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L. F. Velásquez-García and A. I. Akinwande, "A MEMS CNT-based Neutralizer for Micro-propulsion Applications," IEPC-2007-253, Presented at the *30th International Electric Propulsion Conference*, Florence, Italy, September 17-20, 2007.

B. Gassend, L. F. Velasquez-Garcia, A. I. Akinwande, and M. Martinez-Sanchez, "A Fully-Integrated Microfabricated Externally-Wetted Electrospray Thruster," IEPC-2007-233, Presented at the *30th International Electric Propulsion Conference*, Florence, Italy, September 17-20, 2007.

L. F. Velásquez-García, and A.I. Akinwande, "A PECVD CNT-Based Open Architecture Field Ionizer For Portable Mass Spectrometry," *2008 21st IEEE International Conference on Micro Electro Mechanical Systems - MEMS 2008*, pp. 742-745

B. Gassend, L. F. Velasquez-Garcia, A. I. Akinwande, and M. Martinez-Sanchez, "Fabrication of a Fully Integrated Electrospray Array With Applications To Space Propulsion," *2008 21st IEEE International Conference on Micro Electro Mechanical Systems - MEMS 2008*, pp. 976-979.

I. Nausieda, K. Ryu, I. Kymissis, A. I. Akinwande, V. Bulović, C. G. Sodini, "An Organic Active-Matrix Imager," *IEEE Transactions on Electron Devices*, vol. 55, No. 2, Feb. 2008, pp. 527-532

L. F. Velásquez-García, L. Chen and A. I. Akinwande, "Recent MEMS/NEMS Activities at the Microsystems Technology Laboratories of MIT," the International Display Workshop, The 14th International Display Workshops, IDW '07, Saporro Convention Center, Saporro, Japan, December 3-5, 2007.

A. Wang, K. Ryu, J. Perkins, I. Nausieda, B. Yaglioglu, V. Bulović, C. Sodini, A. Akinwande, "Near-Room-Temperature Processed Integrated Metal Oxide Field Effect Transistor for Large Area Electronics," *MRS 2007 Fall Meeting, Symposium, Large-Area Processing and Patterning for Active Optical and Electronic Devices*, Boston MA, USA, November 26-30, 2007.

L. F. Velasquez-Garcia and A. I. Akinwande, "Fabrication of large arrays of high-aspect-ratio single-crystal silicon columns with isolated vertically aligned multi-walled carbon nanotube tips," *Nanotechnology*, v 19, n 40, 8 Oct. 2008, (Cover Page Photo and Featured Article)

A. K. Sood, R. A. Redwine, Y. R. Puri, O. O. Olubuyide, N. DiLello, J. L. Hoyt, A. T. Akinwande, R. S. Balcerak, S. Horn, T. G. Bramhall, D. J. Raddack, "Design considerations for SiGe-based near infrared imaging sensor," *Proc. SPIE - The International Society for Optical Engineering*, v 6940, 3 April 2008, 6940M-1-9.

Kerry Cheung, L.F. Velásquez-García, and A.I. Akinwande, "Fully Batch-fabricated Linear Quadrupole Mass Filters, Hilton Head 2008, Solid State Sensors, Actuators and Microsystems Workshop, June 2008.

A. I. Akinwande, "CNT-based Sensors and Applications," Invited Paper at The International Society for Optical Engineering (SPIE) Conference, 3 April 2008.

L. F. Velasquez-Garcia, K Cheung and A. I. Akinwande, An Application of 3-D MEMS Packaging: Out-of-Plane Quadrupole Mass Filters," *Journal of Microelectromechanical Systems*, vol. 15, no. 5, Oct 2006 Page(s):1272 – 1280.

B. Gassend, L. F. Velasquez-Garcia and A. I. Akinwande, "Precision In-Plane Hand Assembly of Bulk-Microfabricated Components for High Voltage MEMS Arrays Applications," *Journal of Microelectromechanical Systems*, vol. 16, 2009.

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A. Khakifirooz and D.A. Antoniadis, "MOSFET performance scaling — part II: future directions," to be published in IEEE Trans. Electron Devices, vol. 55, no. 6, June 2008.

A. Khakifirooz and, D. A. Antoniadis, "The Future of High-Performance CMOS: Trends and Requirements," Proc. of 38th European Solid-State Device Research Conference, ESSDERC, pp. 30-37, Sept. 2008 (Invited Plenary Paper).

A. Khakifirooz and, D. A. Antoniadis, "MOSFET Performance Scaling: Limitations and Future Options," IEDM 2008 Tech. Digest, pp 253-256. , December 2008(Invited Paper).

A. Khakifirooz and, D. A. Antoniadis, "Trends and requirements of future high-performance CMOS," Physical and Failure Analysis of Integrated Circuits, 2008. Proc. of IPFA 2008. 15th International Symposium, July 2008, pp. 1 – 6. (Invited Plenary Paper).

Nayfeh, O.M.; Chleirigh, C.N.; Hoyt, J.L.; Antoniadis, D.A., "Measurement of Enhanced Gate-Controlled Band-to-Band Tunneling in Highly Strained Silicon-Germanium Diodes," Electron Device Letters, IEEE vol. 29, no. 5, May 2008 Page(s):468 – 470.

Nayfeh, O.M.; Chleirigh, C.N.; Hennessy, J.; Gomez, L.; Hoyt, J.L.; Antoniadis, D.A., "Design of Tunneling Field-Effect Transistors Using Strained-Silicon/Strained-Germanium Type-II Staggered Heterojunctions," *Electron Device Letters, IEEE*, vol. 29, no. 9, Sept. 2008 Page(s):1074 – 1077.

X. Wang, K. L. Pey, W. K. Choi, C. K. F. Ho, E. Fitzgerald, and D. Antoniadis, "Arrayed Si/SiGe Nanowire and Heterostructure Formations via Au-Assisted Wet Chemical Etching Method," *Electrochem. Solid-State Lett.*, Vo. 12, 5, pp. K37-K40, 2009.

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Currie, M.J., J.K. Mapel, T.D. Heidel, S.G. Goffri, and M. A. Baldo, "High efficiency organic solar concentrators for photovoltaics," *Science*, 321, 226 2008.

Celebi, K., P. Jadhav, K.M. Milaninia, M. Bora, and M. A. Baldo, "The density of states in thin film copper phthalocyanine measured by Kelvin probe force microscopy," *Applied Physics Letters*, 93, 083308 2008.

Bora, M., K. Celebi, J. Zuniga, C. Watson, K.M. Milaninia, and M. A. Baldo, "Near field detector for integrated surface plasmon resonance biosensor applications," *Optics Express*, 17, 329-336. 2009.

Mulder, C.L., L. Theogarajan, M. Currie, J.K. Mapel, M. A. Baldo, M. Vaughn, Paul Willard, B. D. Bruce, M.W. Moss, C.E. McLain, and J.P. Morseman, "Luminescent solar concentrators employing phycobilisomes," *Advanced Materials*, 21, 1-5. 2009.

Jadhav, P., B.N. Limketkai, and M. A. Baldo, "Effective temperature models for the electric field dependence of charge carrier mobility in tris(8-hydroxyquinoline) aluminum," invited submission to *Organic Electronics* (Book), edited by Gregor Mellor, Springer Verlag. 29 pages 2009.

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Anant, V., A.J. Kerman, E.A. Dauler, J.K.W. Yang, K.M. Rosfjord, and K.K. Berggren, "Optical Properties of Superconducting Nanowire Single-Photon Detectors," *Optics Express*, vol. 16, pp. 10750-10761, 3 July 2008.

Bita, I., J.K.W. Yang, Y.-S. Jung, C.A. Ross, E.L. Thomas, and Karl K. Berggren, "Graphoepitaxy of Self-Assembled Block Copolymers on Two-Dimensional Periodic Patterned Templates," *Science*, vol. 321, pp. 939-943, 15 August 2008.

Berns, D.M., M.S. Rudner, S.O. Valenzuela, K.K. Berggren, W.D. Oliver, L.S. Levitov, and T.P. Orlando, "Amplitude Spectroscopy of a Solid-State Artificial Atom," *Nature*, vol. 455, pp. 51-57, 4 September 2008.

Haschemi, P., M. Canonico, J.K.W. Yang, L. Gomez, K.K. Berggren, and J. L. Hoyt, "Fabrication and Characterization of Suspended Uniaxial Tensile Strained-Si Nanowires for Gate-All-Around n-MOSFETs," *ECS (Electrochemical Society) Transactions*, vol. 16, pp. 57-68, October 2008.

Wu, W., W.M. Tong, J. Bartman, Y. Chen, R. Walmsley, Z. Yu, Q. Xia, I. Park, C. Picciotto, J. Gao, S.-Y. Wang, D. Morecroft, J.K.W. Yang, K.K. Berggren, and R.S. Williams, "Sub-10 nm Nanoimprint Lithography by Wafer Bowing," *Nano Letters*, vol. 8, No. 11, pp. 3865-3869, 12 November 2008.

Dauler, E.A., M.J. Stevens, B. Baek, R. Molnar, S.A. Hamilton, R.P. Mirin, S.-W. Nam, and K.K. Berggren, "Measuring intensity correlations with a two-element superconducting nanowire single photon detector," *Physical Review A*, vol. 78, 053826 (2008).

Ross, C.A., Y.S. Jung, V.P. Chuang, F. Ilievski, J.K.W. Yang, I. Bita, E.L. Thomas, H.I. Smith, K.K. Berggren, J.G. Vansco, and J.Y. Cheng, "Si-Containing Block Copolymers for Self-Assembled Nanolithography (invited)," *Journal of Vacuum Science and Technology B*, vol. 26 No. 6., pp. 2489-2494 (Nov/Dec 2008).

Dauler, E.A., A.J. Kerman, B.S. Robinson, J.K.W. Yang, B. Voronov, G. Goltsman, S.A. Hamilton, and K.K. Berggren, "Photon-Number-Resolution with Sub-30-ps Timing using Multi-Element Superconducting Nanowire Single Photon Detectors," *Journal of Modern Optics*, vol. 56, No. 2 & 3, pp. 364-373 (January 2009).

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Simberg, D., Park, J.-H., Karmali, P. P., Zhang, W.-M., Merkulov, S., McCrae, K., Bhatia, S. N., Sailor, M. and Ruoslahti, E. (2009 in press): Differential proteomics analysis of the surface heterogeneity of dextran iron oxide nanoparticles and the implications for their in vivo clearance. *Biomaterials*, 30: 3926-3933.

March, S., Hui, E. E., Underhill, G. H., Khetani, S., and Bhatia, S. N. (2009 in press). Microenvironmental regulation of the sinusoidal endothelial cell phenotype in vitro. *Hepatology*.

von Maltzahn, G., Centrone, A., Park, J.-H., Ramanathan, R., Sailor, M. J., Hatton, T. A., and Bhatia, S. N. (2009 in press): SERS-Coded gold nanorods as a multifunctional platform for densely multiplexed near-infrared imaging and photothermal heating. *Advanced Materials*.

von Maltzahn, G., Park, J.-H., Agrawal, A., Bandaru, N. K., Das, S. K., Sailor, M. J., and Bhatia, S. N. (2009 in press): Computationally-guided photothermal tumor therapy using long-circulating gold nanorod antennas. *Cancer Research*.

Park, J.-H., von Maltzahn, G., Zhang, L., Derfus, A. M., Simberg, D., Harris, T. J., Ruoslahti, E., Bhatia, S. N., and Sailor, M. J. (2009): Systematic surface engineering of magnetic nanoworms for in vivo tumor targeting. *Small*, 5(6):694-700.

Park, J.-H., Gu, L., von Maltzahn, G., Ruoslahti, E., Bhatia, S. N., and Sailor, M. J. (2009): Biodegradable luminescent porous silicon nanoparticles for in vivo applications. *Nature Materials*, 8: 331-336.

Higgins, J., Eddington, D., Bhatia, S. N., Mahadevan, L. (2009): Statistical dynamics of flowing red blood cells by morphological image processing. *PLoS Computational Biology*, 5 (2), e1000288.

Chen, A. A.[†], Khetani, S. R.[†], Lee, S., Bhatia, S. N., Van Vliet, K. J. (2009, in press): Modulation of hepatocyte phenotype in vitro via chemomechanical tuning of polyelectrolyte multilayers. *Biomaterials* 30: 1113-1120. [†] These authors contributed equally.

Alvarez, S. D., Derfus, A. M., Schwartz, M. P., Bhatia, S. N., Sailor, M. J. (2008): The compatibility of hepatocytes with chemically modified porous silicon with reference to in vitro biosensors. *Biomaterials*, 30: 26-34.

Khetani, S. R., Chen, A. A., Ranscht, B., and Bhatia, S. N. (2008): T-cadherin modulates hepatocyte functions in vitro. *FASEB Journal*, 22:3678-3775.

J. H. Park, G. von Maltzahn, M. P. Schwartz, E. Ruoslahti, S. N. Bhatia, M. J. Sailor, "Magnetic iron oxide nanoworms for tumor targeting and imaging," *Advanced Materials*, vol. 20, no. 9, pp. 1630-1635, May 2008.

Flaim, C. J., Teng D, Chien, S, and Bhatia, S. N. (2008). Combinatorial signaling microenvironments for studying stem cell fate. *Stem Cells and Development*, 17: 1-11.

S. R. Khetani and S. N. Bhatia, "Microscale human liver tissue for drug development," *Nature Biotechnology*, vol. 26, no. 1, pp. 120-126, Jan. 2008.

Albrecht, D. R., Underhill, G. H., Mendelson, A., Bhatia, S. N. (2007). Multiphase electropatterning of cells and biomaterials. *Lab on a Chip*, 7: 702 – 709.

von Maltzahn, G. [†], Min, D.-H. [†], Zhang, Y., Park, J.-H., Harris, T. J., Sailor, M., Bhatia, S. N. (2007): Nanoparticle self-assembly directed by antagonistic kinase and phosphatase activities. *Advanced Materials*, 19(21): 3579-3583. [†] These authors contributed equally.

Underhill, G. H. and Bhatia, S. N. (2007): High-throughput analysis of signals regulating stem cell fate and function. *Current Opinion in Chemical Biology*, 11: 357-366.

Evans, A. R., Euteneuer, S., Chavez, E., Mullen, L. M., Hui, E. E., Bhatia, S. N., and Ryan, A. F. (2007): Laminin and fibronectin modulate inner ear spiral ganglion neurite outgrowth in an in vitro alternate choice assay. *Developmental Neurobiology*, 67(13): 1721-1730.

A. M. Derfus, A. A. Chen, D. H. Min, E. Ruoslahti, and S. N. Bhatia, "Targeted quantum dot conjugates for siRNA delivery," *Bioconjugate Chemistry*, vol. 18, no. 5, pp. 1391-1396, Sept. 2007.

J. M. Higgins, D. T. Eddington, S. N. Bhatia, and L. Mahadevan, "Sickle-cell vasoocclusion and rescue in a microfluidic device," *Proc. National Academy of Sciences*, vol. 104, no. 51, pp. 20496-20500, Dec. 2007.

A. M. Derfus, G. von Maltzahn, T. J. Harris, T. Duza, K. S. Vecchio, E. Ruoslahti, and S. N. Bhatia, "Remotely triggered release from magnetic nanoparticles," *Advanced Materials*, vol. 19, pp. 3932-3936, 2007.

G. von Maltzahn, T. J. Harris, J. H. Park, A. J. Schmidt, M. J. Sailor, and S. N. Bhatia, "Nanoparticle self-assembly gated by logical proteolytic triggers," *Journal of the American Chemical Society*, vol. 129, pp. 6064-6065, 2007.

E. E. Hui and S. N. Bhatia, "Micromechanical control of cell-cell interactions," *Proc. National Academy of Sciences*, vol. 104, pp. 5722-5726, 2007.

V. Liu Tsang, A. A. Chen, L. M. Cho, K. D. Jadin, R. L. Sah, S. DeLong, J. L. West, and S. N. Bhatia, "Fabrication of 3D hepatic tissues by additive photopatterning of cellular hydrogels," *FASEB Journal*, vol. 21, pp. 790-801, 2007.

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H. Taylor, D. Boning, C. Iliescu, and B. Chen, "Computationally efficient modeling of pattern dependencies in the micro-embossing of thermoplastic polymers," *Microelectronic Engineering*, vol. 85, no. 5-6, pp. 1453-1456, May-June, 2008.

K. Gettings and D. Boning, "Study of CMOS Process Variation by Multiplexing Analog Characteristics," *IEEE Trans. on Semicond. Manuf.*, vol. 21, no. 4, pp. 513-525, Nov. 2008.

N. Drego, A. Chandrakasan, D. Boning, "Lack of Spatial Correlation in MOSFET Threshold Voltage Variation and Implications for Voltage Scaling," *IEEE Trans. on Semicond. Manuf.*, vol. 22, no. 2, pp. 245-255, May 2009.

Y. Sampurno, L. Borucki, Y. Zhuang, S. Misra, K. Holland, D. Boning, and A. Philipossian, "Characterization of Thermoset and Thermoplastic Polyurethane Pads, and Molded and Non-optimized Machined Grooving Methods for Oxide CMP Applications," *Thin Solid Films*, vol. 517, pp. 1719-1726, Jan. 2009.

Z. Xu, S. Li, D. J. Burns, V. Shilpiekandula, H. K. Taylor, S. F. Yoon, K. Youcef-Toumi, I. Reading, Z. Fang, J. Zhao, and D. S. Boning, "Three-Dimensional Profile Stitching Based on the Fiducial Markers for Microfluidic Devices," *Optics Communications*, vol. 282, No. 4, pp. 493-499, Feb. 2009.

H. K. Taylor and D. S. Boning, "Diffraction-based Approaches to the In-situ Measurement of Dimensional Variations in Components Produced by Thermoplastic Micro- and Nano-embossing," presented at the *5th International Symposium on Nanomanufacturing*, Singapore, Jan. 2008.

Z. G. Xu, S. G. Li, S. F. Yoon, Z. P. Fang, K. Youcef-Toumi, D. J. Burns, V. Shilpiekandula, H. K. Taylor and D. S. Boning, "Complete Surface Distinguishing and Overlapping Technology for Three-dimensional Image Processing of Micro Devices," presented at the *5th International Symposium on Nanomanufacturing*, Singapore, Jan. 2008.

H. K. Taylor, Z. Xu, L. Shiguang, K. Youcef-Toumi, S. F. Yoon, and D. S. Boning, "Moiré fringe method for the measurement of distortions of hot-embossed polymeric substrates," presented at the *9th International Symposium on Laser Metrology*, Singapore, June-July 2008.

H. Taylor and D. Boning, "An Integrated Crack-Opening Method for Determining the Work of Fracture of Bonded Polymer Interfaces," presented at the *12th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS 2008)*, San Diego, CA, Oct. 2008.

N. Drego, A. Chandrakasan, and D. Boning, "An All-Digital, Highly Scalable Architecture for Measurement of Spatial Variation in Digital Circuits," presented at the *IEEE Asian Solid-State Circuit Conf.*, Fukuoka, Japan, Nov. 2008.

H. Taylor, D. S. Boning, C. I. Iliescu, B. Chen, Y.-C. Lam, and X. Chen, "Modeling Pattern Dependencies in the Micro-scale Embossing of Polymeric Layers," presented at the *Micro- and Nanotechnology: Materials, Processes, Packaging, and Systems IV*, Proc. of SPIE, vol. 7269, Melbourne, Australia, Dec. 2008.

A. Philipossian, Y. Sampurno, L. Borucki, Y. Zhuang, S. Misra, K. Holland, and D. Boning, "Characterization of Thermoset and Thermoplastic Polyurethane Pads, and Molded and Non-optimized Machined Grooving Methods for Oxide CMP Applications," presented at the *Clarkson Workshop on Chemical-Mechanical Polishing*, Lake Placid, NY, Aug. 2008.

D. Boning, K. Balakrishnan, A. Chang, N. Drego, W. Fan, J. Johnson, and H. Taylor, "Measuring and Modeling IC Variability at the Process, Device, and Circuit Levels," presented at the *ICCAD Workshop on Test Structure Design for Variability Characterization (TSD)*, San Jose, CA, Nov. 2008.

D. Boning, J. Johnson, H. McCulloh, and N. Patel, "The Evolution of Pattern-Density in CMP Modeling," presented at the *Symposium on Chemical-Mechanical Planarization, Materials Research Society Spring Meeting*, San Francisco, CA, April 2009.

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Q. Y. J. Smithwick, J. Barabas, D. E. Smalley, and V. M. Bove, Jr., "Real-time shader rendering of holographic stereograms," *Proc. SPIE Practical Holography XXIII*, v. 7233, p. 723302, 2009.

B.T. Taylor and V.M. Bove, Jr., "Graspables: grasp-recognition as a user interface," *Proc. ACM CHI 2009*, 2009.

S. A. Benton and V. M. Bove, Jr., *Holographic Imaging*, Wiley, New York, 2008.

Q. Y. J. Smithwick, D. E. Smalley, V. M. Bove, Jr., and J. Barabas, "Progress in Holographic Video Displays Based on Guided-Wave Acousto-Optic Devices," *Proc. SPIE Practical Holography XXII*, 6912, 69120H, 2008.

D. E. Smalley, Q. Y. J. Smithwick, and V. M. Bove, Jr., "Holographic Video Display Based on Guided-Wave Acousto-Optic Devices," *Proc. SPIE Practical Holography XXI*, 6488, 64880L, 2007.

W. Plesniak, M. Halle, V. M. Bove, Jr., J. Barabas, and R. Pappu, "Reconfigurable Image Projection (RIP) Holograms," *Optical Engineering*, 45, 115801, Nov. 2006.

V. M. Bove, Jr., W. J. Plesniak, T. Quentmeyer, and J. Barabas, "Real-Time Holographic Video Images with Commodity PC Hardware," *Proc. SPIE Stereoscopic Displays and Applications*, 5664A, 2005.

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- C. Madigan, E. Howe, V. Bulović, P. Mardilović, P. Kornilovitch, "Planarization in electrochemically fabricated nanodimensional films," *Journal of Physical Chemistry C* 112, 7318 (2008).
- I. Nausieda, K. Ryu, I. Kymmissis, A. Akinwande, V. Bulović, C.G. Sodini, "An Organic Active-Matrix Imager," *IEEE Transactions on Electron Devices* 55, 527 (2008).
- J.M. Caruge, J.E. Halpert, V. Wood, V. Bulović, and M.G. Bawendi, "Colloidal Quantum-Dot Light-Emitting Diodes with Metal-Oxide Charge Transport Layers," *Nature Photonics* 2, 247 (2008).
- J. Yu and V. Bulović, "Using Integrated Optical Feedback to Counter Pixel Aging and Stabilize Light Output of Organic LED Display Technology," *IEEE Journal of Display Technology* 4, 308 (2008).
- J. Ho, A. Arango, and V. Bulović, "Lateral Organic Bilayer Heterojunction Photoconductors," *Applied Physics Letters* 93, 063305 (2008).
- P. O. Anikeeva, C.F. Madigan, J.E. Halpert, M.G. Bawendi, V. Bulović, "Electronic and Excitonic Processes in Light-Emitting Devices Based on Organic Materials Colloidal Quantum Dots," *Physical Review B* 78, 085434, (2008).
- M. S. Bradley, J. R. Tischler, Y. Shirasaki, and V. Bulović, "Predicting the Linear Optical Response of J-aggregate Microcavity Exciton-Polariton Devices," *Physical Review B* 78, 193305 (2008).
- L. Kim, P. O. Anikeeva, S. A. Coe-Sullivan, J. S. Steckel, M. G. Bawendi, and V. Bulović, "Contact Printing of Quantum Dot Light-Emitting Devices," *Nano Letters* 8, 4513 (2008).
- A. C. Arango, D. C. Oertel, Y. Xu, M. G. Bawendi, and V. Bulović, "Heterojunction Photovoltaics Using Printed Colloidal Quantum Dots as a Photosensitive Layer," *Nano Letters* 9, 860 (2009).
- T. P. OSEDACH, S. M. Geyer, J. C. Ho, A. C. Arango, M. G. Bawendi, and V. Bulović, "Lateral Heterojunction Photodetector Consisting of Molecular Organic and Colloidal Quantum Dot Thin Films," *Applied Physics Letters* 94, 043307 (2009).
- A. Reina, X. Jia, J. Ho, D. Nezich, H. Son, V. Bulović, M. S. Dresselhaus, and J. Kong, "Large Area, Few-Layer Graphene Films on Arbitrary Substrates by Chemical Vapor Deposition," *Nano Letters* 9, 30 (2009).
- J. E. Halpert, J. R. Tischler, G. Nair, B. J. Walker, W. Liu, V. Bulović, M. G. Bawendi, "Electrostatic Formation of Quantum Dot/J-aggregate FRET Pairs in Solution," *Journal of Physical Chemistry C* 113, 9986 (2009).
- V. Wood, M. J. Panzer, J. Chen, M. S. Bradley, J. E. Halpert, M. G. Bawendi, and V. Bulović, "Inkjet-Printed Quantum Dot-Polymer Composites for Full-Color AC-Driven Displays," *Advanced Materials* 21, 2151 (2009).
- V. Wood, J. E. Halpert, M. J. Panzer, M. G. Bawendi, V. Bulović, "Alternating Current Driven Electroluminescence from ZnSe/ZnS:Mn/ZnS Nanocrystals," *Nano Letters* 9, 2367 (2009).
- J. Mei, M. S. Bradley, V. Bulović, "Photoluminescence quenching of tris-(8-hydroxyquinoline) aluminum thin films at interfaces with metal oxide films of different conductivities," *Physical Review B* 79, 235205 (2009).
- J. M. W. Chan, J. R. Tischler, S. E. Kooi, V. Bulović, T. M. Swager "Synthesis of J-Aggregating Dibenz[a,J]anthracene-Based Macrocycles," *Journal of American Chemical Society* 131, 5659 (2009).

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- A. P. Chandrakasan, F. S. Lee, D. D. Wentzloff, V. Sze, B. P. Ginsburg, P. P. Mercier, D. C. Daly, R. Blazquez, "Low-Power Impulse UWB Architectures and Circuits," *Proc. IEEE*, vol. 97, no. 2, pp. 332-352, February 2009.
- T. S. Cho, K.-J. Lee, J. Kong, and A. P. Chandrakasan, "A 32-uW 1.83-kS/s Carbon Nanotube Chemical Sensor System," *IEEE JSSC*, vol. 44, no. 2, pp. 659-669, February 2009.
- Y. K. Ramadass, A. P. Chandrakasan, "An Efficient Piezoelectric Energy-Harvesting Interface Circuit Using a Bias-Flip Rectifier and Shared Inductor," *IEEE International Solid-State Circuits Conference (ISSCC)*, pp. 296-297, February 2009.
- P. P. Mercier, M. Bhardwaj, D. C. Daly, A. P. Chandrakasan, "A 0.55V 16Mb/s 1.6mW Non-Coherent IR-UWB Digital Baseband with +1ns Synchronization Accuracy," *IEEE ISSCC*, pp. 252-253, February 2009.
- D. C. Daly, P. P. Mercier, M. Bhardwaj, A. L. Stone, J. Voldman, R. B. Levine, J. G. Hildebrand, A. P. Chandrakasan, "A Pulsed UWB Receiver SoC for Insect Motion Control," *IEEE ISSCC*, pp. 200-201, February 2009.
- N. Verma, and A. Chandrakasan, "A High-Density 45nm SRAM Using Small-Signal Non-Strobed Regenerative Sensing," *IEEE JSSC*, vol. 44, no. 1, pp. 163-173, January 2009.
- J. Kwong, Y. K. Ramadass, N. Verma, and A. Chandrakasan, "A 65nm Sub-Vt Microcontroller with Integrated SRAM and Switched Capacitor DC-DC Converter," *IEEE JSSC*, vol. 44, no. 1, pp. 115-126, January 2009.
- B.P. Ginsburg, and A. Chandrakasan, "Highly Interleaved 5-bit, 250-MSample/s, 1.2mW ADC with Redundant Channels in 65nm CMOS," *IEEE JSSC*, vol. 43, no. 12, pp. 2641-2650, December 2008.
- L. Dolecek, M. Qazi, D. Shah, and A.P. Chandrakasan, "Breaking the Simulation Barrier: SRAM Evaluation Through Norm Minimization," *IEEE/ACM International Conference on Computer-Aided Design*, pp. 322-329, November 2008.
- D. F. Finchelstein, V. Sze, M. E. Sinangil, Y. Koken, and A.P. Chandrakasan, "A Low-Power 0.7-V H.264 720p Video Decoder," *IEEE Asian Solid-State Circuits Conference*, pp. 173-176, November 2008.
- N. Ickes, D. Finchelstein, and A. P. Chandrakasan, "A 10-pJ/instruction, 4-MIPS Micropower DSP for Sensor Applications," *IEEE Asian Solid-State Circuits Conference*, pp. 289-292, November 2008.

N. Drego, A. P. Chandrakasan, and D. Boning, "An All-Digital, Highly-Scalable Architecture for Measurement of Spatial Variation in Digital Circuits," *IEEE Asian Solid-State Circuits Conference*, pp. 393-396, November 2008.

V. Sze, M. Budagavi, A. P. Chandrakasan, and M. Zhou, "Parallel CABAC for Low Power Video Coding," *IEEE International Conference on Image Processing*, October 2008.

M. E. Sinangil, N. Verma, and A. P. Chandrakasan, "A reconfigurable 65nm SRAM achieving voltage scalability from 0.25-1.2V and performance scalability from 20kHz-200MHz," *European Solid-State Circuits Conference*, pp. 282-285, September 2008.

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B. Bond, Z. Mahmood, R. Sredojevic, Y. Li, A. Megretski, V. Stojanović, L. Daniel, "Compact Modeling of Nonlinear Circuits using Quasi-Convex Based Stable System Identification," submitted to IEEE Transaction on Computer Aided Design of Integrated Circuits and Systems, May 2009.

T. Moselhy and L. Daniel, "Stochastic Integral Equation Solver for Efficient Variation Aware Interconnect Extraction," submitted to IEEE Transaction on Computer Aided Design of Integrated Circuits and Systems, May 2009.

B. Bond and L. Daniel, "Guaranteed Stable Projection-Based Model Reduction for Indefinite and Unstable Linear Systems," submitted to IEEE Transaction on Computer Aided Design of Integrated Circuits and Systems, May 2009.

T. Moselhy, I. M. Elfadel, and L. Daniel, "A Generalized Floating Random Walk Algorithm for Variation-Aware Electrical Extraction," submitted to IEEE Transaction on Computer Aided Design of Integrated Circuits and Systems, April 2009.

K. C. Sou, A. Megretski, L. Daniel, "Convex Relaxation Approach to the Identification of the Wiener-Hammerstein Model," submitted to IEEE Transaction on Computer Aided Design of Integrated Circuits and Systems, March 2009.

B. Bond and L. Daniel, "Stable Macromodeling for Nonlinear Descriptor Systems via Piecewise-Linear Approximation and Projection," submitted to IEEE Trans. on Computer Aided Design of Integrated Circuits and Systems, January 2009.

K. C. Sou, A. Megretski, L. Daniel, "Convex Relaxation Approach to the Identification of the Wiener-Hammerstein Model," in Proc. 47th IEEE Conference on Decision and Control, Cancun Mexico, December 2008.

T. Moselhy, I. M. Elfadel, and L. Daniel, "A Capacitance Solver for Incremental Variation-Aware Extraction," Proc. IEEE Conference on Computer-Aided Design, San Jose, November 2008.

B. Bond and L. Daniel, "Guaranteed Stable Projection-Based Model Reduction for Indefinite and Unstable Linear Systems" Proc. IEEE Conference on Computer-Aided Design, San Jose, November 2008, (*IEEE/ACM William J. McCalla ICCAD Best Paper Award*).

T. Moselhy and L. Daniel, "Stochastic Integral Equation Solver for Efficient Variation Aware Interconnect Extraction," IEEE/ACM Design Automation Conference, Anaheim, CA, June 2008.

K. C. Sou, A. Megretski, L. Daniel, "A Quasi-Convex Optimization Approach to Parameterized Model Order Reduction. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems," Vol 27, No 3, March 2008.

B. N. Bond, L. Daniel, "A Piecewise-Linear Moment-Matching Approach to Parameterized Model-Order Reduction for Highly Nonlinear Systems," IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, vol. 26 , no.: 12, page(s): 2116 - 2129, Dec. 2007.

K. C. Sou, A. Megretski, L. Daniel, "Bounding L<sub>2</sub> Gain System Error Due to Approximations of the Nonlinear Vector Field," Proc. IEEE Conference on Computer-Aided Design, San Jose, November 2007.

B. Bond and L. Daniel, "Stabilizing Schemes for Piecewise-Linear Reduced Order Models via Projection and Weighting Functions," Proc. IEEE Conference on Computer-Aided Design, San Jose, November 2007, (*Best Paper Award Nomination*).

T. Moselhy, L. Daniel, "Stochastic High Order Basis Functions for Volume Integral Equation with Surface Roughness," IEEE Conference on Electrical Performance of Electronic Packaging (EPEP), Oct. 2007, (*Best Student Paper Award Nomination*).

T. Moselhy , X. Hu, L. Daniel, "pFFT in FastMaxwell: A Fast Impedance Extraction Solver for 3D Conductor Structures over Substrate," IEEE Conference on Design Automation and Test in Europe (DATE), April 2007, (*Best Paper Award Nomination*).

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D.J. Perrault, and J.L. Dawson, "Asymmetric Multilevel  
Outphasing Architecture for Multi-Standard  
Transmitters," accepted for publication at the *2009 IEEE  
RFIC Symposium*.

Chung, S. and J.L. Dawson, "A 73.1dB SNDR Digitally  
Assisted Subsampler for RF Power Amplifier Linearization  
Systems," accepted for publication at the *2009 Symposium  
on VLSI Technology and Circuits*.

J.L. Bohorquez, A.P. Chandrakasan, and J. L. Dawson,  
"A 350 $\mu$ W CMOS MSK Transmitter and 400 $\mu$ W OOK  
Super-Regenerative Receiver for Medical Implant  
Communications," *IEEE Journal of Solid-State Circuits*  
(*VLSI Symposium Special Issue*), pp. 1248-1259, Apr. 2009.

S. Chung, J.W. Holloway, and J.L. Dawson, "Energy-  
Efficient Digital Predistortion with Lookup Table Training  
Using Analog Cartesian Feedback," *IEEE Transactions on  
Microwave Theory and Techniques*, pp. 2248-2258, Oct. 2008.

P. Godoy and J.L. Dawson, "Chopper Stabilization  
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Joh, J. and J. A. del Alamo, "Critical Voltage for Electrical Degradation of GaN High Electron Mobility Transistors." IEEE Electron Device Letters vol. 29, No. 4, pp. 287-289, April 2008.

Villanueva, A. A., J. A. del Alamo, T. Hisaka, K. Hayashi, and M. Somerville, "Degradation Uniformity of RF Power GaAs PHEMTs under Electrical Stress." Invited Paper, IEEE Transactions on Device and Materials Reliability, vol. 8, No. 2, pp. 283-288, June 2008.

Joh, J., J. A. del Alamo and J. Jimenez, "A Simple Current Collapse Measurement Technique for GaN High Electron Mobility Transistors." IEEE Electron Device Letters vol. 29, No. 7, pp. 665-667, July 2008.

Kim, D-H. and J. A. del Alamo, "30 nm InAs Pseudomorphic HEMTs on InP Substrate with Current-Gain Cut-off Frequency of 628 GHz." IEEE Electron Device Letters vol. 29, No. 8, pp. 830-833, August 2008.

Chowdhury, U., J. L. Jimenez, C. Lee, E. Beam, P. Saunier, T. Balistreri, S.-Y. Park, T. Lee, J. Wang, M. J. Kim, J. Joh, and J. A. del Alamo, "TEM Observation of Crack- and Pit-Shaped Defects in Electrically Degraded GaN HEMTs." IEEE Electron Device Letters vol. 29, No. 10, pp. 1098-1100, October 2008.

Kim, D.-H. and J. A. del Alamo, "Lateral and Vertical Scaling of  $In_{0.7}Ga_{0.3}As$  HEMTs for Post-Si-CMOS Logic Applications." IEEE Transactions on Electron Devices 55 (10), 2546-2553, October 2008.

Saunier, P., C. Lee, J. Jimenez, A. Balistreri, H. Dumka, H. Q. Tseng, M. Y. Kao, U. Chowdhury, P. C. Chao, K. Chu, A. Souzis, I. Eliashevich, S. Guo, J. del Alamo, J. Joh, and M. Shur, "Progress in GaN Devices, Performance and Reliability." SPIE Photonics West Conference, San Jose, CA, Jan. 20-24, 2008.

del Alamo, J. A., "CMOS Extension via III-V Compound Semiconductors." Tutorial at Spring Meeting of the Materials Research Society. San Francisco, CA, March, 2008.

del Alamo, J. A., D.-H. Kim, and N. Waldron, "III-V CMOS: Challenges and Opportunities." Invited paper at International Conference on Solid State Devices and Materials, Tsukuba, Japan, September, 2008, pp. 28-29.

Fukuda, S., T. Suemitsu, T. Otsuji, C.-H. Kim, and J. A. del Alamo, "Analysis of Gate Delay Scaling in  $In_{0.7}Ga_{0.3}As$ -Channel HEMTs." International Conference on Solid State Devices and Materials, Tsukuba, Japan, September, 2008, pp. 166-167.

Joh, J., J. A. del Alamo, U. Chowdhury and J. L. Jimenez, "Correlation Between RF and DC Reliability in GaN High Electron Mobility Transistors." 2008 Reliability of Compound Semiconductors Workshop, Monterey, CA, October 12, 2008, pp. 185-188.

Hisaka, T., H. Sasaki, Y. Nogami, K. Hosogi, N. Yoshida, A. A. Villanueva, J. A. del Alamo, S. Hasegawa and H. Asahi, "Degradation Mechanisms of GaAs PHEMTs under Operation in High Humidity Conditions." 2008 Reliability of Compound Semiconductors Workshop, Monterey, CA, October 12, 2008, pp. 109-113.

Joh, J., S. Demirtas, and J. A. del Alamo, "Impact of electrical degradation on trapping characteristics of GaN high electron mobility transistors." 2008 IEEE International Electron Devices Meeting, San Francisco, CA, December 15-17, 2008, pp. 461-464.

Kim, D.-H. and J. A. del Alamo, "30 nm E-mode InAs PHEMTs for THz and Future Logic Applications." 2008 IEEE International Electron Devices Meeting, San Francisco, CA, December 15-17, 2008, pp. 719-722.

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Perkins, J. M., and C. G. Fonstad, "Full Recess Integration of Small Diameter Low Threshold VCSELs within Si-CMOS ICs," *Optics Express*, vol. 16 (2008) 13955-193960.

Cheng, D. I., J. J. Rumpler II, J. M. Perkins, M. Zahn, C. G. Fonstad, Jr., E. S. Cramer, R. W. Zuneska, and F. J. Cadieu. "Use of Patterned Magnetic Films to Retain and Orient Micro-Components During Fluidic Assembly," presented at the *Magnetism and Magnetic Materials Annual Conference*, Austin, TX, November 2008.

F. M. Morales, R. García, S. I. Molina, A. Aouni , P. A. Postigo, and C. G. Fonstad, "Micro-structural Improvements of InP on GaAs (001) grown by Molecular Beam Epitaxy by In-situ Hydrogenation and Post-growth Annealing," *Appl. Phys. Lett.*, in press.

Cheng, D. I., J. J. Rumpler II, J. M. Perkins, M. Zahn, C. G. Fonstad, Jr., E. S. Cramer, R. W. Zuneska, and F. J. Cadieu. "Use of Patterned Magnetic Films to Retain and Orient Micro-Components During Fluidic Assembly," *Journal of Applied Physics*, vol. 105, 07C123 (2009)

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- Schoch, R.B., J. Han, and P. Renaud, Transport phenomena in nanofluidics. *Reviews of Modern Physics*, 80, 839-883, 2008.
- Z. R. Li, G. R. Liu, Y. Z. Chen, J.-S. Wang, H. Bow, Y. Cheng, J. Han, "Continuum Transport Model of Ogston Sieving in Patterned Nanofilter Arrays for Rod-like Biomolecule Separation," *Electrophoresis*, 29, 329-339, 2008.
- Y.-C. Wang and J. Han, "Pre-binding dynamic range and sensitivity enhancement for immuno-sensors using nanofluidic preconcentrator," *Lab on a Chip*, 8, 392-394, 2008.
- J. Lee, Y.-A. Song, J. Han, "Multiplexed Proteomic Sample Preconcentration Device Using Surface-Patterned Ion-Selective Membrane," *Lab on a Chip*, 8, 596-601, 2008.
- S. J. Kim and J. Han, "Self-Sealed Vertical Polymeric Nanoporous-Junctions for High-Throughput Nanofluidic Applications," *Analytical Chemistry*, 80, 3507-3511, 2008.
- S. Chung, J. H. Lee, M.-W. Moon, J. Han, R. D. Kamm, "Non-lithographic wrinkle nanochannels for protein preconcentration," *Advanced Materials*, 20, 3011-3016, 2008.
- J. Hoon Lee, Y.-A. Song, S. R. Tannenbaum, J. Han, "Enhanced Reaction Kinetics and Sensitivity of Low-Abundance Enzyme Assay using Micro/Nanofluidic Preconcentration Chip," *Analytical Chemistry*, 80, 3198-3204, 2008.
- Y.-A. Song, C. Batista, R. Sarapeshkar and J. Han, "In-plane integration of ion-selective membrane in microfluidic PEM fuel cell by micro flow surface patterning," *Journal of Power Sources*, 183, 674-677, 2008.
- J. Fu, P. Mao, and J. Han, "Artificial molecular sieves and filters: a new paradigm for biomolecule separation," *Trends in Biotechnology* 26, 311-320, 2008
- Duong-Hong, D., J. Han, J.-S. Wang, N. G. Hadjiconstantinou, Y. Z. Chen, and G.-R. Liu, "Realistic Simulations of Combined DNA Electrophoretic and Electroosmotic Flows in Nano-Fluidic Devices," *Electrophoresis*, 29, 4880-4886, 2008.
- H. Bow, J. Fu, and J. Han, "Decreasing effective nanofilter size by modulating electrical double layers: Separation enhancement in microfabricated nanofilters," *Electrophoresis*, 29, 1-6, 2008.
- P. Mao and J. Han, "Massively-Parallel Ultra-High-Aspect-Ratio Nanochannels as Mesoporous Membranes," *Lab on a Chip*, 9, 586-591, 2009.
- Zi Rui Li, Gui Rong Liu, J. Han, Yu Zong Chen, Jian-Sheng Wang, N. Hadjiconstantinou, "Transport of biomolecules in asymmetric nanofilter arrays," *Analytical and Bioanalytical Chemistry*, accepted for publication (DOI: 10.1007/s00216-008-2558-y) (2009).
- Y.-Ak Song and J. Han, "High-throughput Sample Preparation for Mass Spectrometry by Continuous-Flow pI-based Fractionation of Peptides and Proteins," (oral) *Proc. μTAS 2008 Symposium*, San Diego, CA, vol. 2, pp. 1323-1325, October 2008.
- S. J. Kim and J. Han, "Self-Sealed Vertical Nanoporous Junctions for Integrating Various Nanomaterials in PDMS Microfluidic System," *Proc. μTAS 2008 Symposium*, San Diego, CA, vol. 2, pp. 1042-1044, October 2008.
- S. J. Kim and J. Han, "Amplified Electrokinetic Fluid Pumping and Switching by Concentration Polarization Near Nanofluidic Channel," *Proc. μTAS 2008 Symposium*, San Diego, CA, vol. 1, pp. 197-199, October 2008.
- H. Bow, P. Abgrall, and J. Han, "Microfabricated Slits in Series: A Simple Platform to Probe Differences in Cell Deformability," (poster), *Proc. μTAS 2008 Symposium*, San Diego, CA, vol. 2, pp. 1199-120, October 2008.
- Y.-A. Song, A. Sarkar, and J. Han, "Encapsulation of Biomolecules with Programmable Concentrations in Microdroplets using Electrokinetic Concentrator," *Proc. μTAS 2008 Symposium*, San Diego, CA, vol. 2, pp. 1420-1422, October 2008.
- P. Mao and J. Han, "Fabrication of Massively-Parallel Regular Nanofluidic Filters for High-Throughput Biomolecule Separation," (poster), *Proc. μTAS 2008 Symposium*, San Diego, CA, vol. 1, pp. 853-855, October 2008.

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C. Ni Chleirigh, N.D. Theodore, H. Fukuyama, S. Mure, H.-U. Ehrke, A. Domenicucci, and J. L. Hoyt, "Thickness Dependence of Hole Mobility in Ultrathin SiGe-Channel p-MOSFETs," *IEEE Trans. Electron Devices*, vol. 55, no. 10, Oct. 2008, pp. 2687 – 2694.

L. Gomez, P. Hashemi, and J.L. Hoyt, "Hole Velocity Enhancement in Sub-100nm Gate Length Strained-SiGe Channel p-MOSFETs on Insulator," *IEEE SOI Conference*, New Paltz, NY, USA, October 2008.

P. Hashemi, M. Canonico, J.K.W. Yang, L. Gomez, K.K. Berggren, and J. L. Hoyt, "Fabrication and Characterization of Suspended Uniaxial Tensile Strained-Si Nanowires for Gate-All-Around n-MOSFETs," *ECS (Electrochemical Society) Transactions*, vol. 16, No. 10, p.p. 57-68, October 2008.

Meekyung Kim, Oluwamuyiwa Olubuyide, Jung Yoon, and Judy Hoyt, "Selective Epitaxial Growth of Ge-on-Si for Photodiode Applications," *ECS (Electrochemical Society) Transactions*, vol. 16, No. 10, pp. 837-847, October 2008.

J.L. Hoyt, P. Hashemi, and L. Gomez, "Prospects for Top-Down Fabricated Uniaxial Strained Nanowire MOSFETs," in *ECS Transactions*, vol. 16, No. 10, p.p. 731-734, October 2008.

O.M. Nayfeh, C. Ni Chleirigh, J. Hennessy, L. Gomez, J.L. Hoyt and D.A. Antoniadis, "Design of tunneling field-effect transistors using strained-silicon/strained-germanium type-II staggered heterojunctions," *IEEE Electron Device Letters*, v 29, n 9, Sept. 2008, p 1074-7.

O.M. Nayfeh, C. Ni Chleirigh, J.L. Hoyt and D.A. Antoniadis, "Measurement of enhanced gate-controlled band-to-band tunneling in highly strained silicon-germanium diodes," *IEEE Electron Device Letters*, v 29, n 5, May 2008, p 468-70.

C. Ni Chleirigh, XiaoRu Wang, G. Rimple, Yun Wang, N.D. Theodore, M. Canonico, and J.L. Hoyt, "Super critical thickness SiGe-channel heterostructure p-type metal-oxide-semiconductor field-effect transistors using laser spike annealing," *Journal of Applied Physics*, v 103, n 10, 15 May 2008, p 104501-1-4.

P. Hashemi, L. Gomez, M. Canonico, and J.L. Hoyt "Performance Enhancement in Uniaxially Tensile Strained-Si Gate-All-Around Nanowire n-MOSFETs," presented at *IEEE Device Research Conference (DRC 2008)*, Santa Barbara, CA, USA, p. 185, June 2008.

L. Gomez, M. Canonico, M.K. Kim, P. Hashemi , and J.L. Hoyt, "Fabrication of Strained-Si/Strained-Ge Heterostructures on Insulator," *Journal of Electronic Materials*, vol. 37, No. 3, pp. 240-244, March 2008.L. Gomez, M. Canonico, M. Kim, P. Hashemi, and J.L. Hoyt, Fabrication of Strained-Si/Strained-Ge Heterostructures on Insulator, *J. Electronic Matl.*, 38 (3), p. 240, Feb. 2008.

P. Hashemi, L. Gomez, J.L. Hoyt, M.D. Robertson, M. Canonico, "Asymmetric strain in nano-scale patterned strained-Si/strained-Ge/strained-Si heterostructures on insulator," *Applied Physics Letters*, vol. 91, 083109, Aug. 2007.

L. Gomez, I. Aberg, and J.L. Hoyt, "Electron Transport in Strained-Silicon Directly on Insulator Ultrathin-Body n-MOSFETs With Body Thickness Ranging From 2 to 25 nm," *IEEE EDL* 28 (4), p. 285, April, 2007.

Guangrui (Maggie) Xia, Judy L. Hoyt and Michael Canonico, "Si-Ge interdiffusion in strained Si/strained SiGe heterostructures and implications for enhanced mobility metal-oxide-semiconductor field-effect transistors," *Journal of Applied Physics*, vol. 101, p. 044901 (2007)

T. Barwicz, H. Byun, F. Gan, C.W. Holzwarth, M.A. Popovic, PT. Rakich, M.R. Watts, E.P. Ippen, F.X. Kartner, H.I. Smith, J.S. Orcutt, R.J. Ram, V. Stojanović, O.O. Olubuyide, J.L. Hoyt, S. Spector, M. Geis, M. Grein, T. Lyszczarz, J.U. Yoon, "Silicon photonics for compact, energy-efficient interconnects," *Journal of Optical Networking*, v 6, n 1, p. 63-73 (Jan. 2007).

Guangrui (Maggie) Xia, Michael Canonico, and Judy L. Hoyt, "Interdiffusion in strained Si/strained SiGe epitaxial heterostructures," *Semicond. Sci. Technol.* 22, pp. S55-S58, Nov. 2006.

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S. Kumar, B. S. Williams, Q. Hu, and J. L. Reno, "1.9-THz quantum-cascade lasers with one-well injector," *Appl. Phys. Lett.* 88, 121123 (2006).

E. E. Orlova, J. N. Hovenier, T. O. Klaassen, I. Kasalynas, A. J. L. Adam, A. Baryshev, J. R. Gao, T. M. Klapwijk, B. S. Williams, S. Kumar, Q. Hu, and J. L. Reno, "Antenna Model for Wire Lasers," *Phys. Rev. Lett.* 96, 173904 (2006). Also published in the May 29, 2006 issue of *Virtual Journal of Nanoscale Science & Technology*.

A. J. L. Adam, I. Kašalynas, J. N. Hovenier, T. O. Klaassen, J. R. Gao, E. E. Orlova, B. S. Williams, S. Kumar, Q. Hu, and J. L. Reno, "Beam pattern of Terahertz quantum cascade lasers with sub-wavelength cavity dimensions," *Appl. Phys. Lett.* 88, 151105 (2006). Also published in *Virtual Journal of Nanoscale Science & Technology*, 13(16), April 26 (2006).

S. Kumar, B. S. Williams, Q. Hu, and J. L. Reno, "1.9-THz quantum-cascade lasers with one-well injector," *Appl. Phys. Lett.* 88, 121123 (2006). H. C. Liu, H. Luo, D. Ban, M. Wächter, C. Y. Song, Z. R. Wasilewski, M. Buchanan, G. C. Aers, A. J. Spring Thorpe, J. C. Cao, S. L. Feng, B. S. Williams, and Q. Hu, "Terahertz Semiconductor Quantum Well Devices," *Proc. of SPIE*, 6029, 602901 (2005).

Alan W.M. Lee, Benjamin S. Williams, Sushil Kumar, Qing Hu, and John L. Reno, "Real-Time Imaging using a 4.3-THz Quantum Cascade Laser and a 320'240 Microbolometer Focal-Plane Array," *IEEE Photonics Technology Letters* 18, 1415 (2006).

A. Baryshev, J. N. Hovenier, A. J. L. Adam, I. Kasalynas, J. R. Gao, T. O. Klaassen, B. S. Williams, S. Kumar, Q. Hu, and J. L. Reno, "Phase locking and spectral linewidth of a two-mode terahertz quantum cascade laser," *Appl. Phys. Lett.* 89, 031115 (2006).

B. S. Williams, S. Kumar, Q. Qin, Q. Hu, and J. L. Reno, "Terahertz quantum cascade lasers with double resonant-phonon depopulation," *Appl. Phys. Lett.* 88, 261101 (2006).

Alan W.M. Lee, Qi Qin, Sushil Kumar, Benjamin S. Williams, Qing Hu, and John L. Reno, 'Real-Time Terahertz Imaging over a Standoff Distance (>25 meters)," *Appl. Phys. Lett.* 89, 141125 (2006).

Sushil Kumar, B. S. Williams, Q. Qin, A. W. M. Lee, Q. Hu, and J. L. Reno, "Surface-emitting distributed feedback terahertz quantum-cascade lasers in metal-metal waveguides," *Optics Express*, 15, 113-128 (2007).

Alan Wei Min Lee, Qi Qin, Sushil Kumar, Benjamin S. Williams, Qing Hu, John L. Reno, "High-power and high-temperature THz quantum-cascade lasers based on lens-coupled metal-metal waveguides," submitted to *Optics Letters* (2007).

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B. Özyilmaz, P. Jarillo-Herrero, D. Efetov, D.A. Abanin, L.S. Levitov and P. Kim, "Electronic Transport and Quantum Hall Effect in Bipolar Graphene p-n-p Junctions," *Phys. Rev. Lett.* 99, 166804 (2007).

H.B. Heersche, P. Jarillo-Herrero, J.B. Oostinga, L.M.K. Vandersypen and A. Morpurgo, "Manifestations of phase-coherent transport in graphene - The Josephson effect, weak localization, and aperiodic conductance fluctuations," *European Physical Journal-Special Topics* 148, 27 (2007).

H.B. Heersche, P. Jarillo-Herrero, J.B. Oostinga, L.M.K. Vandersypen and A. Morpurgo, "Induced superconductivity in graphene," *Solid State Communications* 143, 72 (2007).

H.B. Heersche\*, P. Jarillo-Herrero\*, J.B. Oostinga, L.M.K. Vandersypen and A. Morpurgo, "Bipolar supercurrent in graphene," \*Equal contribution. *Nature* 446, 56 (2007).

S. Sapmaz, P. Jarillo-Herrero, L.P. Kouwenhoven and H.S.J. van der Zant, "Quantum dots in carbon nanotubes," *Semiconductor Science and Technology* 21, s52 (2006) (Focus issue on Charge transport in carbon nanotubes)

S. Sapmaz, C. Meyer, P. Belicynski, P. Jarillo-Herrero and Leo P. Kouwenhoven, "Excited state spectroscopy in carbon nanotube double quantum dots," *Nano Letters* 6, 1350 (2006) (featured in the cover).

P. Jarillo-Herrero, J.A. van Dam and L.P. Kouwenhoven, "Quantum supercurrent transistors in carbon nanotubes," *Nature* 439, 953 (2006).

S. Sapmaz, P. Jarillo-Herrero, Ya.M. Blanter, C. Dekker and H.S.J. van der Zant, "Tunneling in suspended carbon nanotubes assisted by longitudinal phonons," *Phys. Rev. Lett.* 96, 026801 (2006).

S. Sapmaz, P. Jarillo-Herrero, Ya.M. Blanter and H.S.J. van der Zant, "Coupling between electronic transport and longitudinal phonons in suspended nanotubes," *New Journal of Physics* 7, 243 (2005), (Focus issue on Nano-ElectroMechanical Systems).

P. Jarillo-Herrero, J. Kong, H.S.J. van der Zant, C. Dekker, L.P. Kouwenhoven and S. De Franceschi, "Tunable Orbital Pseudospin and Multi-level Kondo Effect in Carbon Nanotubes," in *Proc. Int. Winterschool on Electronic Properties of Novel Materials* (2005).

P. Jarillo-Herrero, J. Kong, H.S.J. van der Zant, C. Dekker, L.P. Kouwenhoven and S. De Franceschi, "Electronic transport spectroscopy of carbon nanotubes in a magnetic field," *Phys. Rev. Lett.* 94, 156802 (2005).

S. Sapmaz, P. Jarillo-Herrero, J. Kong, C. Dekker, L.P. Kouwenhoven and H.S.J. van der Zant, "Electronic excitation spectrum of metallic carbon nanotubes," *Phys. Rev. B* 71, 153402 (2005).

P. Jarillo-Herrero, J. Kong, H.S.J. van der Zant, C. Dekker, L.P. Kouwenhoven and S. De Franceschi, "Orbital Kondo effect in carbon nanotubes," *Nature* 434, 484 (2005).

P. Jarillo-Herrero, S. Sapmaz, C. Dekker, L.P. Kouwenhoven and H.S.J. van der Zant, "A few electron-hole semiconductor carbon nanotube quantum dot," in *Proc. International Winterschool on Electronic Properties of Novel Materials* 583 (2004).

P. Jarillo-Herrero, S. Sapmaz, C. Dekker, L.P. Kouwenhoven and H.S.J. van der Zant, "Electron-hole symmetry in a semiconducting carbon nanotube quantum dot," *Nature* 429, 389 (2004).

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- H.J. In, H. W. Lee, S. G. Kim, and G. Barbastathis, "Carbon nanotube based magnetic actuation of origami membranes," *Journal of Vacuum Science and Technology B*, vol. 26, no. 6, pp. 2509-2512, 2008
- S. Bathurst, H.W. Lee and S.G. Kim, "Direct Printing of Lead Zirconate Titanate Thin Films," *IEEE MEMS 2008*, Tucson, AZ, 2008
- A. Hajati and S. G. Kim, "Rectifierless Piezoelectric Micro Power Generator," *SPIE Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring 2008*, San Diego, CA, 2008
- A. Hajati and S. G. Kim, Energy Harvesting Piezoelectric MEMS Devices for Self-Supportive Wireless Sensors, Proceedings of Innovation Conference NSF Engineering Research, Knoxville, Tennessee, 2008
- S. G. Kim, "Complexity of Assembly at Micro and Nano Scales: Axiomatic Approach," *SAE World Congress 2008* (invited), Chicago 2008
- S. Bathurst, J. Jeon, H.W. Lee and S. G. Kim, "PZT MEMS by Thermal Ink Jet Printing," *Solid-State Sensor and Actuator Workshop*, Hilton Head, SC, 2008
- H. J. In, A. J. Nichol, H. W. Lee, S. G. Kim, G. Barbastathis, "Carbon Nanotube-Based Magnetic Actuation of Origami Membranes," *Proc. International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication*, Portland, OR, 2008
- J. Peck and S.G. Kim, "Improving Emergency Department Patient Flow through Optimal Fast Track Usage," *ACEP Research Forum*, American College of Emergency Physicians Scientific Assembly, Chicago, IL, 2008
- Bathurst, S., Jeon, J. Lee, H.W. and S.-G. Kim, "Ink Jet Printing of PZT Thinfilms for MEMS Applications," presented at *Digital Fabrication*, Pittsburgh, PA, 2008.
- S. H. Kim, H. W. Lee and S.-G. Kim, "Deterministic Transplanting Assembly of Individual Carbon Nanotubes to MEMS Cantilevers," in *Proc. μTAS 2008 Symposium*, San Diego, CA, 2008
- N. Reticker-Flynn, H. W. Lee and S.-G. Kim, "Printing of Temperature Sensitive Hydrogel for Compact Microfluidic Valves," in *Proc. μTAS 2008 Symposium*, San Diego, CA, 2008
- H. W. Lee, S. H. Kim and S.-G. Kim, "Effective Parameters For Growing Vertically-Aligned Individual Freestanding Carbon Nanotubes/Nanofibers (CNs) using Plasma Enhanced Chemical Vapor Deposition (PECVD)," *Mater. Res. Soc. Symp. Proc.* Boston, MA, 2008
- S. H. Kim, H. W. Lee and S.-G. Kim, "Double Polymeric Layer Encapsulation Process for Transplanting Assembly of Carbon Nanotubes into MEMS," *Mater. Res. Soc. Symp. Proc.* Boston, MA, 2008
- H. W. Lee, H. J. In, G. Barbastathis, and S-G Kim, "Growth of Single Strand Carbon Nanotube Arrays on Foldable Titanium Nitride Membranes," *Mater. Res. Soc. Symp. Proc.* Boston, MA, 2008
- H. J. In, H. W. Lee, and S-G Kim, G. Barbastathis, "Nano-manufacturing of Carbon Nanotubes on Titanium Nitride," *6th International Symposium on Nanomanufacturing*, Athens, Greece, Nov. 12-14, 2008
- S. H. Kim, H. W. Lee and S.G. Kim, "Integration of Carbon Nanotubes into MEMS Devices via Deterministic Transplanting," *IEEE MEMS 2009*, Sorrento, Italy, 2009
- S. Bathurst and S.-G. Kim, "Designing Direct Printing Process for Improved Piezoelectric Micro Devices," *Annals of the CIRP (Int'l Academy for Production Engineering)*, vol. 58, 2009
- J. Peck, S-G. Kim, "Improving Patient Flow Through Axiomatic Design of Hospital Emergency Departments," *Proc. CIRP Design Conference*, Cranfield, UK, 2009
- S. Bathurst, H.W. Lee, and S.G. Kim, "Design Against The Coupled Nature Of PZT Spin Coating," *Proc. 5<sup>th</sup> International Conference on Axiomatic Design*, Portugal, 2009
- J. Peck, E. Kolb, T. Lee and S.G. Kim, "Lessons Learned by Applying Axiomatic Design to an Emergency Department," *Proc. 5<sup>th</sup> International Conference on Axiomatic Design*, Portugal 2009
- H. J. In, H. W. Lee, and S-G Kim, G. Barbastathis, "Nano-manufacturing of Carbon Nanotubes on Titanium Nitride," *Int. J. of Nanomanufacturing*, 2009, accepted for publication
- S. H. Kim, H. W. Lee and S.G. Kim, "Assembly of Individual Nanostructures to Micro Devices," *Proc. 6<sup>th</sup> Annual Conference on Foundations of Nano Science: Self-Assembled Architectures and Devices*, Snowbird, Utah, 2009
- S. Kim, H.W. Lee and S-G. Kim, "Transplanting Assembly of CNT-tipped AFM Probes," accepted to *Applied Physics Letters*, 2009
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amorphous silicon channel waveguides with silicon nitride  
intercladding layer," *Applied Physics Letters* **94**: 141108  
(2009).
- S. Saini, C.Y. Hong, S. Bernardis, N. Pfaff, L.C.  
Kimerling, J. Michel, "Hybrid waveguides for optically  
pumped amplifiers," *Applied Physics Letters* **94**:091117  
(2009).
- Jifeng Liu and Jurgen Michel, "High Performance Ge  
Devices for Electronic-Photonic Integrated Circuits "  
*ECS Transactions* **16**: 575 (2008).
- L. Zeng, P. Bermel, Y. Yi, B. A. Alamariu, K. A. Broderick,  
J. Liu, C. Hong, X. Duan, J. Joannopoulos, L.C.  
Kimerling, "Demonstration of enhanced absorption in  
thin film Si solar cells with textured photonic crystal back  
reflector," *Applied Physics Letters* **93**:221105 (2008).
- J. Hu, V. Tarasov, N. Carlie, L. Petit, A. Agarwal, K.  
Richardson, L.C. Kimerling, "Exploration of waveguide  
fabrication from thermally evaporated Ge-Sb-S glass  
films," *Optics Express* **30** (10):1560-1566 (2008).
- J. Hu, N. Carlie, N.N. Feng, L. Petit, A. Agarwal, K.  
Richardson, L.C. Kimerling, "Planar waveguide-coupled,  
high-index-contrast, high-Q resonators in chalcogenide  
glass for sensing, *Optics Letters* **33**:2500 (2008)
- J. Wang, J. Hu, X. Sun, A. Agarwal, D. Lim, R. Synowicki,  
and L. Kimerling, "Structural, electrical and optical  
properties of thermally evaporated nanocrystalline PbTe  
films," *Journal of Applied Physics* **104**: 053707 (2008).
- J. Hu, N. Carlie, L. Petit, A. Agarwal, K. Richardson, and  
L.C. Kimerling, "Demonstration of chalcogenide glass  
racetrack micro-resonators," *Optics Letters* **33**:761 (2008).
- J. F. Liu, M. Beals, A. Pomerene, S. Bernardis, R. Sun,  
J. Cheng, L. C. Kimerling and J. Michel, "Waveguide-  
integrated, ultra-low energy GeSi electro-absorption  
modulators" *Nature Photonics* **2**, 433 (2008)
- T. Anderson, L. Petit, N. Carlie, J. Choi, J. Hu, A.  
Agarwal, L.C. Kimerling, K. Richardson, M. Richardson,  
"Femtosecond laser photo-response of Ge<sub>23</sub>Sb<sub>7</sub>S<sub>70</sub>  
films," *Optics Express* **16**: 20081 (2008).
- R. Sun, L. Wang, J. Cheng, L. C. Kimerling, M. Balseanu,  
L.-Q. Xia, and H. M'saad, "Theoretical modeling  
on hydrogen evolution in Ultraviolet light-treated  
hydrogenated silicon nitride," *Journal of Applied Physics*,  
**104**:094103 (2008).
- R. Sun, M. Beals, A. Pomerene, J. Cheng, C.Y. Hong, L.C.  
Kimerling, and J. Michel, "Impedance matching vertical  
optical waveguide couplers for dense high index contrast  
circuits," *Optics Express* **16**:11682-11690 (2008).
- J. Hiltunen, D. Seneviratne, R. Sun, M. Stolfi, H. L.  
Tuller, J. Lappalainen, and V. Lantto, "Optical properties  
of BaTiO<sub>3</sub> thin films: Influence of oxygen pressure  
utilized during pulsed laser deposition," *Journal of  
Electroceramics*, DOI 10.1007/s10832-008-9463-9,  
published online March 7, 2008.
- W.N. Ye, J. Michel, L.C. Kimerling, "Athermal High-  
Index-Contrast Waveguide Design," *Photonics  
Technology Letters*, IEEE **20** (11): 885-887 (June 1,  
2008).
- V. Sorianello, A. Perna, L. Colace, G. Assanto, H.C.  
Luan, L.C. Kimerling, "Near-infrared absorption of  
germanium thin films on silicon," *Applied Physics Letters*  
**93** (11):111115 (Sept. 15, 2008).
- S. Saini, C.Y. Hong, N. Pfaff, L. C. Kimerling, and  
J. Michel, "Partial confinement photonic crystal  
waveguides," *Applied Physics Letters* **93**, 261102 (2008).

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T.-M. Shih, A. Kurs, M. Dahlem, G. S. Petrich, M. Soljacic, E. P. Ippen, L. A. Kolodziejski, K. Hall, and M. Kesler, "Supercollimation in Photonic Crystals Composed of Silicon Rods" *Virtual Journal of Nanoscale Science and Technology*, vol. 18, no. 16 (2008).

T.-M. Shih, M. Dahlem, A. Kurs, G.S. Petrich, M. Soljacic, E.P Ippen, L.A. Kolodziejski, K. Hall, and M. Kesler, "Supercollimation in Photonic Crystals Composed of Nano-Scale Silicon Rods" *Lasers and Electro-Optics, 2008 and 2008 Conference on Quantum Electronics and Laser Science. CLEO/QELS 2008*. Conference on 4-9 May 2008 Page(s):1 - 2

D. Pudo, H. Byun, J.T. Gopinath, G.S. Petrich, E.P. Ippen, F.X. Kaertner, and L.A. Kolodziejski, "Nonlinear Phase Response of a Saturable Bragg Reflector for Modulation Depth Control" *Lasers and Electro-Optics, 2008 and 2008 Conference on Quantum Electronics and Laser Science. CLEO/QELS 2008*. Conference on 4-9 May 2008 Page(s):1 - 2

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- H. Farhat, H. Son, G.G. Samsonidze, S. Reich, M.S. Dresselhaus, and J. Kong, "Phonon softening in individual metallic carbon nanotubes due to the Kohn anomaly," *Physical Review Letters*, vol. 99, no. 14 , pp. 145506:1-4, Oct. 2007.
- X.J. Duan, H.B. Son, B. Gao, J. Zhang, T.J. Wu, G.G. Samsonidze, M.S. Dresselhaus, Z.F. Liu, and J. Kong, "Resonant raman spectroscopy of individual strained single-wall carbon nanotubes," *Nano Letters*, vol. 7, no. 7, pp. 2116-2121, June 2007.
- H. Son, G.G. Samsonidze, J. Kong, Y.Y. Zhang, X.J. Duan, J. Zhang, Z.F. Liu, and M.S. Dresselhaus, "Strain and friction induced by van der Waals interaction in individual single walled carbon nanotubes," *Applied Physics Letters*, vol. 90, no. 25, pp. 253113:1-3, June 2007.
- A. Reina, M. Hofmann, D. Zhu, and J. Kong, "Growth mechanism of long and horizontally aligned carbon nanotubes by chemical vapor deposition," *Journal of Physical Chemistry C*, vol. 111, no. 20, pp. 7292-7297, May 2007.
- Y.Y. Zhang, H. Son, J. Zhang, J. Kong, and Z.F. Liu, "Laser-heating effect on Raman spectra of individual suspended single-walled carbon nanotubes," *Journal of Physical Chemistry C*, vol. 111, no. 5, pp. 1988-1992, Jan. 2007.
- Y.Y. Zhang, H. Son, J. Zhang, M.S. Dresselhaus, J. Kong, and Z.F. Liu, "Raman spectra variation of partially suspended individual single-walled carbon nanotubes," *Journal of Physical Chemistry C*, vol. 111, no. 5, pp. 1983-1987, Jan. 2007.
- S. Bhaviripudi, E. Mile, S. Steiner, A.T. Zare, M.S. Dresselhaus, A. Belcher, and J. Kong, "CVD synthesis of single-walled carbon nanotubes from gold nanoparticle catalysts," *Journal of the American Chemical Society*, vol. 129, pp. 1516-1517, Jan. 2007.
- X. Zhang, K. Jiang, C. Feng, P. Liu, L. Zhang, J. Kong, T. Zhang, Q. Li, and S. Fan, "Spinning and processing continuous yarns from 4-inch wafer scale super-aligned carbon nanotubes arrays," *Advance Materials*, vol. 18, pp. 1505-1510, May 2006.
- H.B. Son, A. Reina, M.S. Dresselhaus, and J. Kong, "Characterizing the chirality distribution of single-walled carbon nanotube materials with tunable Raman spectroscopy," *Physica Status Solidi (b)*, vol. 243, no. 13, pp. 3161-3165, Oct. 2006.
- S. Bhaviripudi, A. Reina, J. Qi, J. Kong, and A. Belcher, "Block-copolymer assisted synthesis of arrays of metal nanoparticles and their catalytic activities for the growth of SWNTs," *Nanotechnology*, vol. 17, pp. 5080-5086, Sept. 2006.
- H. Son, A. Reina, G.G. Samsonidze, R. Saito, A. Jorio, M.S. Dresselhaus, and J. Kong, "Raman characterization of electronic transition energies of metallic single-wall carbon nanotubes," *Physical Review B*, vol. 74, p. 073406, Aug. 2006.
- X. Zhang, K. Jiang, C. Feng, P. Liu, L. Zhang, J. Kong, T. Zhang, Q. Li, and S. Fan, "Spinning and processing continuous yarns from 4-inch wafer scale super-aligned carbon nanotubes arrays," *Advanced Materials*, vol. 18, pp. 1505-1510, May 2006.
- F. Villalpando-Paez, A. Zamudio, A.L. Elias, H. Son, E.B. Barros, S.G. Chou, Y.A. Kim, H. Muramatsu, T. Hayashi, J. Kong, H. Terrones, G. Dresselhaus, M. Endo, M. Terrones, and M.S. Dresselhaus, "Synthesis and characterization of long strands of nitrogen-doped single-walled carbon nanotubes," *Chemical Physical Letters*, vol. 424, pp. 345-352, Apr. 2006.
- J. Lu, T. Kopley, D. Dutton, J. Liu, C. Qian, H. Son, M.S. Dresselhaus, and J. Kong, "Generating suspended single-walled carbon nanotubes across a large surface area via patterning self-assembled catalyst-containing block copolymer thin films," *Journal of Physical Chemistry Letters*, vol. 110, pp. 10585-10589, Apr. 2006.
- Y.Y. Zhang, J. Zhang, H.B. Son, J. Kong, and Z.F. Liu, "Substrate-induced Raman frequency variation for single-walled carbon nanotubes," *Journal of the American Chemical Society*, vol. 127, no. 49, p. 17156, Dec. 2005.
- B.J. LeRoy, J. Kong, V.K. Pahilwani, C. Dekker, and S.G. Lemay, "Three-terminal scanning tunneling spectroscopy of suspended carbon Nanotubes," *Physics Review B*, vol. 72, pp. 075413:1-5, Aug. 2005.
- P. Jarillo-Herrero, J. Kong, H.S.J. van der Zant, C. Dekker, L.P. Kouwenhoven, and S. De Franceschi, "Electronic transport spectroscopy of carbon nanotubes in a magnetic field," *Physics Review Letters*, vol. 94, pp. 156802: 1-4, Apr. 2005
- S. Sapmaz, P. Jarillo-Herrero, J. Kong, C. Dekker, L.P. Kouwenhoven, and H.S.J. van der Zant, "Excitation spectrum of metallic carbon nanotubes," *Physics Review B*, vol. 71, pp. 153402:1-4, Apr. 2005.

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V. I. Fernandez, S. M. Hou, F. S. Hover, J. H. Lang and M. S. Triantafyllou; "MEMS-array pressure sensing for underwater navigation," *Proc. Undersea Distributed Network Systems Conference*, Newport, RI, February 13-15, 2007.

J. W. Phinney, D. J. Perreault and J. H. Lang; "Radio-frequency inverters with transmission-line input networks," *IEEE Transactions on Power Electronics*, 22, 1154-1161, July 2007.

J. W. Phinney, D. J. Perreault and J. H. Lang; "Synthesis of lumped transmission-line analogs," *IEEE Transactions on Power Electronics*, 22, 1531-1542, July 2007.

V. I. Fernandez, S. M. Hou, F. S. Hover, J. H. Lang and M. S. Triantafyllou; "Lateral line inspired MEMS-array pressure sensing for passive underwater navigation," *Proc. Unmanned Untethered Submersible Technology Symposium, Sensors Paper #4*, Durham, NH, August 19-22, 2007.

A. C. Weber, J. H. Lang and A. H. Slocum; "111 Si etched planar electrical contacts for power MEMS relays," *Proc. 53rd IEEE Holm Conference on Electrical Contacts*, 156-159, Pittsburgh, PA, Sept 15-19, 2007.

H. Ma, J. H. Lang and A. H. Slocum; "Technique for measuring the dielectric constant of liquids and gases without the use of calibration standards," *Proc. µTAS 2008 Symposium*, 1692-1694, Paris, France, October 7-11, 2007.

H. Ma, J. H. Lang and A. H. Slocum; "Design of an electrochemical impedance test cell with servomechanically adjustable cell constant," *Proc. IEEE Sensors Conference*, 1233-1236, Atlanta, GA, October 28-31, 2007.

M. B. Read, A. H. Slocum, R. Martens, J. H. Lang, A. C. Weber and O. Yaglioglu; "A highly repeatable MEMS-based electrical contact test system," *Proc. Tenth International Conference of the European Society for Precision Engineering and Nanotechnology (EUSPEN 2008)*, 389-393, Zurich, Switzerland, May 18-22, 2008.

A. C. Weber, J. H. Lang and A. H. Slocum; "A MEMS-relay for make-break power switching applications," *Proc. Solid-State Sensors, Actuators and Microsystems Workshop*, 52-53, Hilton Head Island, SC, June 1-5, 2008.

M. B. Read, A. C. Weber, O. Yaglioglu, R. Martens, J. H. Lang and A. H. Slocum, "Two-coupon system for the repeatable measurement of flat microscale contact resistance," *Proc. International Conference on Electrical Contacts*, 246-250, Saint-Malo, France, June 9-12, 2008.

H. Ma, J. H. Lang and A. H. Slocum; "Permittivity measurements using adjustable microscale electrode gaps between millimeter-sized spherical electrodes," *Review of Scientific Instruments*, 79, March 2008.

B. C. Yen, F. Herrault, M. G. Allen, F. F. Ehrich, K. J. Hillman, S. Jacobson, C. H. Ji, J. H. Lang, H. Li, Z. S. Spakovszky and D. R. Veazie; "Characterization of a fully-integrated permanent-magnet turbine generator," *Proc. 8TH International Workshop on Micro/Nano Technology for Power Generation and Energy Conversion Applications (Power MEMS)*, 121-124, Sendai, Japan, November 9-12, 2008.

D. Golda, J. H. Lang and M. L. Culpepper; "Two-layer electroplated microcoils with a PECVD silicon dioxide interlayer dielectric," *IEEE/ASME Journal of Microelectromechanical Systems*, 17, 1537-1545, December 2008.

J. L. Steyn, S. H. Kendig, R. Khanna, S. D. Umans, J. H. Lang and C. Livermore; "A self-excited MEMS electroquasistatic induction turbine-generator," *IEEE/ASME Journal of Microelectromechanical Systems*, 18, 424-432, April 2009.

H. Ma, J. H. Lang and A. H. Slocum; "Calibration-free measurement of permittivity and conductivity using electrochemical impedance test cell with servomechanically adjustable cell constant," *IEEE Sensors Journal*, 2009, to be published.

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H.-S. Lee, "Comparator and Zero-Crossing Based ADC's: Challenges and Possible Solutions," *ISSCC Special Evening Topics Session*, San Francisco, CA, Feb. 2008.

H.-S. Lee and C. G. Sodini, "Mixed-Signal Integrated Circuits-Digitizing the Analog World," *Proceedings of IEEE*, vol. 96, pp. 323-334, Feb. 2008.

S.-K. Shin, Y.-S. You, S.-H. Lee, K.-H. Moon, J.-W. Kim, L. Brooks., and H.-S. Lee, "A Fully-Differential Zero-Crossing-Based 1.2V 10b 26MS/s Pipelined ADC in 65nm CMOS," *Digest of Technical Papers, Symposium on VLSI Circuits*, Honolulu, HI, June 2008.

M-Y Choi, S-o Lee, S-B You, W-S Yeum, H-J Park, J-W Kim, and H-S Lee, "A 101-dB SNR Hybrid Delta-Sigma Audio ADC using Post Integration Time Control," *Digest of Technical Papers, IEEE Custom Integrated Circuits Conference*, San Jose, September 2008.

T-H Oh, H-Y Lee, J-H Kim, H-J Park, K-H Moon, J-W Kim, and H-S Lee, "A 16b 10MS/s Digitally Self-Calibrated ADC with Time Constant Control," *Digest of Technical Papers, IEEE Custom Integrated Circuits Conference*, San Jose, September 2008.

N. Sun, H-S Lee, and D. Ham, "Digital background calibration in pipelined ADCs using commutated feedback capacitor switching," *IEEE Trans. Circuits and Systems*, Sept. 2008.

L. Brooks and H.-S. Lee, "Background calibration of Pipelined ADCs Via Decision Boundary Gap Estimation," *IEEE Trans. Circuits and Systems*, Nov. 2008.

L. Brooks and H.-S. Lee, "A 12b, 50MS/s, Fully Differential Zero-Crossing Based ADC without CMFB," *Digest of Technical Papers IEEE ISSCC*, Feb. 2009.

T. Sepke, P. Holloway, C. G. Sodini, and H.-S. Lee, "Noise Analysis for Comparator-Based Circuits," *IEEE Trans. Circuits and Systems*, March, 2009.

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Steyn, J.L., S.H. Kendig, R. Khanna, S.D. Umans, J.H. Lang, and C. Livermore, "A Self-Excited MEMS ElectroQuasiStatic Induction Turbine-Generator," *Journal of Microelectromechanical Systems* 18, 424-432, April 2009.

Shaar, N., G. Barbastathis, and C. Livermore, "Controlled latching of microplates for 3D MEMS assembly," International Conference and Exhibition on Device Packaging, Scottsdale, AZ, March 2009.

Hill, F.A., T. Havel, A. John Hart, and C. Livermore, "Storing Elastic Energy in Carbon Nanotubes," presented at *Power MEMS 2008*, Sendai, Japan, November 2008.

Wilhite, B.A., T.F. Hill, L.F. Velasquez-Garcia, A.H. Epstein, K.F. Jensen, and C. Livermore, "Design of a Silicon-Based Microscale Trickle-Bed System for Singlet-Oxygen Production," *American Institute of Chemical Engineers Journal* 54, 2441-2455, September 2008.

Eid, F., S. Jung, and C. Livermore, "Templatized assembly by selective removal (TASR): Simultaneous, selective assembly and model verification," *Nanotechnology* 19, 285602 (8 pp.), July 2008.

Shaar, N., G. Barbastathis, and C. Livermore, "Cascaded Mechanical Alignment for Assembling 3D MEMS," in *Proc. 18th IEEE International Conference on Micro Electro Mechanical Systems*, Tuscon, AZ, January 2008.

Velásquez-García, L.F., T.F. Hill, B.A. Wilhite, K.F. Jensen, A.H. Epstein, and C. Livermore, "A MEMS Singlet Oxygen Generator – Part I: Device Fabrication and Proof of Concept Demonstration," *IEEE Journal of Microelectromechanical Systems* 16 (6), 1482-1491, December 2007.

Hill, T.F., L.F. Velásquez-García, B.A. Wilhite, W.T. Rawlins, S. Lee, S.J. Davis, K.F. Jensen, A.H. Epstein, and C. Livermore, "A MEMS Singlet Oxygen Generator – Part II: Experimental Exploration of the Performance Space," *IEEE Journal of Microelectromechanical Systems* 16 (6), 1492-1505, December 2007.

Hill, F.A., T.F. Havel, and C. Livermore, "A Portable Power Source Based on MEMS and Carbon Nanotubes," *Proceedings of IMECE 2007*, Seattle, WA, November 2007.

Velasquez-Garcia, L.F., T.F. Hill, B.A. Wilhite, K.F. Jensen, A.H. Epstein, and C. Livermore, "A MEMS Singlet Oxygen Generator for a MEMS Chemical Oxygen Iodine Laser," *Proceedings of Power MEMS 2006*, Berkeley, CA, 117-120, November 2006.

Hill, T.F., B.A. Wilhite, L.F. Velasquez-Garcia, A.H. Epstein, K.F. Jensen, and C. Livermore, "A MEMS Singlet Oxygen Generator," *Solid State Sensor, Actuator, and Microsystems Workshop*, Hilton Head Island, SC, June 2006.

Jung, S. and C. Livermore, "Achieving Selective Assembly with Template Topography and Ultrasonically Induced Fluid Forces," *Nano Letters* 5 (11), 2188-2194, November 2005.

Nagle, S.F., C. Livermore, L.G. Frechette, R. Ghodssi, and J.H. Lang, "An Electric Induction Micromotor," *IEEE Journal of Microelectromechanical Systems* 14 (5), 1127-1143, October 2005.

Steyn, J.L., S.H. Kendig, R. Khanna, T.M. Lysczarz, S.D. Umans, J.U. Yoon, C. Livermore, and J.H. Lang, "Generating Electric Power with a MEMS Electroquasistatic Induction Turbine-Generator," *MEMS 2005*, Miami, FL, January 2005.

Wilhite, B.A., C. Livermore, Y. Gong, A.H. Epstein, and K.F. Jensen, "Design of a MEMS-Based MicroChemical Oxygen Iodine Laser System," *IEEE Journal of Quantum Electronics* 40 (8), 1041-1055, August 2004.

Livermore, C., A. Forte, T. Lysczarz, S.D. Umans, A.A. Ayon, and J.H. Lang, "A High-Power MEMS Electric Induction Micromotor," *IEEE Journal of Microelectromechanical Systems* 13 (3), 465-471, June 2004.

Livermore, C., A. Forte, T. Lysczarz, S.D. Umans, and J. Lang, "Microscale Electric Induction Machines for Power Applications," *Proc. Electrostatics 2003*, Edinburgh, Scotland, 45-52, March 2003.

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S. Son, W.H. Grover, T.P. Burg, S.R. Manalis. Suspended microchannel resonators for ultra-low volume universal detection. *Analytical Chemistry*. 2008; 80 4757-4760.

W.H. Grover, M. von Muhlen, S.R. Manalis. Teflon films for chemically-inert microfluidic valves and pumps. *Lab on a Chip*. 2008; 8 913-918.

T.M. Squires, R.J. Messinger, S.R. Manalis. Making it stick: convection, reaction, and diffusion in surface based biosensors. *Nature Biotechnology*. 2008; 26 417-426.

R. Chunara, M. Godin, S. M. Knudsen, S.R. Manalis. Mass-based readout for agglutination assays. *Applied Physics Letters*. 2007; 91 193902.

M. Godin, A.K. Bryan, T. Burg, and S.R. Manalis, Measuring the mass, density and size of particles and cells using a suspended microchannel resonator. *Applied Physics Letters*. 2007; 91 123121.

T.P. Burg M.Godin, W. Shen, G. Carlson, J.S. Foster, K. Babcock, and S.R. Manalis. Weighing of Biomolecules, Single Cells, and Single Nanoparticles in Fluid. *Nature* 2007; 446 1066-1069

J. Hou, M. Godin, K. Payer, R. Chakrabarti, S.R. Manalis. Integrated Microelectronic Device for Label-free Nucleic Acid Amplification and Detection. *Lab on a Chip* 2007; 7 347-354.

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Berthold Horn, Yajun Fang, Ichiro Masaki, "Hierarchical framework for direct gradient-based time-to-contact estimation." IEEE Intelligent Vehicles Symposium 2009 (IV2009).

Fang, Y., Horn, B.K.P., Masaki I., "Systematic information fusion methodology for static and dynamic obstacle detection in ITS." 15th World Congress On ITS, 2008.

Horn, B.K.P., Fang, Y., Masaki I., "Time to Contact Relative to a Planar Surface." Berthold Horn, Yajun Fang, Masaki, I., IEEE Intelligent Vehicles Symposium 2007 (IV2007).

Herrington, W.F., Jr., Horn, B. K. P. and Masaki, I., "Application of the Discrete Haar Wavelet Transform to Image Fusion for Nighttime Driving", IEEE Intelligent Vehicles Symposium 2005 (June 6-8, 2005),

Fang, Y., K. Yamada, Y. Ninomiya, B. Horn and Masaki, I., "A Shape-Independent-Method for Pedestrian Detection with Far Infrared-images." Special issue on "In-Vehicle Computer Vision Systems" of IEEE Transactions on Vehicular Technology, Vol.53, No.6, Nov. 2004, pp.1679-1697.

Fang, Y., K. Yamada, Y. Ninomiya, Horn, B. K. P. and Masaki, I., "Comparison between Infrared-image-based and Visible-image-based Approaches for Pedestrian Detection," IEEE Intelligent Vehicles Symposium 2003 (IV2003, pp.505-510). First Prize, Best Paper Award by IEEE ITS Council

Kato, T., Ninomiya, Y., Masaki, I., „An Obstacle Detection Method by Fusion of Radar and Motion Stereo.” SICE Annual Conference in Fukui, August 4-6, 2003

Fang, Y., Masaki, I. and Horn, B. K. P., "Depth-Based Target Segmentation for Intelligent Vehicles: Fusion of Radar and Binocular Stereo," IEEE Transactions on Intelligent Transportation Systems, Vol.3, No.3, Sept. 2002, pp.196-202.

Kato, T., Ninomiya, Y., Masaki, I., „An Obstacle Detection Method by Fusion of Radar and Motion Stereo.” IEEE Transactions on Intelligent Transportation Systems, Vol.3, No.3, Sep. 2002, pp.182-188.

Kato, T., Ninomiya, Y., Masaki, I., „Preceding vehicle recognition based on learning from sample images.” IEEE Transactions on Intelligent Transportation Systems, Vol.3, No.4, Dec. 2002, pp.252-260.

Fang, Y., Masaki, I. and Horn, B. K. P., "Distance/Motion Based Segmentation under Heavy Background Noise," IEEE Intelligent Vehicles Symposium 2002 (IV2002, pp.483-488).

Fang, Y., Ninomiya, Y., Masaki, I., "Intelligent Transportation Systems, Challenges and Opportunities," The 2<sup>nd</sup> International Symposium on Multimedia Mediation Systems, 2002 (pp.72-77). Invited Paper

Fang, Y., Masaki, I. and Horn, B. K. P., "Distance Range Based Segmentation in Intelligent Transportation Systems: Fusion of Radar and Binocular Stereo," IEEE Intelligent Vehicles Symposium 2001 (IV2001, pp.171-176).

Yajun Fang, Marcelo Mizuki, Berthold Horn, Ichiro Masaki, "TV Camera-based Vehicle Motion Detection and its Chip Implementation." IEEE Intelligent Vehicles Symposium 2000 (IV2000, pp.134-139).

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Rajan S., U. K. Mishra, and T. Palacios , "AlGaN/GaN HEMTs: Recent Developments and Future Directions," *International Journal of High Speed Electronics* 18, 913-922, 2008.

Palacios T., " Beyond the AlGaN/GaN HEMT: New Concepts for High-Speed Transistors," in press, *physica status solidi (a)*, Sept. 2008 (invited contribution).

Palacios T., J. W. Chung, O. Saadat, and F. Mieville: " GaN and Digital Electronics: A Way out of Moore 's Law? ," in press, *physica status solidi (a)*, Sept. 2008 (invited contribution).

Wang H., D. Nezich, J. Kong, and T. Palacios : " Graphene Frequency Multipliers," *Electron Device Letters*, May, 2009.

Wang H. and T. Palacios , "Efficency of Graphene Nanoribbon RF Amplifiers: A Theoretical Analysis , " submitted to *Electron Device Letters*, Sept. 2008.

Chung J. W., Edwin L. Piner, and T. Palacios , " N-face GaN/AlGaN HEMTs Fabricated through Layer Transfer Technology , " *Electron Device Letters* 30, 113-116 (2009).

Chung J. W., Edwin L. Piner, and T. Palacios , " Effect of Gate Leakage on the Subthreshold Characteristics of AlGaN/GaN HEMTs , " *Electron Device Letters* 29, 1196-1198 (2008).

Chung J. W., X. Zhao, Y. Wu, J. Singh and T. Palacios, "Effect of image charges in the drain delay of AlGaN/GaN high electron mobility transistors," *Appl. Phys. Lett.* 92, 093502, Mar. 2008.

Chung, J.W., Edwin L. Piner, and T. Palacios, "N-face GaN/AlGaN HEMTs Fabricated through Layer Transfer Technology," *Electron Device Letters* 30, 113-116, 2009.

Palacios, T., "Nitride Transistors for Beyond-Si Digital Electronics," 213th Electrochemical Society Meeting, Phoenix, AZ, May 18-23, 2008.

Palacios, T., "GaN and Digital Electronics: A Way out of Moore's Law?," International Symposium on Compound Semiconductors (ISCS-2008), Freiburg, Germany, September 21-24, 2008.

Palacios, T., "Beyond the AlGaN/GaN HEMT: New Concepts for High-Speed Nitride Transistors," International Workshop on Nitride Semiconductors (IWN-2008), Montreux, Switzerland, October 6-10, 2008.

Saadat, O. I., J. Chung, E. L. Piner, and T. Palacios, "Gate-first GaN HEMT Technology for High Frequency Applications," International Workshop on Nitride Semiconductors, Montreux, Switzerland, October 6-10, 2008.

Palacios, T., "Heterogeneous Integration of Nitride and Si Electronics," Meeting of the American Physical Society, Pittsburg PA (2009).

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Pierquet, B.J., T.C. Neugebauer, and D.J. Perreault, "A Fabrication Method for Integrated Filter Elements with Inductance Cancellation," *IEEE Transactions on Power Electronics* Vol. 24, No. 3, pp. 838-848, March 2009.

Chung, S., P.A. Godoy, T.W. Barton, E.W. Huang, D.J. Perreault, and J.L. Dawson, "Asymmetric Multilevel Outphasing Architecture for Multi-Standard Transmitters," *2009 IEEE Radio Frequency Integrated Circuits Symposium*, June 2009, pp. 237-240.

Perreault, D.J., J. Hu, J.M. Rivas, Y. Han, O. Leitermann, R.C.N. Pilawa-Podgurski, A. Sagneri, and C.R. Sullivan, "Opportunities and Challenges in Very High Frequency Power Conversion," *2009 IEEE Applied Power Electronics Conference*, Feb. 2009, pp. 1-14.

Rivas, J.M., Y. Han, O. Leitermann, A.D. Sagneri, and D.J. Perreault, "A High-Frequency Resonant Inverter Topology with Low Voltage Stress," *IEEE Transactions on Power Electronics*, Vol. 23, No. 4, pp. 1759-1771, July 2008.

Warren, J.R., K.A. Rosowski, and D.J. Perreault, "Transistor Selection and Design of a VHF DC-DC Power Converter," *IEEE Transactions on Power Electronics*, Vol. 23, No. 1, pp. 27-37, Jan. 2008.

Han, Y., A. Li, G. Cheung, C.R. Sullivan, and D.J. Perreault, "Evaluation of Magnetic Materials for Very High Frequency Power Applications," *2008 IEEE Power Electronics Specialists Conference*, June 2008.

Hu, J., A.D. Sagneri, J.M. Rivas, S.M. Davis, and D.J. Perreault, "High-Frequency Resonant SEPIC Converter with Wide Input and Output Voltage Ranges," *2008 IEEE Power Electronics Specialists Conference*, June 2008.

Pilawa-Podgurski, R.C.N., D. Giuliano, and D.J. Perreault, "Merged Two-Stage Power Converter Architecture with Soft Charging Switched-Capacitor Energy Transfer," *2008 IEEE Power Electronics Specialists Conference*, June 2008.

Rivas, J.M., O. Leitermann, Y. Han, and D.J. Perreault, "A Very High Frequency DC-DC Converter Based on a Phi-2 Resonant Inverter," *2008 IEEE Power Electronics Specialists Conference*, June 2008.

Phinney, J.W., D.J. Perreault, and J.H. Lang, "Synthesis of Lumped Transmission-Line Analogs," *IEEE Transactions on Power Electronics*, Vol. 22, No. 4, pp. 1531-1542, July 2007.

Phinney, J.W., D.J. Perreault, and J.H. Lang, "Radio-Frequency Inverters with Transmission-Line Input Networks," *IEEE Transactions on Power Electronics*, Vol. 22, No. 4, pp. 1154-1161, July 2007.

Han, Y., O. Leitermann, D.A. Jackson, J.M. Rivas, and D.J. Perreault, "Resistance Compression Networks for Radio-Frequency Power Conversion," *IEEE Transactions on Power Electronics*, Vol. 22, No. 1, pp. 41-53, Jan. 2007.

Tang, S.C., D.M. Otten, T.A. Keim, and D.J. Perreault, "Design and Evaluation of a 42 V Automotive Alternator with Integrated Switched-Mode Rectifier," *2007 IEEE Vehicle Power and Propulsion Conference*, September 2007.

Pierquet, B.J., T.C. Neugebauer, and D.J. Perreault, "A Fabrication Method for Integrated Filter Elements with Inductance Cancellation," *2007 IEEE Applied Power Electronics Conference*, Anaheim, CA, pp. 51-62, Feb. 25 - Mar. 1, 2007.

Pilawa-Podgurski, R.C.N., A.D. Sagneri, J.M. Rivas, D.I. Anderson, and D.J. Perreault, "High-Frequency Resonant Boost Converters," *2007 IEEE Power Electronics Specialists Conference*, pp. 2718 - 2724, June 2007.

Rivas, J.M., Y. Han, O. Leitermann, A.D. Sagneri, and D.J. Perreault, "A High-Frequency Resonant Inverter Topology with Low Voltage Stress," *2007 IEEE Power Electronics Specialists Conference*, pp. 2705 - 2717, June 2007.

Pierquet, B.J., T.C. Neugebauer, and D.J. Perreault, "Inductance Compensation of Multiple Capacitors with Application to Common- and Differential-Mode Filters," *IEEE Transactions on Power Electronics*, Vol. 21, No. 6, pp. 1815-1824, Nov. 2006. (Also, see "Corrections to Inductance Compensation of Multiple Capacitors with Application to Common- and Differential-Mode Filters," *IEEE Transactions on Power Electronics*, Vol. 22, No. 1, pp. 346-347, Jan. 2007.)

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Zaman T., X. Guo, R. J. Ram, "Semiconductor Waveguide Isolators," *Journal of Lightwave Technology*, 26 (2), 291 - 301, January 2008

R. Amatya, C. W. Holzwarth, H. I. Smith, and R. J. Ram, "Precision Tunable Silicon Compatible Microring Filters," *IEEE Photonics Technology Letters*, 20, 1739-41, 2008.

Lee, K. S. and Ram, R. J., 2009, Plastic-PDMS bonding for high pressure hydrolytically stable active microfluidics, *Lab on a Chip*, 9, 1618-24, 2009.

C. Batten, A. Joshi, J. Orcutt, A. Khilo, B. Moss, C. W. Holzwarth, M. A. Popovic, H. Li, H. I. Smith, J. Hoyt, F. X. Kaertner, R. J. Ram, V. Stojanović, Krste Asanovic, "Building Manycore Processor-to-DRAM Networks with Monolithic CMOS Silicon Photonics," *IEEE Micro*, to be published, 2009.

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V. Sivakumar, N. Yabuuchi, C. A. Ross, Y. Shao-Horn, "Partially reversible changes in magnetic properties of CrO<sub>2</sub> nanoparticles through electrochemical cycling," *J. Appl. Phys.* 103 07D708 p1-3 (2008)

V. Sivakumar, C. A. Ross, N. Yabuuchi, Y. Shao-Horn, K. Persson and G. Ceder, "Electrochemical Control of the Magnetic Moment of CrO<sub>2</sub>," *J. Electrochemical Society* 155(8) p83-88 (2008)

C. A. Ross, F.J. Castaño, W. Jung, B.G. Ng, I.A. Colin, D. Morecroft, "Magnetism in multilayer thin film rings," *J. Phys. D* 41 113002 p1-6 (2008)

F.J. Castaño, B.G. Ng, I.A. Colin, D. Morecroft, W. Jung, C.A. Ross, "Magnetoresistance of submicron multilayer Wheatstone bridges as a probe of magnetic reversal mechanism," *J. Phys. D* 41 132005 (2008)

Hyun-Suk Kim, Lei Bi, G. F. Dionne, and C. A. Ross, "Structure, magnetic and magneto-optical properties of transition metal-doped transparent SnO<sub>2</sub> films," *Phys. Rev. B* 77 214436 (2008)

Y.S. Jung, W. Jung, C.A. Ross, "Self-assembled ring structures from a diblock copolymer under circular confinement," *Nano Letts.* 8 2975-81 (2008)

I. Bita, J. K.W. Yang, Y. S. Jung, C. A. Ross, E. L. Thomas, K. K. Berggren, "Graphoepitaxy of self-assembled block copolymers on 2D periodic patterned templates," *Science* 321 (5821) p939-943 (2008)

Bi L., A.R. Taussig, H.-S. Kim, L. Wang, G. F. Dionne, D. Bono, G. Ceder and C. A. Ross, "Structural, magnetic and optical properties of BiFeO<sub>3</sub> and Bi<sub>2</sub>FeMnO<sub>6</sub> epitaxial thin films: an experimental and first principles study," *Phys. Rev. B* 78 104106 (2008)

V.P. Chuang, C.A. Ross, P. Bilalis, N. Hadjichristides, "Nanoscale rings fabricated using Self-Assembled Triblock Terpolymer Templates," *ACS Nano* 2(10) 2007-2014 (2008)

Kim, H.-S., L. Bi, G. F. Dionne, and C. A. Ross, "Structural, magnetic, and magneto-optical properties of transparent Fe-doped SrTiO<sub>3</sub> films," *Appl. Phys. Letts.* 93 092506 (2008)

S. Moralejo, F. J. Castaño, C. A. Ross, C. Redondo and F. Castaño, "Collective switching of single-layer and exchange bias coupled nanomagnet arrays," *J. Phys. D* 41 195003 (2008)

G.M. Muller, G. Eilers, Z. Wang, M. Scherff, Ran Ji, K. Nielsch, C.A. Ross, M. Münenberg, "Magnetization dynamics in optically excited nanostructured nickel films," *New J. Phys.* (2008)

Y.S. Jung, W. Jung, H.L. Tuller, C.A. Ross, "Nanowire conductive polymer gas sensor patterned using self-assembled block copolymer lithography," *Nano Letts.* 8 (11), 3776-3780 (2008)

Y. S. Jung, C.A. Ross, "Solvent vapor induced tunability of self-assembled block copolymer patterns," *Adv. Mater.* 21 2540-2545 (2009)

Y.J. Oh, C.A. Ross, Y.S. Jung, Y. Wang, C.V. Thompson, "Co nanoparticle arrays made by templated solid-state dewetting," *Small* 5 860-856 (2008)

E. Verploegen, T. Zhang, Y. S. Jung, C. Ross, and P. T. Hammond, "Controlling the Morphology of Side Chain Liquid Crystalline Block Copolymer Thin Films through Variations in Liquid Crystalline Content," *Nano Letts.* 8 (10), pp 3434-3440 (2008)

C. A. Ross, Y.S. Jung, V.P. Chuang, F. Ilievski, J.K.W. Yang, I. Bita, E.L. Thomas, H.I. Smith, K.K. Berggren, G.J. Vancso, J.Y. Cheng, "Si-containing block copolymers for self-assembled nanolithography (invited)," *J. Vac. Sci. Technol. B* 26(6) 2489-94 (2008)

C. Nam, B.G. Ng, F. J. Castaño, and C. A. Ross, Effect of magnetic field direction on the remanent resistance levels and vortex chirality of a multilayered magnetic ring," *J. Appl. Phys.* 105 033918 (2009)

C. Nam, B. G. Ng, F. J. Castaño, M. D. Mascaro and C. A. Ross, "Current-driven vortex formation in a magnetic multilayer ring," *Appl. Phys. Letts.* 94 082501 (2009)

K. L. Krycka, B. B. Maranville, J. A. Borchers, F. J. Castaño, B. G. Ng, J. C. Perkinson, C. A. Ross, "Magnetic Domain Formation within Patterned NiFe/Cu/Co Ellipses," *J. Appl. Phys.* 105 07C120 (2009)

J. L. Sánchez Llamazares1, B. Hernando1, V. Prida1, C. García, J. González, R. Varga and C. A. Ross, "Magnetic field influence on the structural transformation in ferromagnetic shape memory alloy Mn50Ni40In10 melt spun ribbons," *J. Appl. Phys.* 105 07A945 (2009)

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Mandal, S., and R. Sarpeshkar, "Power-efficient Impedance-Modulation Wireless Data Links for Biomedical Implants," *IEEE Transactions on Biomedical Circuits and Systems*, Vol. 2, No. 4, pp. 301—315, 2008.

Wee, K.H., L.Turicchia, and R. Sarpeshkar, "An Analog Integrated-Circuit Vocal Tract," *IEEE Transactions on Biomedical Circuits and Systems*, Vol. 2, No. 4, pp. 316—327, 2008.

Mandal, S., S. K. Arfin, and R. Sarpeshkar, "Sub-uHz MOSFET  $1/f$  noise measurements," *Electronics Letters*, Vol. 45, No. 1, pp. 81-82, January 1 2009.

Mandal, S., S. Zhak, and R. Sarpeshkar, "A Bio-inspired Active Radio-Frequency Silicon Cochlea," *IEEE Journal of Solid-State Circuits*, accepted for publication, expected June 2009.

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N. de Mas, A. Gunther, M. A. Schmidt, and K. F. Jensen, "Increasing Productivity of Microreactors for Fast Gas–Liquid Reactions: The Case of Direct Fluorination of Toluene," *Ind. Eng. Chem. Res.*, 2009, 48 (3), pp 1428–1434

Savoulides, N. Jacobson, S.A., H. Li, L. Ho, Khanna, R., C.-J. Teo, Protz, J.M., L. Wang, Ward, D. Schmidt, M. A., Epstein, A. H., "Fabrication and Testing of a High-Speed Microscale Turbocharger", *Journal of Microelectromechanical Systems*, Oct. 2008, Volume: 17, Issue: 5, Pages 1270-1282

J. Chen, V. Leblanc, S. H. Kang, P. J. Benning, D. Shut, M. A. Baldo, M. A. Schmidt, and V. Bulović, High definition digital fabrication of organic devices by molecular jet printing, *Advanced Functional Materials*, vol. 17, no. 15, pp. 2722-2727, Oct. 2007.

V. Leblanc, J. Chen, S. H. Kang, V. Bulović, and M. A. Schmidt, "Micromachined printheads for the evaporative patterning of organic materials and metals," *IEEE/ ASME Journal of Microelectromechanical Systems*, vol. 16, no. 2, pp. 394-400, Apr. 2007.

L. R. Arana, N. deMas, R. Schmidt, A. J. Franz, M. A. Schmidt, and K. F. Jensen, "Isotropic etching of silicon in fluorine gas for MEMS micromachining," *Journal of Micromechanics and Microengineering*, vol. 17, no. 2, pp. 384-392, Feb. 2007.

Y. Wada, M. A. Schmidt, and K.F. Jensen, "Flow distribution and ozonolysis in gas-liquid multichannel microreactors," *Industrial & Engineering Chemistry Research*, vol. 45, no. 24, pp. 8036-8042, Nov. 2006.

B. A. Wilhite, S. E. Weiss, J.Y. Ying, M. A.Schmidt, and K. F. Jensen, "High-purity hydrogen generation in a microfabricated 23 wt % Ag-Pd membrane device integrated with 8:1 LaNi<sub>0.95</sub>Co<sub>0.0503</sub>/Al<sub>2</sub>O<sub>3</sub> catalyst," *Advanced Materials*, vol. 18, no. 13, pp. 1701-1710, July 2006.

J. G. Kralj, M. T. W., Lis, M. A. Schmidt, and K. F. Jensen, "Continuous dielectrophoretic size-based particle sorting," *Analytical Chemistry*, vol. 78, no. 14, pp. 5019-5025,July 2006.

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J. Sun, C.W. Holzwarth, M. Dahlem, J.T. Hastings, and H.I. Smith, "Accurate Frequency Alignment in Fabrication of High-Order Microring-resonator Filters", *Opt. Express* 16(20), 15958-15963 (2008).

T. Barwicz, C. W. Holzwarth, P.T. Rakich, M. A. Popovic, E. P. Ippen, and H. I. Smith, "Optical loss in silicon microphotonic waveguides induced by metallic contamination", *Appl. Phys. Lett.* 92(13), 131108 (2008).

T. B. O'Reilly and H. I. Smith, "Linewidth uniformity in Lloyd's mirror interference lithography systems," *J. Vac. Sci. Technol. B* 26(6), p.2131 – 2134, Nov/Dec 2008.

C. W. Holzwarth, R. Amatya, M. Dahlem, A. Khilo, F. X. Kärtner, E. P. Ippen, R. J. Ram, and H. I. Smith, "Fabrication strategies for filter banks based on microring resonators," *J. Vac. Sci. Technol. B* 26(6), p. 2164 – 2165, Nov/Dec (2008).

E. E. Moon, and H. I. Smith, "Nanometer, level-alignment to a substrate-embedded coordinate system," *J. Vac. Sci. Technol. B* 26(6), p. 2341-2344, Nov/Dec (2008).

C. A. Ross, Y. S. Jung, V. P. Chuang, F. Ilievski, J. K. W. Yang, I. Bita, E. L. Thomas, H. I. Smith, K. K. Berggren, G. J. Vansco, and J. Y. Cheng, "Si-containing block copolymers for self-assembled nanolithography," *J. Vac. Sci. Technol. B* 26(6), p. 2489-2494, Nov/Dec (2008).

H. I. Smith, C. V. Thompson, and M. H. Hong, "Synthesis of Silicon Nanowires and Nanofin Arrays Using Interference Lithography and Catalytic Etching," *Nano Letters*, Vol. 8(11 , p.3799-3802, (2008).

"System and method for fabrication and replication of diffractive optical elements for maskless lithography," D. Gil, J. T. Hastings, J. G. Goodberlet, R. Menon, P.J. Carter, and H. I. Smith, US Patent 7,348,104, March 25, 2008.

"Imaging System and Method Employing Beam Folding", R. Menon and H. I. Smith, US Patent 7,405,806, July 29, 2008.

"Spatial-phase locking of energy beams for determining two-dimensional location and beam shape," J. T. Hastings, J. G. Goodberlet, F. Zhang, and H. I. Smith US Patent 7,417,234, Aug. 26, 2008.

"Nanoscale imaging via absorbance modulation," R. Menon and H. I. Smith, filed August 2008.

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J. D. Powell, H. Kim, and C. G. Sodini, “SiGe Receiver Front Ends for Millimeter-Wave Passive Imaging,” *IEEE Transactions on Microwave Theory & Techniques*, vol. 56, no. 11, pp. 2416-2425, Nov. 2008.

J. Yu, J. R. Tischler, C. G. Sodini, and V. Bulović, “Using Integrated Optical Feedback to Counter Pixel Aging and Stabilize Light Output of Organic LED Display Technology,” *Journal of Display Technology*, vol. 4, no. 3, pp. 308-313, Sept. 2008.

H.-S. Lee and C. G. Sodini, “Analog-to-digital converters: Digitizing the analog world,” *Proceedings of the IEEE*, vol. 96, no. 2, pp. 323-334, Feb. 2008.

I. Nausieda, K. Ryu, I. Kymissis, A.I. Akinwande, V. Bulović, and C. G. Sodini, “An organic active-matrix imager,” *IEEE Transactions on Electron Devices*, vol. 55, no. 2, pp. 527-532, Feb. 2008.

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B. Kim and V. Stojanović, "Modeling and Design Framework: Equalized and Repeated Interconnects for Networks-on-Chip [Invited]," *IEEE Design & Test of Computers*, vol. 25, no. 5, pp. 430-439, 2008.

T. Barwicz, H. Byun, F. Gan, C. W. Holzwarth, M. A. Popovic, P. T. Rakich, M. R. Watts, E. P. Ippen, F. X. Kärtner, H. I. Smith, J. S. Orcutt, R. J. Ram, V. Stojanović, O. O. Olubuyide, J. L. Hoyt, S. Spector, M. Geis, M. Grein, T. Lyszczarz, and J. U. Yoon, "Silicon photonics for compact, energy-efficient interconnects [Invited]," *J. Opt. Netw.* 6, 63-73 (2007)

B. Kim and V. Stojanović, "A 4 Gb/s/ch 356fJ/b 10 mm Equalized On-Chip Interconnect with Nonlinear Charge-Injecting Transmit Filter and Transimpedance Receiver in 90 nm CMOS Technology," *IEEE International Solid-State Circuits Conference*, San Francisco, CA, pp. 66-67, February 2009.

R. Sredojević and V. Stojanović, "Optimization-based Framework for Simultaneous Circuit and System Design-Space Exploration: A High-Speed Link Example," *IEEE/ACM International Conference on Computer-Aided Design*, San Jose, CA, pp. 314-321, November 2008.

F. Chen, H. Kam, D. Marković, T.J. King, V. Stojanović, and E. Alon, "Integrated Circuit Design with NEM Relays," *IEEE/ACM International Conference on Computer-Aided Design*, San Jose, CA, pp. 750-757, November 2008.

C. Batten, A. Joshi, J. Orcutt, A. Khilo, B. Moss, C. Holzwarth, M. Popovic, H. Li, H. Smith, J. Hoyt, F. Kärtner, R. Ram, V. Stojanović, and K. Asanovic, "Building manycore processor to DRAM networks with monolithic silicon photonics," *IEEE Symposium on High-Performance Interconnects*, Stanford, CA, pp. 21-30, August 2008.

A. Amirkhani, A. Abbasfar, J. Savoj, M. Jeeradit, B. Garlepp, V. Stojanović, M. A. Horowitz "A 24Gb/s Software Programmable Analog Multi-Tone Transmitter," *IEEE Journal of Solid-State Circuits*, vol. 43, no. 4, pp. 999-1009, 2008.

N. Blitvić, L. Zheng, V. Stojanović "Low-complexity Pattern-eliminating Codes for ISI-limited Channels," to appear in *IEEE International Communications Conference*, May 2008.

C. W. Holzwarth, J. S. Orcutt, H. Li, M. A. Popović, V. Stojanović, J. L. Hoyt, R. J. Ram, and H. I. Smith "Localized Substrate Removal Technique Enabling Strong-Confinement Microphotonics in Bulk Si CMOS Processes," to appear in *Optical Society of America - CLEO/QELS Conference*, May 2008.

J. S. Orcutt, A. Khilo, M. A. Popović, C. W. Holzwarth, B. Moss, H. Li, M. S. Dahlem, T. D. Bonifield, F. X. Kärtner, E. P. Ippen, J. L. Hoyt, R. J. Ram and V. Stojanović "Demonstration of an Electronic Photonic Integrated Circuit in a Commercial Scaled Bulk CMOS Process," to appear in *Optical Society of America - CLEO/QELS Conference*, May 2008.

B. Kim and V. Stojanović "Equalized Interconnects for On-Chip Networks: Modeling and Optimization Framework," *IEEE/ACM International Conference on Computer-Aided Design*, San Jose, CA, pp. 552-559, November 2007

F. Chen, A. Joshi, V. Stojanović and A. Chandrakasan "Scaling and Evaluation of Carbon Nanotube Interconnects for VLSI Applications," *ACM International Conference on Nano-Networks*, Catania, Sep. 2007.

A. Amirkhani, A. Abbasfar, V. Stojanović and M.A. Horowitz "Practical Limits of Multi-Tone Signaling Over High-Speed Backplane Electrical Links," *IEEE International Conference on Communications*, pp. 2693-2698, June 2007.

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- R. Tadepalli, K.T. Turner, and C.V. Thompson, "Mixed Mode Interface Toughness of Wafer-Level Cu-Cu Bonds Using Asymmetric Chevron Test," *J. Mech. Phys. Sol.* 56, 707 (2008).
- Z.-S. Choi, R. Mönig, and C.V. Thompson, "Effects of Microstructure on the Formation, Shape, and Motion of Voids During Electromigration in Passivated Copper Interconnects," *J. Mater. Res.* 23, 383 (2008).
- R. Tadepalli, K.T. Turner and C.V. Thompson, "Effects of Patterning on the Interface Toughness of Wafer-Level Cu-Cu Bonds," *Acta Mater.* 56, 438 (2008).
- H.L. Leong, C.L. Gan, C.V. Thompson, K.L. Pey, and H.Y. Li, "Application of Contact Theory to Metal-Metal Bonding of Silicon Wafers," *J. Appl. Phys.* 102, 103510 (2007).
- W.K. Choi, T.H. Liew, H.G. Chew, F. Zheng, C.V. Thompson, Y. Wang, M.H. Hong, X.D. Wang , L. Li and J. Yun, "A Combined Top-down and Bottom-up approach for Precise Placement of Metal Nanoparticles on Silicon," *Small* 4, 330 (2008).
- J. Oh and C.V. Thompson, "Selective Barrier Perforation in Porous Alumina Anodized on Substrates," *Advanced Materials* 20, 1368 (2008).
- F.L. Wei, C.S. Hau-Riege, A.P. Marathe, and C.V. Thompson, "Effects of active atomic sinks and reservoirs on the reliability of Cu/low-k interconnects," *J. Appl. Phys.* 103, 084513 (2008).
- F.L. Wei , C.L. Gan and T.L. Tan, C.S. Hau-Riege and A.P. Marathe, J.J. Vlassak, and C.V. Thompson, "Electromigration-Induced Extrusion Failures in Cu/low-k Interconnects," *J. Appl. Phys.* 104, 023259 (2008).
- J.A. Kalb, Q. Guo, X. Zhang, Y. Li, C. Sow, and C.V. Thompson, "Phase-Change Materials in Optically Triggered Microactuators," *J. Microelectromechanical Systems* 17, 1094 (2008).
- G.D. Nessim, A.J. Hart, J.S. Kim, D. Acquaviva, J. Oh, C.D. Morgan, M. Seita, J.S. Leib, and C.V. Thompson, "Tuning of Vertically-Aligned Carbon Nanotube Diameter and Areal Density through Catalyst Pre-Treatment," *Nano Letters* 8, 3587 (2008).
- W. K. Choi, T. H. Liew, M. K. Dawood, H. I. Smith , C. V. Thompson, and M. H. Hong, "Synthesis of silicon nanowires and nanofin arrays using interference lithography and catalytic etching," *Nano Letters* 8, 3799 (2008).
- Yong-Jun Oh, C. A. Ross, Yeon Sik Jung, Yang Wang, C. V. Thompson, "Co nanoparticles arrays made by templated solid-state dewetting," *Small* 5, 860 (2009).
- Q. Guo, M. Li, Y. Li, L. Shi, T.C. Chong, J.A. Kalb, and C.V. Thompson, "Crystallization-induced stress in thin phase change films of different thicknesses," *Appl. Phys. Lett.*, 93, 221907 (2008).
- Y. Li, Q. Guo, J.A. Kalb, and C.V. Thompson, "Matching Glass-Forming Ability with the Density of the Amorphous Phase," *Science* 322, 1816 (2008).
- H. L. Leong, C. L. Gan, R. I. Made, C. V. Thompson, K. L. Pey, and H. Y. Li, "Experimental characterization and modeling of the contact resistance of Cu-Cu bonded interconnects," *J. Appl. Phys.* 105, 033514 (2009).
- H. L. Leong, C. L. Gan, C. V. Thompson, K. L. Pey, and H. Y. Li, "Electromigration-induced bond improvement for three-dimensional integrated circuits," *Appl. Phys. Letts.* 94 (2009).
- S.-W. Chang, V.P. Chuang, S.T. Boles, C.A. Ross, and C.V. Thompson, "Densely-packed arrays of ultrahigh-aspect-ratio silicon nanowire fabricated using block copolymer lithography and metal-assisted etching," *Advanced Functional Materials* (2009).
- C.V. Thompson, "Carbon Nanotubes as Interconnects: Emerging Technology and Potential Reliability Issues," *46th International Reliability Symposium, IEEE CFP08RPS-PRT*, p. 368 (2008).

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- W.C. Jung, J. L. Hertz, H. L Tuller, "Enhanced Ionic Conductivity and Phase Meta-stability of Nano-sized Thin Film Ytria-doped Zirconia (YDZ)," *Acta Materialia*, **57**, 1399-1404 (2009).
- H. L. Tuller, S. J. Litzelman and W.C. Jung, "Micro-ionics: Next Generation Power Sources," *Phys. Chem. Chem. Phys.*, **11**, 3023 – 3034 (2009).
- A. Bieberle-Hütter, J. L. Hertz, and H. L. Tuller, "Fabrication and Electrochemical Characterization of Planar Pt-CGO Microstructures," *Acta Materialia*, **56**, 177-187 (2008).
- I.-D. Kim, A. Rothschild, D.-J. Yang, and H. L. Tuller, "Macroporous TiO<sub>2</sub> Thin Film Gas Sensors Obtained Using Colloidal Templates," *Sens. Actuators B: Chem.* **130**, 9–13 (2008)
- S. J. Litzelman, R. A. De Souza, B. Butz, and H. L. Tuller, M. Martin, and D. Gerthsen, "Heterogeneously Doped Nanocrystalline Ceria Films by Grain Boundary Diffusion: Impact on Transport Properties," *J. Electroceramics*, published online February 2008.
- J. L. Hertz, A. Rothschild, and H. L. Tuller, "Highly Enhanced Electrochemical Performance of Silicon-Free Platinum - Ytria Stabilized Zirconia Interfaces," *J. Electroceramics*, published online March 08.
- J. Hiltunen, J. Lappalainen, J. Puustinen, V. Lantto, and H. L. Tuller, "Size-dependent Optical Properties of BaTiO<sub>3</sub> - SrTiO<sub>3</sub> Superlattices," *Optics Express*, **16**, 8219-8228 (2008)
- S.J. Litzelman, J.L. Hertz, W.C. Jung and H.L. Tuller, "Opportunities and Challenges in Materials Development for Thin Film Solid Oxide Fuel Cells," *Fuel Cells*, **8**, 294-302 (2008).
- W.C. Jung and H.L. Tuller, "Investigation of Cathode Behavior of Model Thin Film SrTi<sub>1-x</sub>Fe<sub>x</sub>O<sub>3.8</sub> (x =0.35 and 0.5) Mixed Ionic-Electronic Conducting Electrodes," *J. Electrochem. Soc.*, **155**, B1194-B1201 (2008).
- J. Hiltunin, D. Seneviratne, R. Sun, M. Stolfi, H.L. Tuller, J. Lappalainen and V. Lanto, "Crystallographic and Dielectric Properties of Highly Oriented BaTiO<sub>3</sub> Thin Films: Influence of Oxygen Pressure Utilized During Pulsed Laser Deposition," *J. Electroceramics*, published online 8 March 2008. 10p.
- J. Hiltunin, D. Seneviratne, H.L. Tuller, J. Lappalainen and V. Lanto, "Optical Properties of BaTiO<sub>3</sub> Thin Films: Influence of Oxygen Pressure Utilized During Pulsed Laser Deposition," *J. Electroceramics*, published online 7 March 2008. 5p.
- K. Sahner, H.L. Tuller, "Novel Deposition Techniques for Metal Oxides - Prospects for Gas Sensing," *J. Electroceram.*, 23pp, published online September 25, 2008. Feature article.
- Y. S. Jung, W.C. Jung, H.L. Tuller, C. A. Ross, "Nanowire Conductive Polymer Gas Sensor Patterned Using Self-Assembled Block Copolymer Lithography," *Nano Lett.* **8**, 3776-3780 (2008).

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- M. D. Vahey and J. Voldman, "Characterization of diverse cell and particle types using iso-dielectric separation," *Analytical Chemistry*, vol. 81, pp. 2446-55, 2009.
- S. P. Desai, M. D. Vahey, and J. Voldman, "Vesicle libraries - tools for dielectrophoresis metrology," *Langmuir*, vol. 25, pp. 3867-75, 2009.
- B. M. Taff, S. P. Desai, and J. Voldman, "Electroactive hydrodynamic weirs for microparticle manipulation and patterning," *Applied Physics Letters*, vol. 94, 084102, 2009.
- A. M. Skelley, O. Kirak, H. Suh, R. Jaenisch, and J. Voldman, "Microfluidic Control of Cell Pairing and Fusion," *Nature Methods*, vol. 6, pp. 147-52, 2009.
- D. C. Daly, P. P. Mercier, M. Bhardwaj, A. L. Stone, J. Voldman, R. Levine, J. G. Hildebrand, and A. P. Chandrasekaran, "A Pulsed UWB Receiver SoC for Insect Motion Control," in *ISSCC*, San Francisco, 2009.
- M. D. Vahey and J. Voldman, "Sorting concentrated suspensions: particle interactions, emergent behavior, and implications for microfluidic separations," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 1474-76.
- M. D. Vahey and J. Voldman, "High-throughput cell and particle characterization using iso-dielectric separation," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 1187-89.
- W. M. Tsang, Z. Aldworth, A. Stone, A. Permar, R. Levine, J. G. Hildebrand, T. Daniel, A. I. Akinwande, and J. Voldman, "Insect flight control by neural stimulation of pupae-implanted flexible multisite electrodes," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 1922-24.
- A. M. Skelley and J. Voldman, "An active, integrated bubble trap and debubbler for microfluidic applications," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 1360-62.
- S. Sampattavanich, B. M. Taff, S. P. Desai, and J. Voldman, "Organizing complex multicellular constructs using stencil-delineated electroactive patterning (S-DEP)," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 567-69.
- S. P. Desai and J. Voldman, "Measuring the impact of dielectrophoresis on cell physiology using a high-content screening platform," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 1308-10.
- H.-H. Cui, K.-M. Lim, and J. Voldman, "Experiment and modeling of pillar array micro-traps with negative dielectrophoresis," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 1012-14.
- K. Blagovic, L. Y. Kim, A. M. Skelley, and J. Voldman, "Microfluidic control of stem cell diffusible signaling," in *Micro Total Analysis Systems '08*, San Diego, CA, USA, 2008, pp. 677-679.
- M. D. Vahey and J. Voldman, "A new equilibrium method for continuous-flow cell sorting using dielectrophoresis," *Analytical Chemistry*, vol. 80, pp. 3135-43, 2008.
- A. M. Skelley and J. Voldman, "An Active Bubble Trap and Debubbler for Microfluidic Systems," *Lab Chip*, vol. 8, pp. 1733-7, 2008.
- T. D. Robinson, B.-H. Ooi, B. M. Taff, K. E. Willcox, and J. Voldman, "Surrogate-Based Optimization of a Microfluidic Weir Structure for Single-Cell Manipulation," in *12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Victoria, British Columbia, Canada, 2008.
- J. R. Kovac and J. Voldman, "Image-based cell sorting using optofluidics," in *2008 IEEE/LEOS Summer Topical Meeting on Optofluidics*, Acapulco, Mexico, 2008.
- S. P. Desai, B. M. Taff, and J. Voldman, "A photopatternable silicone for biological microsystems," *Langmuir*, vol. 24, pp. 575-81, 2008.

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Wang, E.N., Bucaro, M., Taylor, J.A., Kolodner, P., Aizenberg, J., and T. Krupenkin, "Droplet Mixing Using Electrically Tunable Superhydrophobic Nanostructured Surfaces," Microfluidics and Nanofluidics, DOI 10.1007/s10404-008-0364-7, 2008.

Krupenkin, T.N., Taylor, J.A., Wang, E.N., Kolodner, P., Hodes, M., and T.R. Salamon, "Reversible Wetting-dewetting Transitions on Electrically Tunable Superhydrophobic Nanostructured Surfaces," Langmuir 23, 9128-9133, 2007.

Wang, E.N., Devasenathipathy, S., Lin, H., Hidrovo, C.H., Santiago, J.G., Goodson, K.E., and T.W. Kenny, "A Hybrid Method for Bubble Reconstruction in Two-Phase Microchannels," Experiments in Fluids 40, 847-858, 2006.

Kenny, T.W., Goodson, K.E., Santiago, J.G., Wang, E., Koo, J.-M., Jiang, L., Zhang, L., Fogg, D., Yao, S., Rose, K., Flynn, R., Cheng, C.-H., and C. Hidrovo, "Advanced Cooling Technologies for Microprocessors," International Journal of High Speed Electronics and Systems 16, 301-313, 2006.

Hidrovo, C.H., Kramer, T.A., Wang, E.N., Vigneron, S., Steinbrenner, J.E., Koo, J.-M., Wang, F.-M., Fogg, D.W., Flynn, R.D., Lee, E.S., Cheng, C.-H., Kenny, T.W., Eaton, J.K., and K.E. Goodson, "Two-Phase Microfluidics for Semiconductor Circuits and Fuel Cells," Heat Transfer Engineering 27, 53-63, 2006.

Zhang, L., Wang, E.N., Goodson, K.E., and T.W. Kenny, "Phase Change Phenomena in Silicon Microchannels," International Journal of Heat and Mass Transfer 48, 1572-1582, 2005.

Wang, E.N., Devasenathipathy, S., Santiago, J.G., Goodson, K.E., and T.W. Kenny, "Nucleation and Growth of Vapor Bubbles in a Heated Silicon Microchannel," Journal of Heat Transfer 126, 497, 2004.

Wang, E.N., Zhang, L., Jiang, L., Koo, J.-M., Maveety, J.G., Sanchez, E.A., Goodson, K.E., and T.W. Kenny, "Micromachined Jets for Liquid Impingement Cooling of VLSI Chips," Journal of MicroElectroMechanical Systems 13, 833-842, 2004.

Balandin, A., Wang, K.L., Cai, S., Li, R., Viswanathan, C.R., Wang, E.N., and M. Wojtowicz, "Investigation of Flicker Noise Level and Deep Levels in AlGaN/GaN Heterostructure Field Effect Transistors," Journal of Electronic Materials, 29, 297-301, 2000.

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Wardle, B.L., and S.M. Spearing, "Chapter 9, Structural Considerations," ed. by A. Mitsos and P.I. Barton, *Microfabricated Power Generation Devices: Design and Technology*, Wiley-VCH, Weinheim, 2009. ISBN: 978-3-527-32081-3.

Duong, H.M., Yamamoto, N., Papavassiliou, D.V., Maruyama, S., and B.L. Wardle "Inter Carbon Nanotube Contact in Thermal Transport of Controlled-Morphology Polymer Nanocomposites," *Nanotechnology*, Vol. 20, 2009.

Yamamoto, N., Hart, A.J., Garcia, E.J., Wicks, S., Duong, H.M., Slocum, A.H., and B.L. Wardle, "High-yield Growth and Morphology Control of Aligned Carbon Nanotubes on Ceramic Fibers for Multifunctional Enhancement of Structural Composites," *Carbon*, Vol. 47 (3), March 2009, pp. 551-560.

Blanco, J., Garcia, E.J., Guzman deVilloria, R., and B.L. Wardle, "Limiting Mechanisms in Mode I Interlaminar Toughness of Composites Reinforced with Aligned Carbon Nanotubes," *J. Composite Materials*, Vol. 43 (8), April 2009.

Duong, H., Papavassiliou, D.V., Mullen, K.J., Wardle, B.L., and S. Maruyama, "Calculated Thermal Properties of Single Walled Carbon Nanotube Suspensions," *J. Physical Chemistry C*, 112 (50), 2008, pp. 19860-65.

Bello, D., Wardle, B.L., Ahn, K., Yamamoto, N., Garcia, E.J., Hart, A.J., and M.J. Ellenbecker, "Exposure to Nanoscale Particles and Fibers During Fabrication and Machining of Hybrid CNT Advanced Composites," *J. Nanoparticle Research*, Vol. 11, 2009, pp. 231-249.

Garcia, E.J., Wardle, B.L., and A.J. Hart, "Joining Prepreg Composite Interfaces with Aligned Carbon Nanotubes," *Composites Part A*, Vol. 39, 2008, pp. 1065-1070.

Wardle, B.L., Saito, D.S., Garcia, E.J., Hart, A.J., and R. Guzman deVilloria, "Fabrication and Characterization of Ultra-High Volume Fraction Aligned Carbon-Nanotube-Polymer Composites," *Advanced Materials*, Vol. 20, 2008, pp. 2707-14.

Garcia, E.J., Hart, J., and B.L. Wardle, "Long Carbon Nanotubes Grown on the Surface of Fibers for Hybrid Composites," *AIAA Journal*, Vol. 46, No.6, 2008, pp.1405-1412.

Bello, D., Hart, A.J., Ahn, K., Hallock, M., Yamamoto, N., Garcia, E.J., Ellenbecker, E.J., and B.L. Wardle, "Particle Exposure Levels During CVD Growth and Subsequent Handling of Vertically-aligned Carbon Nanotube Films," *Carbon*, Vol. 46, 2008, pp. 974-978.

Garcia, E.J., Wardle, B.L., Hart, A.J., and N. Yamamoto, "Fabrication and Multifunctional Properties of a Hybrid Laminate with Aligned Carbon Nanotubes Grown In Situ," *Composites Science & Technology*, Vol. 68, No. 9, 2008, pp. 2034-2041.

Quinn, D., Wardle, B.L., and Spearing, S.M., "Residual Stress and Microstructure of As-deposited and Annealed Sputtered Yttria Stabilized Zirconia Thin Films," *Journal of Materials Research*, Vol. 23, No. 3, March, 2008, pp.609-618.

Garcia, E.J., Hart, J., Wardle, B.L. and A. Slocum, "Fabrication and Nanocompression Testing of Aligned CNT/Polymer Nanocomposites," *Advanced Materials*, 19:2151-2156, August 2007.

duToit, N.E. and B. L. Wardle, "Experimental Verification of Models for Microfabricated Piezoelectric Vibration Energy Harvesters," *AIAA Journal*, Vol. 45, No. 5, May 2007, pp. 1126-1137.

Garcia, E.J., Hart, J., Wardle, B.L. and A. Slocum, "Fabrication of Composite Microstructures by Capillarity-driven Wetting of Aligned Carbon Nanotubes with Polymers," *Nanotechnology*, Vol. 18, No. 16, April 2007, pages 165602 (11pp).

duToit, N.E., and B.L. Wardle, "Performance of Microfabricated Piezoelectric Vibration Energy Harvesters," *Integrated Ferroelectrics*, Vol. 83, 2006, pp.13-23.

duToit, N. E., Wardle, B. L., and S.-G. Kim, "Design Considerations for MEMS-scale Piezoelectric Vibration Energy Harvesters," *Integrated Ferroelectrics*, Vol. 71, 2005, pp. 121-160.