, Pira Nanoscale Inks and Pigment Technologies Conference, Chicago, IL, Sept 27-28, 2006.
63. **invited** “Toward Printed RFID: Materials, Processes, and Devices”, V. Subramanian, 5<sup>th</sup> Annual Printed Electronics and Displays Conference and Trade Fair, Las Vegas, Oct 11-13, 2006.
64. **invited** “Inkjetted Organic Transistors for Smart Tagging Applications”, Vivek Subramanian, Jean M. J. Frechet, Steven Molesa, Josephine Chang, Amanda R. Murphy, Alejandro de la Fuente Vornbrock, Steven Volkman, 2006 AiChE Annual Meeting, Nov 17<sup>th</sup>, 2006
65. **invited focal paper** “All-printed electronics: Materials, Devices, and Circuit Implications”, V.Subramanian, J. Chang, S. Molesa, D. Redinger, and S. Volkman, Digital Fabrication 2006, Denver, CO, Sept 17-22, 2006.
66. **invited** “Printed transistors and passive components for low-cost electronics applications”, V. Subramanian, J. B. Chang, S. E. Molesa, S. K. Volkman, and D. R. Redinger, International Symposium on VLSI Technology, Systems and Applications (VLSI-TSA) April, 2006, pp. 68-9.
67. **invited** “Advanced printed materials and devices for RFID applications”, V. Subramanian, IDTechEx Printed Electronics Europe, April 19-21, 2006.
68. **invited** “Printed Electronic Nose Vapor Sensors for Consumer Product Monitoring”, V. Subramanian, J. Lee, V. Liu, S. Molesa, IEEE International Solid State Circuits Conference, Paper 15.3, February, 2006.
69. **invited** “Nanotechnology in Printed Electronics: Nanoparticles, Nanorods, and Nanowhy”, V. Subramanian, Pira Pack Electronics Conference, January 25-26, 2006.
70. **invited** “All-printed RFID Tags: Materials, Devices, and Circuit Implications”, Vivek Subramanian, Paul C. Chang, Daniel Huang, Josephine B. Lee, Steven E. Molesa, David R. Redinger, and Steven K. Volkman, VLSI Design, 2006, Hyderabad India, Jan 2006.
71. **invited** “Printed organic transistors: materials and technology”, Vivek Subramanian, Pacificchem 2005: American Chemical Society Pacific Basin meeting, December 15-20, 2005, Honolulu, HI,
72. **invited** “Low-cost arrayed gas sensors for environmental monitoring”. Vivek Subramanian, Josephine Lee and Vincent Liu, Materials Research Society Fall Symposium, Paper S2.1, Boston, MA, December 2005.
73. **invited** “Prospects for All-printed RFID: Materials, Devices, Circuits”, V. Subramanian, International Workshop on Radio Frequency Identification (RFID) and Wirelss Sensors, 11-13 November, 2005, Kanpur, India.
74. **invited** “Printed electronics for low-cost tagging applications”, V. Subramanian, 2005 International Symposium on Flexible Electronics and Display, Hsinchu, Taiwan, October 2005.

75. *invited* "Printed electronic nose gas sensors", Vivek Subramanian, Plastic Electronics 2005, Frankfurt, Germany, Oct 4-5, 2005
76. *invited* "Uses of nanotechnology in printed electronics", Vivek Subramanian, Printed Electronics 205, Pira International, Thistle Marble Arch, London, UK, Sept 14-15, 2005
77. *invited* "Printed organic transistors for low-cost RFID applications", Vivek Subramanian, Proceedings of SPIE-The International Society for Optical Engineering vol. 5940, (594013/1-594013/9) , pp. 170-178, 2005.
78. *invited* "Advanced printed materials and devices for ultra-low-cost RFID", Vivek Subramanian, Printed RFID: Achieving low cost tags through printed electronics – Pira International, Gatwick, Surrey, UK, May 10-11, 2005.
79. *Plenary session invited talk* "Printed Organic Transistors for Ultra-low-cost RFID Applications", Vivek Subramanian, Paul C. Chang, Josephine B. Lee, Steven E. Molesa, and Steven K. Volkman, Polytronic 2004: 4th International IEEE Conference on Polymers and Adhesives in Microelectronics and Photonics, Portland, Oregon, USA, 12 September 2004.
80. *invited* "Materials, Device, and Circuits Issues for low-cost printed RFID", V. Subramanian, 2<sup>nd</sup> Cintelliq Organic Semiconductor Conference, 2004 (OSC-2004), Cambridge, England, October 2004.
81. *invited* "All-printed flexible organic thin film transistors: Current status and outlook for the future", V. Subramanian, J. M. J. Fréchet, P. C. Chang, D. C. Huang, J. B. Lee, F. Liao, B. A. Mattis, S. Molesa, A. R. Murphy, D. R. Redinger, and S. K. Volkman, 206<sup>th</sup> meeting of the Electrochemical Society, Honolulu, HI, October 2004.
82. *invited* "Nanoscale organic transistors: towards gain in molecular devices", V. Subramanian, P. C. Chang, J. B. Lee, T. Le, A. Murphy, J. M. J. Frechet, and A. Liddle, 2004 IEEE Nanoscale Devices and Systems Integration Conference, Miami, FL, 2004.
83. *invited* "Towards Printed Low-Cost RFID Tags: Device, Materials and Circuit Technologies", V. Subramanian, 2nd Advanced Technology Workshop on Printing an Intelligent Future: Printed Organic and Molecular Electronic Technologies, Boston, MA, March 16-19, 2003.
84. *invited* "Prospects for organic semiconductor based devices and circuits: applications, performance, and reliability considerations", V. Subramanian, 2002 Topical Research Conference on Reliability, Oct 2002.
85. *invited* "FinFET - quasi-planar double-gate MOSFET", S. H. Tang, L. Chang, N. Lindert, Y-K. Choi, W-C. Lee, X. Huang, V. Subramanian, J. Bokor, T-J. King, C. Hu, 20001 IEEE International Solid-State Circuits Conference Digest of Technical Papers, pp. 118-119, 437, 2001.
86. *invited* "3-D ICs with Multiple Si Layers: Performance Analysis, and Technology", K. Saraswat, K. Banerjee, A. Joshi, P. Kalavade, S. Souri, and V. Subramanian, *presented at* The Fifth International Symposium on Low and High Dielectric Constant Materials: Materials Science, Processing, and Reliability Issues, 197<sup>th</sup> meeting of the Electrochemical Society, Toronto, Ontario, Canada, May 14-18, 2000.
87. *invited* "Novel 3-D Structures", K. C. Saraswat, S. J. Souri, V. Subramanian, A. R. Joshi, and A. W. Wang, 1999 IEEE International SOI Conference Proceedings, pp. 54-55.
88. *invited* "Seeding Technology for High Performance TFTs", K. C. Saraswat and V. Subramanian, Proceedings of the Electronic Display Forum 98, EIAJ/SEMI, Yokohama, April 1998, pp. 2.7-2.15.
89. *invited* "A Low-Temperature Polycrystalline Si TFT Technology for Large-Area AMLCD Drivers", K. C. Saraswat, V. Subramanian, and S. Jurichich, Polycrystalline Thin Films III - Structure, Texture, Properties, and Applications, MRS Symposium Proceedings pp 439-449, 1997.
90. *invited* "A low temperature polycrystalline SiGe CMOS TFT technology for large area AMLCD drivers", K. C. Saraswat, S. Jurichich, T.-J. King, V. Subramanian, and A. Wang, Proceedings of Thin Film Transistor Technologies III, ECS Symposium, 1996, pp. 186-196.

### Journal Papers

1. MM Fadlelmula, B Mazinani, V Subramanian, "Towards personalized microfluidics: 3D printing of high-performance micropumps by control and optimization of fabrication-induced surface roughness", Additive Manufacturing 94, 104468, 2024
2. Haq, Muhammad Refatul, Babak Mazinani, Vivek Subramanian, and Helmut Schift. "Room temperature imprinting of water-based microparticulate inks for realizing glass microfluidic channels." Materials & Design 242 (2024): 112982.
3. Biaou, Carlos, Matthew Mcphail, Kazutaka Eriguchi, Vivek Subramanian, and Oscar Dubon. "Tracking deep-level defects in degrading perovskite solar cells with a multifactorial approach." Organic Electronics 130 (2024): 107074.

4. Hodaiei, Amin, and Vivek Subramanian. "Sub-mm 3 dimensional scaling of fully-integrated additively-fabricated microsupercapacitors for embedded energy storage applications." *Journal of Materials Chemistry A* 12, no. 17 (2024): 10229-10241.
5. Hodaiei, Amin, and Vivek Subramanian. "Additive fabrication of fully-integrated high-performance millimeter-scale microsupercapacitors: Fine-tuning chemistry to maximize performance". *Journal of Power Sources* 588 (2023): 233738.
6. Sels, Annelies, Remo Blum, Rajasundar Chandran, Enrica Montinaro, Jan Schildknecht, Mickael Chabart, and Vivek Subramanian. "Digital LIGA: Exploitation of droplet-on-demand inkjet printing to fabricate complex mechanical structures by electroforming." *Journal of Micromechanics and Microengineering* (2023).
7. Annelies Sels and Vivek Subramanian, "Printed Platinum Nanoparticle Thin-Film Structures for Use in Biology and Catalysis: Synthesis, Printing, and Application Demonstration", *ACS Omega Article ASAP*, DOI: 10.1021/acsomega.2c04687
8. **Invited** Scheideler, W. J., & Subramanian, V. (2022). How to print high-mobility metal oxide transistors—Recent advances in ink design, processing, and device engineering. *Applied Physics Letters*, 121(22), 220502.
9. Deng, Mengmeng, and Vivek Subramanian. "Screen-Printable Cu–Ag Core–Shell Nanoparticle Paste for Reduced Silver Usage in Solar Cells: Particle Design, Paste Formulation, and Process Optimization." *ACS Applied Electronic Materials* (2022).
10. **invited** Bonnassieux, Yvan, Christoph J. Brabec, Yong Cao, Tricia Breen Carmichael, Michael L. Chabinyk, Kwang-Ting Cheng, Gyoujin Cho et al. "The 2021 flexible and printed electronics roadmap." *Flexible and Printed Electronics* 6, no. 2 (2021): 023001.
11. Deka, Nishita, and Vivek Subramanian. "On-chip fully integrated field emission arrays for high-voltage MEMS applications." *IEEE Transactions on Electron Devices* 67, no. 9 (2020): 3753-3760.
12. **invited** Gerd Grau and Vivek Subramanian, "Dimensional scaling of high-speed printed organic transistors enabling high-frequency operation", *Flex. Print. Electron.* 2020, Vol. 5 014013
13. **invited** William Scheideler and Vivek Subramanian, "Printed flexible and transparent electronics: enhancing low-temperature processed metal oxides with 0D and 1D nanomaterials", *2019 Nanotechnology* 30 272001
14. R. Kumar, K. M. Johnson, N. X. Williams, V. Subramanian, "Scaling Printable Zn–Ag<sub>2</sub>O Batteries for Integrated Electronics", *Adv. Energy Mater.* 2019, 1803645.
15. William J. Scheideler, Matthew W. McPhail, Rajan Kumar, Jeremy Smith, and Vivek Subramanian, "Scalable, High-Performance Printed InOx Transistors Enabled by Ultraviolet-Annealed Printed High-k AlOx Gate Dielectrics", *ACS Applied Materials & Interfaces* 2018 10 (43), 37277-37286.
16. J. Smith, S. Chung, J. Jang, C. Biao, V. Subramanian, "Solution-processed complementary resistive switching arrays for associative memory", *IEEE Transactions on Electron Devices* 64 (10), pp 4310, 2017
17. A. Zeumault, V. Subramanian, "Use of high-k encapsulation to improve mobility in trap-limited metal oxide semiconductors", *physica status solidi (b)* 254 (10), 1700124, 2017
18. A. Zeumault, W. Scheideler, V. Subramanian, "Electrostatic tuning of spray-deposited ZnO for controlled mobility enhancement", *Advanced Functional materials*, 27 (30), pp. 1701021, 2017
19. W. J. Scheideler, R. Kumar, A. R. Zeumault, V. Subramanian, "Low-Temperature-Processed Printed Metal Oxide Transistors Based on Pure Aqueous Inks", *Advanced Functional Materials* 2017, 1606062.
20. Jaewon Jang, Vivek Subramanian, "Effect of electrode material on resistive switching memory behavior of solution-processed resistive switches: Realization of robust multi-level cells", *Thin Solid Films*, Volume 625, Pages 87-92, 1 March 2017.
21. S. Chung, M. A. U. Karim, H. J. Kwon, W. Scheideler and V. Subramanian, "A High-Speed Inkjet-Printed Microelectromechanical Relay With a Mechanically Enhanced Double-Clamped Channel-Beam," *Journal of Microelectromechanical Systems*, vol. 26, no. 1, pp. 95-101, Feb. 2017.
22. G. Grau, E. J. Frazier, and V. Subramanian, "Printed unmanned aerial vehicles using paper-based electroactive polymer actuators and organic ion gel transistors", *Nature Microsystems & Nanoengineering*, vol 2, pp. 16032, 2016
23. **invited** Gerd Grau, Jialiang Cen, Hongki Kang, Rungrot Kitsomboonloha, William J Scheideler, and Vivek Subramanian "Gravure-printed electronics: recent progress in tooling development, understanding of printing physics, and realization of printed devices", *IOP Journal of Flexible and Printed Electronics*, vol. 1, No. 2, pp. 023002, 2016

24. Scheideler, William J., Jeremy Smith, Igal Deckman, Seungjun Chung, Ana Claudia Arias, and Vivek Subramanian. "A robust, gravure-printed, silver nanowire/metal oxide hybrid electrode for high-throughput patterned transparent conductors." *Journal of Materials Chemistry C* 4, no. 15 (2016): 3248-3255.
25. Karim, Muhammed Ahasan Ul, Seungjun Chung, Elad Alon, and Vivek Subramanian. "Fully Inkjet-Printed Stress-Tolerant Microelectromechanical Reed Relays for Large-Area Electronics." *Advanced Electronic Materials* (2016).
26. Khan, Yasser, Felipe J. Pavinatto, Monica C. Lin, Amy Liao, Sarah L. Swisher, Kaylee Mann, Vivek Subramanian, Michel M. Maharbiz, and Ana C. Arias. "Bioelectronic Interfaces: Inkjet-Printed Flexible Gold Electrode Arrays for Bioelectronic Interfaces (*Adv. Funct. Mater.* 7/2016)." *Advanced Functional Materials* 26, no. 7 (2016): 981-981.
27. Jang, Jaewon, Seungjun Chung, Hongki Kang, and Vivek Subramanian. "P-type CuO and Cu<sub>2</sub>O transistors derived from a Sol–Gel Copper (II) acetate monohydrate precursor." *Thin Solid Films* (2016).
28. Grau, Gerd, and Vivek Subramanian. "Fully High-Speed Gravure Printed, Low-Variability, High-Performance Organic Polymer Transistors with Sub-5 V Operation." *Advanced Electronic Materials* (2016).
29. Zeumault, Andre, and Vivek Subramanian. "Mobility Enhancement in Solution-Processed Transparent Conductive Oxide TFTs due to Electron Donation from Traps in High-k Gate Dielectrics." *Advanced Functional Materials* (2016).
30. Zeumault, Andre, William Scheideler, Gerd Grau, Jeremy Smith, and Vivek Subramanian. "Patterning of Solution-Processed, Indium-Free Oxide TFTs by Selective Spray Pyrolysis." *Advanced Electronic Materials* (2015).
31. Jang, Jaewon, Hongki Kang, Himamshu C. Nallan Chakravarthula, and Vivek Subramanian. "Fully Inkjet-Printed Transparent Oxide Thin Film Transistors Using a Fugitive Wettability Switch." *Advanced Electronic Materials* 1, no. 7 (2015).
32. Grau, Gerd, Rungrot Kitsomboonloha, Hongki Kang, and Vivek Subramanian. "High performance printed organic transistors using a novel scanned thermal annealing technology." *Organic Electronics* 20 (2015): 150-157.
33. Zeumault, Andre, and Vivek Subramanian. "Improved Technique for Quantifying the Bias-Dependent Mobility of Metal-Oxide Thin-Film Transistors." *Electron Devices, IEEE Transactions on* 62, no. 3 (2015): 855-861.
34. Swisher, Sarah L., Steven K. Volkman, and Vivek Subramanian. "Tailoring Indium Oxide Nanocrystal Synthesis Conditions for Air-Stable High-Performance Solution-Processed Thin-Film Transistors." *ACS applied materials & interfaces* 7, no. 19 (2015): 10069-10075.
35. Koo, Hyunmo, Wookyu Lee, Yunchang Choi, Junfeng Sun, Jina Bak, Jinsoo Noh, Vivek Subramanian, Yasuo Azuma, Yutaka Majima, and Gyoujin Cho. "Scalability of carbon-nanotube-based thin film transistors for flexible electronic devices manufactured using an all roll-to-roll gravure printing system." *Scientific reports* 5 (2015).
36. "Perpendicular Magnetization Switching via Current induced Spin-Orbit Torques on Flexible Substrate", O.J. Lee, L. You, J. Jang, V. Subramanian, S. Sahahuddin, *Bulletin of the American Physical Society* 60, 2015.
37. "High-Performance Inkjet-Printed Four-Terminal Microelectromechanical Relays and Inverters", Seungjun Chung, Muhammed Ahasan Ul Karim, Hyuk-Jun Kwon, and Vivek Subramanian, *Nano Letters*, 15 (5), pp 3261–3266, 2015.
38. *Invited* Subramanian, Vivek, Jialiang Cen, Alejandro de la Fuente Vornbrock, Gerd Grau, Hongki Kang, Rungrot Kitsomboonloha, Daniel Soltman, and Huai-Yuan Tseng. "High-Speed Printing of Transistors: From Inks to Devices." *Proceedings of the IEEE* 103, no. 4 (2015): 567-582.
39. Scheideler, William J., Jaewon Jang, Muhammed Ahasan Ul Karim, Rungrot Kitsomboonloha, Andre Zeumault, and Vivek Subramanian. "Gravure-Printed Sol–Gels on Flexible Glass: A Scalable Route to Additively Patterned Transparent Conductors." *ACS applied materials & interfaces* 7, no. 23 (2015): 12679-12687.
40. Lee, OukJae, Long You, Jaewon Jang, Vivek Subramanian, and Sayeef Salahuddin. "Flexible spin-orbit torque devices." *Applied Physics Letters* 107, no. 25 (2015): 252401.
41. Kitsomboonloha, Rungrot, Hongki Kang, Gerd Grau, William Scheideler, and Vivek Subramanian. "MHz-Range Fully Printed High-Performance Thin-Film Transistors by Using High-Resolution Gravure-Printed Lines." *Advanced Electronic Materials* 1, no. 12 (2015).
42. Swisher, Sarah L., Monica C. Lin, Amy Liao, Elisabeth J. LeeFlang, Yasser Khan, Felipe J. Pavinatto, Kaylee Mann et al. "Impedance sensing device enables early detection of pressure ulcers in vivo." *Nature communications* 6 (2015).
43. "A Stencil Printed, High Energy Density Silver Oxide Battery Using a Novel Photopolymerizable Poly(acrylic acid) Separator", K. Braam and V. Subramanian, *Advanced Materials*, Vol. 27, 689-694, 2015

44. "Megahertz-class printed high mobility organic thin-film transistors and inverters on plastic using attoliter-scale high-speed gravure-printed sub-5 $\mu$ m gate electrodes", H. Kang, R. Kitsomboonloha, K. Ulmer, L. Stecker, G. Grau, J. Jang, V. Subramanian, *Organic Electronics*, vol. 15, 3639-3647, 2014.
45. "Exploitation of the coffee-ring effect to realize mechanically enhanced inkjet-printed microelectromechanical relays with U-bar-shaped cantilevers", S Chung, MAU Karim, M Spencer, HJ Kwon, CP Grigoropoulos, E Alon, V. Subramanian, *Applied Physics Letters* 105 (26), 261901, 2014.
46. "Printed Transistors on Paper: Towards Smart Consumer Product Packaging", G. Grau, R. Kitsomboonloha, S. L. Swisher, H. Kang, and V. Subramanian, *Advanced Functional Materials*, Vol. 24, 5067-5074, 2014.
47. "Cell Filling in Gravure Printing for Printed Electronics, J. Cen, R. Kitsomboonloha, and V. Subramanian, vol. 30, 13716-13726, 2014.
48. "Systematic Design of Jettable Nanoparticle-based inkjet inks: Rheology, Acoustics, and Jetability", H. C. Nallan, J. A. Sadie, R. Kitsomboonloha, S. K. Volkman, and V. Subramanian, *Langmuir*, vol. 30, 13470-13477, 2014.
49. "Three-dimensional Inkjet-printed Interconnects using Functional Metallic Nanoparticle Inks", J. A. Sadie, V. Subramanian, *Advanced Functional Materials*, vol. 24, 6834-6842, 2014.
50. "Electrical Characteristics of multilayer MoS<sub>2</sub> transistors at real operating temperatures with different ambient conditions", H-J. Kwon, J. Jang, S. Kim, V. Subramanian, and C. P. Grigoropoulos, *Applied Physics Letters*, vol. 105, 15205, 2014.
51. "Lubrication-related residue as a fundamental process scaling limit to gravure printed electronics", R. Kitsomboonloha and V. Subramanian, *Langmuir*, vol. 30, 3612-3624, 2014.
52. "Roll-to-roll gravure with nanomaterials for printing smart packaging", M. Jung, J. Kim, H. Koo, W. Lee, V. Subramanian, G. Cho, *Journal of Nanoscience and Nanotechnology*, vol. 14, 1303-1317, 2014.
53. "Measurement and analysis of 1/f noise under switched bias in organic thin film transistors", H. Kang and V. Subramanian, *Applied Physics Letters*, 104, 023301, 2014.
54. "A new switching device for printed electronics: Inkjet-printed Microelectromechanical Relay", E. S. Park, Y. Chen, T. J. K. Liu, and V. Subramanian, *Nano Letters*, 13 (11), 5355-5360, 2013.
55. "Inkjet printing of precisely defined features using contact-angle hysteresis", Dan Soltman, Ben Smith, S.J.S. Morris, Vivek Subramanian, *Journal of Colloid and Interface Science*, Volume 400, Pages 135–139, 2013
56. "Transparent High-Performance Thin Film Transistors from Solution-Processed SnO<sub>2</sub>/ZrO<sub>2</sub> Gel-like Precursors", J. Jang, R. Kitsomboonloha, S. L. Swisher, E. S. Park, H. Kang, and V. Subramanian, *Advanced Materials*, 25 (7), pp. 1042-1047, 2013.
57. "Femtoliter-Scale Patterning by High-Speed, Highly Scaled Inverse Gravure Printing", R Kitsomboonloha, SJS Morris, X Rong, V Subramanian, *Langmuir* 28 (48), 16711-16723, 2012
58. "Resistance Switching Characteristics of Solid Electrolyte Chalcogenide Ag<sub>2</sub>Se Nanoparticles for Flexible Nonvolatile Memory Applications", J. Jang, F. Pan, K. Braam, and V. Subramanian, *Advanced Materials*, 24, pp. 3573-3576, 2012
59. "High-Performance Printed Transistors Realized Using Femtoliter Gravure-Printed Sub-10  $\mu$ m Metallic Nanoparticle Patterns and Highly Uniform Polymer Dielectric and Semiconductor Layers", H. Kang, R. Kitsomboonloha, J. Jang, and V. Subramanian, *Advanced Materials*, 24, pp. 3065–3069, 2012
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62. "Characterization and optimization of a printed, primary silver-zinc battery", Kyle Braam, Steven K. Volkman, Vivek Subramanian, *Journal of Power Sources*, vol. 199, pp. 367-372, 2012.
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### Conference Presentations

1. A. Hodaei, V. Subramanian, "Sub-Mm3 Dimensional Scaling of Additively Fabricated Microsupercapacitors for Embedded Energy Applications", 2023 IEEE NANO Conference, Jeju, Korea, July 2-5, 2023.
2. B. Mazinani, V. Subramanian, "Synthesis and characterization of highly durable P2O5-ZnO-Na2O/CaO-Fe2O3 glasses for low-temperature sealing applications", 2023 European Materials Research Society Spring Meeting, Strasbourg, France, May 29-June 2, 2023
3. M. Fadlelmula, V. Subramanian, "A Sol-gel inkjet printable PZT ink for additively fabricated mechanical transducers for energy harvesting, sensing, and mechanical actuation", 2023 European Materials Research Society Spring Meeting, Strasbourg, France, May 29-June 2, 2023
4. A. Hodaei, V. Subramanian, "All-Additively-Fabricated Microsupercapacitors: Fine-Tuning Chemistry to Maximize Performance", 2023 European Materials Research Society Spring Meeting, Strasbourg, France, May 29-June 2, 2023

5. M. Deng, V. Subramanian, "Understanding and insight of paste formulation and curing behavior with sub-100-nanometer Ag-Cu core-shell nanoparticles", 10<sup>th</sup> Metallization and Interconnection Workshop, Genk, Belgium, Nov 14-15, 2022.
6. McPhail, Matt, Rajan Kumar, and Vivek Subramanian. "Slurry Design for a Low Cost, High Capacity Magnesium Semi-Solid Flow Battery." In ECS Meeting Abstracts, no. 2, p. 300. IOP Publishing, 2020.
7. R. Kumar, E. Kedzie, B. D. McCloskey, and V. Subramanian, "Characterizing Zn Corrosion in Printed Zn-Air batteries Via Operando Dems, XRD, and XAS", Electrochemical Conference on Energy and the Environment: Bioelectrochemistry and Energy Storage, MA2019-04 July 21-26, 2019, Glasgow, Scotland
8. Carlos Biao, Matt McPhail, Vivek Subramanian and Oscar Dubon, "Comprehensive Multifactorial Studies on the Degradation of Perovskite Solar Cells in Operation", 2019 Spring Materials Research Society Meeting, Phoenix, AZ, April 22-26, 2019.
9. Rajan Kumar, Jessica E. Nichols, Bryan D. McCloskey, and Vivek Subramanian, "Low-Temperature-Processing of Printed Cathodes for Aqueous Metal-Air Batteries", ECS AiMES 2018 Meeting, September 30, 2018 - October 4, 2018, Cancun, Mexico
10. N. Deka and V. Subramanian, "First demonstration of vacuum-sealed fully integrated BEOL-compatible field emission devices for Si integrated high voltage applications," 2018 76th Device Research Conference (DRC), Santa Barbara, CA, 2018, pp. 1-2.
11. "Inkjet-printed MEM relays for active solar cell routing", S Patel, WJ Scheideler, MAU Karim, V Subramanian, Micro Electro Mechanical Systems (MEMS), 2018 IEEE, 616-619
12. "Back-channel engineering of ultrathin printed indium oxide transistors for carbon dioxide sensing", Y. Kobayashi, W. Scheideler, V. Subramanian, 2017 Materials Research Society Fall Meeting, Boston, MA, Nov 28, 2017.
13. "Morphological Control of Gravure Printed Perovskite Films", M. McPhail and V. Subramanian, 2017 Materials Research Society Fall meeting, Boston, MA, Nov 29, 2017.
14. "Improving high-speed nanomaterial printing with sub-process-decoupled gravure printer design", W. Scheideler, V. Subramanian, ASME 2017 Conference on Smart Materials, Adaptive Structures, and Intelligent Systems, Snowbird, UT, Sept 18-20, 2017
15. "Development of a printed cathode and catalyst layer for printed zinc-air batteries, R. Kumar, N. Williams, and V. Subramanian, 232<sup>nd</sup> ECS Meeting, National Harbor, MD, Oct 1-5, 2017.
16. "UV-annealing-enhanced stability in high-performance printed InOx transistors, W. Scheideler, V. Subramanian, 2017 IEEE Electron Devices Technology and Manufacturing Conference (EDTM), Toyama, Japan, Feb 28-Mar 2, 2017.
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19. "Systematic Ink Design and Solubility Enhancement via Genetic Algorithm for Nanoparticle-based Inkjet Inks", J. Sadie, H. Nallan, S. Volkman, V. Subramanian, NIP & Digital Fabrication Conference (Vol. 2015, No. 1, pp. 439-442). Society for Imaging Science and Technology.
20. M. Ahsan Ul Karim, S. Chung, E. Alon, V. Subramanian, "Stress-tolerant fully inkjet-printed Reed Relays", IEEE International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS) (pp. 568-571), 2015.
21. "High-resolution gravure printed lines: proximity effects and design rules", G. Grau, W. J. Scheideler, V. Subramanian, SPIE Organic Photonics+ Electronics (pp. 95690B-95690B). International Society for Optics and Photonics, 2015
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26. "Fully Printed Transient Silver-Zinc Primary Battery", Nishita Deka, Kyle Braam, Vivek Subramanian, 2015 Spring Meeting of the Materials Research Society, San Francisco, CA, April 6-10, 2015.
27. "Perpendicular Magnetization Switching via Current induced Spin-Orbit Torques on Flexible Substrate", OukJae Lee, Long You, JaeWon Jang, Vivek Subramanian, Sayeef Salahuddin. 2015 Spring Meeting of the Materials Research Society, San Francisco, CA, April 6-10, 2015.
28. "Direct Patterning of Sol-Gel-Enhanced Silver Nanowire Electrodes by Gravure Printing", William Joseph Scheideler, Vivek Subramanian, 2015 Spring Meeting of the Materials Research Society, San Francisco, CA, April 6-10, 2015.
29. "Development of Oxidation-Resistant Cu/Ag Alloyed Particles for Realization of Low-Resistance, Low-Cost Printed Conductors", Steven K Volkman, Vivek Subramanian, 2015 Spring Meeting of the Materials Research Society, San Francisco, CA, April 6-10, 2015.
30. "Perpendicular Magnetization Switching via Current induced Spin-Orbit Torques on Flexible Substrate", OukJae Lee, Long You, Jaewon Jang, Vivek Subramanian, Sayeef Salahuddin, APS Bulletin of the American Physical Society. APS March Meeting 2015 Volume 60, Number 2. San Antonio, TX, March 2-6, 2015
31. "Gravure-Printing Transparent Sol-Gel Conductors on Flexible Glass Substrates", William Joseph Scheideler, Jaewon Jang, Vivek Subramanian, 2014 Fall Meeting of the Materials Research Society, Boston, MA, Nov 30 – Dec 6, 2014.
32. "High performance printed organic transistors using a novel scanned thermal annealing technology," G. Grau, R. Kitsomboonloha, H. Kang, and V. Subramanian, LOPE-C, Munich, 2014.
33. "High-Performance Organic TFTs using High-Resolution Gravure Printed Electrodes", R. Kitsomboonloha, H. Kang, V. Subramanian, 2013 Fall Meeting of the Materials Research Society, Boston, Ma, Dec 1-6, 2013
34. "Effect of Substrate Roughness on the Performance of Printed OTFTs on Paper Substrates", G. Grau and V. Subramanian, 2013 Fall Meeting of the Materials Research Society, Boston, Ma, Dec 1-6, 2013.
35. "Simulation and Experimental Characterization of Cell Filling During Highly-Scaled Gravure Printing for Printed Electronics Applications", A. Cen, R. Kitsomboonloha, and V. Subramanian, 2013 Fall Meeting of the Materials Research Society, Boston, Ma, Dec 1-6, 2013.
36. **Best paper award** "Droplet-on-demand Inkjet-Filled TSVs as a pathway to cost-efficient chip stacking", J. Sadie, N. Quack, M. Wu, and V. Subramanian, IMAPS 2013 - 46<sup>th</sup> International Symposium on Microelectronics, Orlando, FL, Sept 30 – Oct 3, 2013.
37. "Through silicon vias and thermocompression bonding using inkjet-printed gold nanoparticles for heterogeneous MEMS Integration", N. Quack, J. Sadie, V. Subramanian, and M. C. Wu, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, Barcelona, Spain, June 16-20, 2013.
38. "Micro-relay reliability improvement by inkjet-printed microshell encapsulation", Yenhao Chen, Eung Seok Park, I-Ru Chen, Louis Hutin, Vivek Subramanian, Tsu-Jae King Liu, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, Barcelona, Spain, June 16-20, 2013.
39. "Understanding the Enhanced Mobility of Transparent Metal-Oxide Semiconductor Thin-Film Transistors Utilizing High-k Dielectrics" Andre Zeumault, Jaewon Jang, Vivek Subramanian, 2013 Large Area, Organic and Printed Electronics Conference (LOPE-C), Munich, Germany, June 11-13, 2013.
40. "High Performance Solution-Processed Thin-Film Transistors Based on  $\text{In}_2\text{O}_3$  Nanocrystals: Investigating Effects of Annealing Conditions and Gate Dielectric", Sarah L. Swisher, Steve Volkman, and Vivek Subramanian, 2013 Large Area, Organic and Printed Electronics Conference (LOPE-C), Munich, Germany, June 11-13, 2013.
41. "Printed Transistors on Paper: Towards Smart Consumer Product Packaging", Gerd Grau, Rungrot Kitsomboonloha, Sarah Swisher, Hongki Kang and Vivek Subramanian, 2013 Large Area, Organic and Printed Electronics Conference (LOPE-C), Munich, Germany, June 11-13, 2013.
42. "Inkjetted Inorganic Transistors using a Sol-gel Processed  $\text{SnO}_2$  Semiconductor and Sb-doped  $\text{SnO}_2$  Electrodes", Jaewon Jang, Eung Seok Park, Hongki Kang and Vivek Subramanian, Materials Research Society Fall 2012 Meeting, Boston, MA, Nov 25-30, 2012

43. **Best Paper Award** “Demonstration of Inkjet Printed Nanoparticle-based Inks for Solder Bump Replacement”, Jacob Sadie, Steven Volkman, and Vivek Subramanian, 45th International Symposium on Microelectronics (IMAPS 2012), San Diego, CA, September 9 - 13, 2012
44. “Experimental study of the residue film in direct gravure printing of electronics”, Rungrot Kitsomboonloha, Umut Ceyhan, SJS Morris, Vivek Subramanian, 65th Annual Meeting of the APS Division of Fluid Dynamics, Volume 57, Number 17, San Diego, California, November 18–20, 2012
45. “Lubrication analysis of the nanometric coating film deposited during gravure printing”, Umut Ceyhan, Rungrot Kitsomboonloha, SJS Morris, Vivek Subramanian, 65th Annual Meeting of the APS Division of Fluid Dynamics, Volume 57, Number 17, San Diego, California, November 18–20, 2012
46. “A Simple Model of Highly Scaled Gravure Printing”, R. Kitsomboonloha, S. Morris and V. Subramanian, 2012 Large Area Organic and Printed Electronics Conference (LOPE-C), Munich, Germany, July 2012
47. “Development and characterization of an air-stable printed silver-zinc battery”, K. Braam, S. K. Volkman, and V. Subramanian, 2012 Large Area Organic and Printed Electronics Conference (LOPE-C), Munich, Germany, July 2012.
48. “A very reliable multilevel YSZ resistive switching memory”, F. Pan, J. Jang, and V. Subramanian, 70th Annual Device Research Conference (DRC), 18-20 June 2012, pp. 217 - 218
49. “High performance solution-processed thin-film transistors based on In<sub>2</sub>O<sub>3</sub> nanocrystals”, S. L. Swisher, S. Volkman, K. Braam, J. Jang, V. Subramanian, 70th Annual Device Research Conference (DRC), 18-20 June 2012, pp. 241 - 242
50. “A Mixed-Signal EEG Interface Circuit For Use In First Year Electronics Courses,”, V. Lee, J. Monski, W. Williams, B. Muthuswamy, T. Swiontek, M. Maharbiz, V. Subramanian, F. Kovac, Proceedings of the 2012 IEEE International Symposium on Circuits and Systems (ISCAS), pp. 2689 – 2692, May 2012.
51. “A novel Yttrium Stabilized Zirconia based resistive switching memory”, Feng Pan, Jaewon Jang, Vivek Subramanian, 2012 Spring Materials Research Meeting.
52. “Resistance Switching Memory Device with Ag<sub>2</sub>Se Nano-particle Aqueous Ink”, Jaewon Jang, Feng Pan, Kyle Braam and Vivek Subramanian, 2012 Spring Materials Research Meeting.
53. “Highly-Scaled Gravure Printed organic TFTs with 10 $\mu$ m channel length on Plastic with 300 kHz operation”, Hongki Kang, Rungrot Kitsomboonloha, Jaewon Jang, and Vivek Subramanian, 2012 Spring Materials Research Meeting.
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