



Andrew Sarangan

Dept. of Electro-Optics and Photonics

School of Engineering

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<http://professornano.com/>

OVERVIEW

Professor, Dept. of Electro-Optics and Photonics

Optoelectronics, Thin Films, Nanofabrication & Integrated Optics

Licensed Professional Engineer (Ohio)

Commercial Pilot & Flight Instructor

ACADEMIC APPOINTMENTS

University of Dayton, OH, USA

Department of Electro-Optics and Photonics

2000 -

Full Professor

2011 -

Associate Professor

2006 - 2011

Assistant Professor

2000 - 2006

- Nanofabrication, Optical Thin Films, Integrated Photonics, Photodetectors, Computational Electromagnetics
- Joint Appointment with Electrical and Computer Engineering
- **Key Accomplishments:** I established a nanofabrication laboratory as a single-PI effort *entirely from externally sponsored research funds*. I personally maintain its daily operations, and receive no subsidies or course-release from the university. The laboratory has all of the fab capabilities - thin films, photolithography, deep-UV interference lithography, thermal processes and plasma etching.

Laboratory website: <http://nano-fab.com>

I also developed remote-executing photonic simulation software, long before cloud computing. This software is used by many researchers around the world.

Photonics simulation: <http://maxwellsequations.org>

University of New Mexico, Albuquerque, NM, USA

Center for High Technology Materials (CHTM)

1997 - 2000

Research Assistant Professor

- High power, high brightness semiconductor lasers
- Taught courses in Introductory Photonics
- **Key Accomplishments:** Completed the first theoretical and experimental study of the α -DFB semiconductor laser.

EDUCATION

- PhD Electrical Engineering** 1993-1997
University of Waterloo, Canada
“Multi-wavelength distributed feedback lasers”
Dissertation advisor: W. -P. Huang (currently at Shandong University, China)
- MASc Electrical Engineering** 1991-1993
University of Waterloo, Canada
“An electronic switch based on quantum interference”
Thesis advisor: W. -P. Huang
- BASc Electrical Engineering** 1986-1991
University of Waterloo, Canada
Physics Option

AWARDS & HONORS

- 2013 Faculty Excellence in Teaching Awards – Southwestern Ohio Council for Higher Education
- 2013 Affiliate Societies Council Outstanding Scientists & Engineers Award – Research category, Dayton, OH
- 2008 Sigma Xi Noland Award for Excellence in Research, University of Dayton
- AFOSR Summer Faculty Fellowship (2001, 2002, 2017 & 2018) for research at Air Force Research Laboratory, Wright-Patterson AFB.
- Post-Doctoral Fellowship for Research in Optoelectronics (1997 & 1998) - Natural Sciences and Engineering Research Council (NSERC) of Canada. This is a prestigious two-year award. Only 14 were awarded in all of Canada in Electrical Engineering, and I was the only Engineering recipient at Waterloo.
- Post-Graduate Scholarship, NSERC of Canada (1991-1995). Full scholarships for MS & PhD.
- Telecommunications Research Institute of Ontario Internship award (1995-1997).

PROFESSIONAL SOCIETIES

- Senior Member, IEEE, Photonics Society, Electron Devices Society
- Senior Lifetime Member, SPIE
- Associate Editor of IEEE Journal of Quantum Electronics
- Chair of the Technical program committee of IEEE Photonics Society on Photodetectors, Sensors, Systems and Imaging (2017 & 2018)
- Chair of the IEEE/Photonics Society chapter of Dayton, OH (since 2002)

ENGINEERING EXPERIENCE

- Consultant for Silfex (Lam Research) on semiconductor etch process development
- Consultant for Gentex (automotive displays)
- Founder, Dayton Photonics, LLC
- Worked in various capacities at Nortel Networks, IBM & Air Force Research Laboratory.

AERONAUTICAL EXPERIENCE

- ~ 1500 hours as pilot-in-command
- FAA Certificates:
 - Commercial Pilot
 - Flight Instructor
 - Advanced Ground Instructor

BOOKS

- Andrew Sarangan. *Nanofabrication: Principles to Laboratory Practice (Optical Sciences and Applications of Light)*. CRC Press, 2016. ISBN:1498725570

BOOK CHAPTERS

- A. Sarangan. “Quantum mechanics and computation in nanophotonics”. *Fundamentals and Applications of Nanophotonics*, pages 45–87. Elsevier, 2016. doi:[10.1016/B978-1-78242-464-2.00003-8](https://doi.org/10.1016/B978-1-78242-464-2.00003-8)
- A Sarangan. “Nanofabrication”. *Fundamentals and Applications of Nanophotonics*, pages 149–184. Elsevier, 2016. doi:[10.1016/B978-1-78242-464-2.00005-1](https://doi.org/10.1016/B978-1-78242-464-2.00005-1)

PATENTS

- Agus Widjaja, Andrew Sarangan, ” *Thin film structures with negative inductance and methods for fabricating inductors comprising the same*”, U.S. Patent No. 20090261936, 2011
- Gregory M. Peake, Stephen D. Hersee and Andrew M. Sarangan, ” *Non-Planar Micro-Optical Structures*”, U.S. Patent No. 6,728,289, 2004
- Gregory M. Peake, Stephen D. Hersee and Andrew M. Sarangan, ” *Method of Making Non-Planar Micro-Optical Structures*”, U.S. Patent No. 6365237, 2002
- G.P. Li, T. Makino, A. Sarangan and W.P. Huang, ” *Multi-Wavelength Gain-Coupled Distributed Feedback Laser Arrays with Fine Tunability*”, U.S. Patent No. 5536085, 1996

FUNDING [≈\$4.2M as PI, ≈\$2.5M as Co-PI]

- Lam Research Corp., “Laser-assisted chemical etching for deep silicon micromachining”, \$25,000 (Gift) (PI, 08/2018).
- Gentex Corp., “Wiregrid polarizers for automotive applications”, \$39,220 (PI, 06/2017 - 12/2018).
- National Science Foundation (NSF), “[Collaborative Research: Nanopatterning and temporal control of phase-change materials for reconfigurable photonics](#)”, \$197,768 (Co-PI, 08/2017 - 07/2020).
- Silfex Inc., “Process development for wet-chemical etching of silicon”, \$20,000 (PI, 07/2016 - 10/2017).
- Silanna Semiconductor, “UVC Material evaluation”, \$9000 (PI, 03/2017 - 08/2017).
- Dayton Area Graduate Studies Institute, “An Integrated Photonics CMOS Compatible Platform for Chemical and Biological Sensors”, \$212,976 (PI, 07/2016 - 06/2019).
- Air Force Research Laboratory, “Transition Metal Nitrides for Opto-Electronic Applications & New Ferroelectrics & Composite Multiferroic Materials for RF”, \$98,734 (PI, 07/2017 - 08/2019).
- Air Force Research Laboratory/UES, “Infrared Anti-Reflection Coatings”, \$53,271 (PI, 01/2015 - 12/2017).
- Missile Defense Agency Phase 1 SBIR/Rnet, “ID Compromised Electronic Components”, \$40,000 (PI, 01/2015 - 07/2015).
- Air Force Research Laboratory, “Thermal Diffusion Tube Furnace System”, \$13,352 (PI, 10/2014 - 10/2014).
- Air Force Research Laboratory, “Ion Assisted Deposition System”, \$19,514 (PI, 07/2014 - 07/2014).
- Air Force Research Laboratory, “Interferometric Lithography and Substrate Patterning/Epitaxy for Nonlinear Quasi-Phase-Matched Device Development”, \$368,505 (PI, 01/2014 - 07/2016).
- Air Force Research Laboratory/UES, “Anti-reflection coatings”, \$25,000 (PI, 01/2014 - 12/2015).
- National Science Foundation (NSF), “[CC-NIE Network Infrastructure: Network 10Gb Upgrade and Science DMZ Implementation to Support Science and Engineering Research and Enhance Outreach for High School STEM Education](#)”, \$232,788 (Co-PI, 12/2013 - 05/2016).
- National Science Foundation (NSF), “[CCSS: Spectral Filter Array for Multispectral Imaging](#)”, \$319,952 (Co-PI, 09/2013 - 08/2016).
- National Science Foundation (NSF), “[Collaborative Research: Cross-institutional Nanotechnology Education and Workforce Training Project](#)”, \$100,000 (PI, 01/2012 - 12/2014).
- China Southern Glass Holding Co. Ltd, “Electrochromic glass research and development”, \$175,000 (Co-PI, 10/2012 - 09/2013).

- FMI Imaging, “Development of metal vapor coating & blue-enhanced detectors for medical imaging”, \$30,800 (PI, 09/2012 - 04/2013).
- FMI Imaging, “Rapid thermal annealer for blue enhanced detector development”, \$44,300 (PI, 06/2011 - 01/2012).
- Air Force Research Laboratory/UES, “Infrared Coatings for Laser Effects on Materials, Structures and Sensors”, \$39,000 (PI, 04/2011 - 10/2013).
- Navy SBIR Phase 1/Forza Silicon, “Dual Well Focal Plane Array”, \$19,536 (PI, 08/2010 - 12/2010).
- Air Force Research Laboratory, “Interdisciplinary Technology Development for Future MAV Systems”, \$1,506,500 (Co-PI, 10/2008 - 09/2011).
- Air Force Research Laboratory, “Project Biosense”, \$175,000 (PI, 08/2010 - 07/2013).
- Air Force Research Laboratory, “Mid-Wave Infrared Sensing Technology Advancement (MISTA)”, \$99,989 (PI, 08/2010 - 12/2012).
- DARPA/University of Rochester, “Development of Mini-Cluster Computational Facility For Modeling Large Mode Area Fibers”, \$45,200 (PI, 04/2009 - 08/2010).
- Missile Defense Agency SBIR Phase 2/Aegis, “Beam Steering”, \$33,121 (PI, 04/2009 - 03/2011).
- L3 Cincinnati Electronics, “Development of Spectral and Polarimetric Devices for Lenslet Imaging”, \$34,158 (PI, 07/2009 - 06/2010).
- Air Force Research Laboratory/GDIT, “Anti-reflection coatings”, \$44,600 (PI, 04/2008 - 10/2010).
- Air Force Research Laboratory, “Development of Advanced Infrared Detectors”, \$78,016 (PI, 01/2009 - 10/2009).
- Institute for the Development and Commercialization of Advanced Sensors Technology, “Polarimetric Imaging Technology”, \$200,000 (PI, 02/2007 - 01/2010).
- Institute for the Development and Commercialization of Advanced Sensors Technology - OSCAR Project, “Fabrication of MWIR Micro-lenslet imaging arrays”, \$24,530 (PI, 07/2009 - 06/2010).
- Air Force Research Laboratory/L3CE, “Multispectral/Polarimetric Imaging Camera Program”, \$202,000 (PI, 04/2006 - 12/2007).
- Office of Naval Research/L3CE, “Multi Color IR FPA Utilizing Low Cost 2D Pixel Architecture”, \$37,000 (PI, 04/2006 - 12/2006).
- Mantech/L3CE, “Large Area Micro-Optics”, \$25,000 (PI, 10/2005 - 04/2006).
- Air Force Research Laboratory, “Quantum Cascade Lasers”, \$18,000 (PI, 05/2005 - 12/2005).
- Missile Defense Agency/L3CE, “C-QWIP Based IR Detectors”, \$45,598 (PI, 05/2005 - 04/2006).

- Ohio Third Frontier Wright Project, “Development and Commercialization of Long-wavelength Infrared Focal Plane Arrays”, \$1,092,800 (PI, 1/05 - 3/09).
- L3 Cincinnati Electronics, “Micro-optic IR FPA Project”, \$126,727 (PI, 09/2004 - 12/2008).
- Wright Capital Project Fund, “Development of Arrayed micro-optic elements for enhanced infrared image detection”, \$773,589 (PI, 09/2003 - 08/2006).
- Navy Research Laboratory STTR Phase 1/Defense Research Associates, “Silicon-Based Visible/Near-Infrared Affordable Missile Warning”, \$17,644 (PI, 07/2003 - 01/2004).
- National Science Foundation (NSF) SBIR Phase 1/Srico Inc, “Photonic Band Gap Waveguide Structures in Lithium Niobate”, \$19,714 (Co-PI, 07/2002 - 12/2002).
- Dayton Area Graduate Studies Institute, “Measurement and Modeling of Aero-Optical Aberrations in Coherent Laser Radiation”, \$66,660 (Co-PI, 07/2001 - 06/2004).

PUBLICATIONS AND CONFERENCE PROCEEDINGS [statistics]

2018

105. Pengfei Guo, Joshua A. Burrow, Gary A. Sevison, Aditya Sood, Mehdi Asheghi Joshua Hendrickson, Kenneth Goodson, Imad Agha, and Andrew Sarangan. “Improving the performance of $\text{Ge}_2\text{Sb}_2\text{Te}_5$ materials via nickel doping: Towards RF-compatible phase-change devices”. *Applied Physics Letters*, Under Review
104. Andrew Sarangan. “Design of metal-dielectric resonant-cavity thin-film structures using the effective reflectance index method”. *Journal of the Optical Society of America B*, 35(9):2294, 2018. doi:[10.1364/JOSAB.35.002294](https://doi.org/10.1364/JOSAB.35.002294)
103. Chuan Ni, Jie Jia, Matthew Howard, Keigo Hirakawa, and Andrew Sarangan. “Single-shot multispectral imager using spatially multiplexed fourier spectral filters”. *J. Opt. Soc. Am. B*, 35(5):1072–1079, 2018. doi:[10.1364/JOSAB.35.001072](https://doi.org/10.1364/JOSAB.35.001072)
102. R. Yahiaoui, J. A. Burrow, S. M. Mekonen, A. Sarangan, J. Mathews, I. Agha, and T. A. Searles. “Electromagnetically induced transparency control in terahertz metasurfaces based on bright-bright mode coupling”. *Physical Review B*, 97(15):155403, 2018. doi:[10.1103/PhysRevB.97.155403](https://doi.org/10.1103/PhysRevB.97.155403)
101. Andrew Sarangan, Josh Duran, Vladimir Vasilyev, Nicholaos Limberopoulos, Ilya Vitebskiy, and Igor Anisimov. “Broadband Reflective Optical Limiter Using GST Phase Change Material”. *IEEE Photonics Journal*, 10(2):1–9, 2018. doi:[10.1109/JPHOT.2018.2796448](https://doi.org/10.1109/JPHOT.2018.2796448)

2017

100. Joshua A. Burrow, Riad Yahiaoui, Andrew Sarangan, Imad Agha, Jay Mathews, and Thomas A. Searles. “Polarization-dependent electromagnetic responses of ultrathin and highly flexible asymmetric terahertz metasurfaces”. *Optics Express*, 25(26):32540, 2017. doi:[10.1364/OE.25.032540](https://doi.org/10.1364/OE.25.032540)
99. Zhengning Gao, Mallik M. R. Hussain, Domenico de Ceglia, Maria A. Vincenti, Andrew Sarangan, Imad Agha, Michael Scalora, Joseph W. Haus, and Parag Banerjee. “Unraveling delocalized electrons in metal induced gap states from second harmonics”. *Applied Physics Letters*, 111(16):161601, 2017. doi:[10.1063/1.4996893](https://doi.org/10.1063/1.4996893)

98. Mallik Mohd Raihan Hussain, Zhengning Gao, Domenico de Ceglia, Maria Vinceti, Andrew Sarangan, Imad Agha, Michael Scalora, Parag Banerjee, and Joseph W. Haus. "Observation of Third Harmonic Enhancement Due to Tunneling at a Metal-Insulator-Metal Junction". *Frontiers in Optics 2017*, volume Part F66-F, page JTU3A.29, Washington, D.C., 2017. OSA. doi:[10.1364/FIO.2017.JTu3A.29](https://doi.org/10.1364/FIO.2017.JTu3A.29)
97. Pengfei Guo, David Lombardo, and Andrew M. Sarangan. "Vanadium dioxide switchable components based on wiregrids for mid-infrared applications". *Nanoengineering: Fabrication, Properties, Optics, and Devices XIV*, page 43. SPIE, 2017. doi:[10.1117/12.2272758](https://doi.org/10.1117/12.2272758)
96. Joshua M. Duran and Andrew Sarangan. "Fabrication of ultrahigh aspect ratio silicon nanostructures using self-assembled gold metal-assisted chemical etching". *Journal of Micro/Nanolithography, MEMS, and MOEMS*, 16(1):014502, 2017. doi:[10.1117/1.JMM.16.1.014502](https://doi.org/10.1117/1.JMM.16.1.014502)
95. Chenhao Wan, David Lombardo, Andrew Sarangan, and Qiwen Zhan. "High efficiency geometric-phase polarization fan-out grating on silicon". *Optics Express*, 25(20):24559, 2017. doi:[10.1364/OE.25.024559](https://doi.org/10.1364/OE.25.024559)
94. Chenhao Wan, David Lombardo, Andrew Sarangan, and Qiwen Zhan. "Geometric-Phase Polarization Fan-out Grating Fabricated with Deep-UV Interference Lithography". *Journal of Physics: Conference Series*, 844(1):012028, 2017. doi:[10.1088/1742-6596/844/1/012028](https://doi.org/10.1088/1742-6596/844/1/012028)
93. Diego Garcia Mina, Joseph W. Haus, Andy Chong, Ankita Khanolkar, Andrew Sarangan, and Karolyn Hansen. "Bi-tapered fiber sensor using visible to near infrared light". *Sensors and Actuators A: Physical*, 263:285–290, 2017. doi:[10.1016/j.sna.2017.06.017](https://doi.org/10.1016/j.sna.2017.06.017)
92. J. Duran and A. Sarangan. "Infrared absorption in MacEtch fabricated silicon quantum walls". *2016 IEEE Photonics Conference, IPC 2016*, 2017. doi:[10.1109/IPCCon.2016.7831057](https://doi.org/10.1109/IPCCon.2016.7831057)
91. C. Ni, J. Jia, K. Hirakawa, and A. Sarangan. "A Fourier multispectral imaging camera with pixel-level sinusoidal filter arrays". *2016 IEEE Photonics Conference, IPC 2016*, 2017. doi:[10.1109/IPCCon.2016.7831060](https://doi.org/10.1109/IPCCon.2016.7831060)
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- 2016
90. David Lombardo, Piyush Shah, Pengfei Guo, and Andrew Sarangan. "Deep-UV interference lithography combined with masked contact lithography for pixel wiregrid patterns". *Proc. SPIE - The International Society for Optical Engineering*, volume 9777, page 97771N, 2016. doi:[10.1117/12.2219484](https://doi.org/10.1117/12.2219484)
89. Mengyang Zou, Chuan Ni, and Andrew Sarangan. "Ion-assisted evaporation of vanadium dioxide thin films". *Proc. SPIE Nanoengineering: Fabrication, Properties, Optics, and Devices XIII*, page 99271Q, 2016. doi:[10.1117/12.2238491](https://doi.org/10.1117/12.2238491)
88. A. Belardini, G. Leahu, M. Centini, R. Li Voti, E. Fazio, C. Sibilìa, Joseph W. Haus, Andrew Sarangan, D. Hooper, and V. K. Valev. "Effective chiral behavior on self-assembled tilted gold nanowires metasurface by means of linear and nonlinear optical techniques". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 9894, page 98941V, 2016. doi:[10.1117/12.2230382](https://doi.org/10.1117/12.2230382)
87. Alessandro Belardini, Marco Centini, Grigore Leahu, David C. Hooper, Roberto Li Voti, Eugenio Fazio, Joseph W. Haus, Andrew Sarangan, Ventsislav K. Valev, and Concita Sibilìa. "Chiral light intrinsically couples to extrinsic/pseudo-chiral metasurfaces made of tilted gold nanowires". *Scientific Reports*, 6(1):31796, 2016. doi:[10.1038/srep31796](https://doi.org/10.1038/srep31796)

86. A. Belardini, A. Benedetti, M. Centini, E. Fazio, M. Bertolotti, C. Sibia, Joseph W. Haus, and Andrew Sarangan. "Symmetry breaking in the second harmonic field of self-assembled metallic nanostructures". *Proc. SPIE - The International Society for Optical Engineering*, volume 9502, page 950206. SPIE, 2015. doi:[10.1117/12.2182759](https://doi.org/10.1117/12.2182759)
85. Alessandro Belardini, Marco Centini, Grigore Leahu, Eugenio Fazio, Concita Sibia, Joseph W. Haus, and Andrew Sarangan. "Second harmonic generation on self-assembled tilted gold nanowires". *Faraday Discussions*, 178:357–362, 2015. doi:[10.1039/C4FD00200H](https://doi.org/10.1039/C4FD00200H)
84. Jie Jia, Chuan Ni, Andrew Sarangan, and Keigo Hirakawa. "Fourier multispectral imaging". *Optics Express*, 23(17):22649, 2015. doi:[10.1364/OE.23.022649](https://doi.org/10.1364/OE.23.022649)
83. Junxin Wang, Yun Zhao, Imad Agha, and Andrew M. Sarangan. "SU-8 nanoimprint fabrication of wire-grid polarizers using deep-UV interference lithography". *Optics Letters*, 40(19):4396, 2015. doi:[10.1364/OL.40.004396](https://doi.org/10.1364/OL.40.004396)
82. Chuan Ni, Jie Jia, Keigo Hirakawa, and Andrew Sarangan. "Design and fabrication of sinusoidal spectral filters for multispectral imaging". *Proc. SPIE - The International Society for Optical Engineering*, volume 9556, page 95560I, 2015. doi:[10.1117/12.2188830](https://doi.org/10.1117/12.2188830)
81. Yun Zhao, Andrew Sarangan, and Imad Agha. "Frequency conversion via asymmetrically pumped four-wave-mixing Bragg scattering in silicon waveguides". *Frontiers in Optics 2015*, page FTh2B.5, Washington, D.C., 2015. OSA. doi:[10.1364/FIO.2015.FTh2B.5](https://doi.org/10.1364/FIO.2015.FTh2B.5)

80. Michael Benson, Piyush Shah, Michael Marciniak, Andrew Sarangan, and Augustine Urbas. "Optical Characterization of Silver Nanorod Thin Films Grown Using Oblique Angle Deposition". *Journal of Nanomaterials*, 2014:1–8, 2014. doi:[10.1155/2014/694982](https://doi.org/10.1155/2014/694982)
79. Long Wang, Peter E. Powers, Andrew Sarangan, and Joseph W. Haus. "Image revivals in multi-mode optical fibers with periodic multiple sub-apertures". *Optics Communications*, 326:57–63, 2014. doi:[10.1016/j.optcom.2014.04.022](https://doi.org/10.1016/j.optcom.2014.04.022)
78. Junxin Wang and Andrew M. Sarangan. "Nanoimprint fabrication of wiregrids micro-polarizers in near infrared spectra using SU-8 as an intermediate film". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 9170, page 917010, 2014. doi:[10.1117/12.2061230](https://doi.org/10.1117/12.2061230)

77. Branden J. King, Ighodalo Idehenre, Peter E. Powers, Andrew M. Sarangan, Joseph W. Haus, and Carolyn M. Hansen. "Tapered optical fibers for aqueous and gaseous phase biosensing applications". *Progress in Biomedical Optics and Imaging - Proceedings of SPIE*, volume 8570, page 85700G, 2013. doi:[10.1117/12.2004799](https://doi.org/10.1117/12.2004799)
76. Emily M. Fehrman Cory, Roberto S. Aga, Jack P. Lombardi, Carrie M. Bartsch, Andrew Sarangan, and Emily M. Heckman. "Nanoimprint lithography of deoxyribonucleic acid biopolymer films". *Journal of Micro/Nanolithography, MEMS, and MOEMS*, 12(4):040501, 2013. doi:[10.1117/1.JMM.12.4.040501](https://doi.org/10.1117/1.JMM.12.4.040501)

75. Susan Derenko, René Kulloock, Zhi Wu, Andrew Sarangan, Christiane Schuster, Lukas M. Eng, and Thomas Härtling. “Local photochemical plasmon mode tuning in metal nanoparticle arrays”. *Optical Materials Express*, 3(6):794, 2013. doi:[10.1364/OME.3.000794](https://doi.org/10.1364/OME.3.000794)
74. Susan Derenko, Roland Wuchrer, Andrew Sarangan, Christiane Schuster, and Thomas Härtling. “Plasmonic gradient structures of nanoparticle arrays for optical sensing applications”. *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8693, page 869305, 2013. doi:[10.1117/12.2008954](https://doi.org/10.1117/12.2008954)
73. A. Sarangan, J.W. Haus, S.M. Jain, J. Moradmand, and N. Reeder. “Collaborative classroom tools for nanotechnology process education”. *ASEE Annual Conference and Exposition, Conference Proceedings*, 2013
72. Piyush Shah, Dongquan Ju, Xiaoxu Niu, and Andrew M. Sarangan. “Vapor Phase Sensing Using Metal Nanorod Thin Films Grown by Cryogenic Oblique Angle Deposition”. *Journal of Sensors*, 2013:1–6, 2013. doi:[10.1155/2013/823041](https://doi.org/10.1155/2013/823041)
71. Joseph W. Haus, Long Wang, Peter E. Powers, and Andrew M. Sarangan. “Coherent superposition of multiple beams in a large mode area fiber”. *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8775, page 87750G, 2013. doi:[10.1117/12.2018765](https://doi.org/10.1117/12.2018765)
70. Piyush J. Shah, Zhi Wu, and Andrew M. Sarangan. “Effects of CO₂ critical point drying on nanostructured SiO₂ thin films after liquid exposure”. *Thin Solid Films*, 527:344–348, 2013. doi:[10.1016/j.tsf.2012.10.057](https://doi.org/10.1016/j.tsf.2012.10.057)

2012

69. Piyush J Shah, Xiaoxu Niu, and Andrew M Sarangan. “Journal of Nanoscience Letters High aspect ratio silver nanorod thin films grown at cryogenic substrate temperature”. 2012
68. G. Nehmetallah, R. Aylo, P. Powers, A. Sarangan, J. Gao, H. Li, A. Achari, and P. P. Banerjee. “Co-sputtered SiC + Ag nanomixtures as visible wavelength negative index metamaterials”. *Optics Express*, 20(7):7095, 2012. doi:[10.1364/OE.20.007095](https://doi.org/10.1364/OE.20.007095)
67. P. P. Banerjee, R. Aylo, G. Nehmetallah, H. Li, A. Sarangan, and P. Powers. “Binary nanoparticle dispersed metamaterial implementation and characterization”. *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8268, page 826805, 2012. doi:[10.1117/12.915689](https://doi.org/10.1117/12.915689)
66. Piyush Shah, Xiaoxu Niu, and Andrew Sarangan. “Effect of Cryogenic Substrate Temperature on the Growth of Ag and Cu Nanostructured Optical Metamaterials”. *2012 Symposium on Photonics and Optoelectronics*, pages 1–2. IEEE, 2012. doi:[10.1109/SOPO.2012.6270908](https://doi.org/10.1109/SOPO.2012.6270908)
65. Jian Gao, Andrew M. Sarangan, and Qiwen Zhan. “Polarization multiplexed fluorescence enhancer using a pixelated one-dimensional photonic band gap structure”. *Optics Letters*, 37(13):2640, 2012. doi:[10.1364/OL.37.002640](https://doi.org/10.1364/OL.37.002640)
64. Xiaoxu Niu, Paul T. Murray, and Andrew Sarangan. “Synthesis of Fe–Ni bimetallic nanoparticles from pixel target ablation: plume dynamics and surface characterization”. *Journal of Nanoparticle Research*, 14(8):1017, 2012. doi:[10.1007/s11051-012-1017-z](https://doi.org/10.1007/s11051-012-1017-z)
63. R. C. G. Smith, A. M. Sarangan, Z. Jiang, and J. R. Marciante. “Direct measurement of bend-induced mode deformation in large-mode-area fibers”. *Optics Express*, 20(4):4436, 2012. doi:[10.1364/OE.20.004436](https://doi.org/10.1364/OE.20.004436)

62. Jian Gao, Qiwen Zhan, and Andrew M. Sarangan. "High-index low-loss gallium phosphide thin films fabricated by radio frequency magnetron sputtering". *Thin Solid Films*, 519(16):5424–5428, 2011. doi:[10.1016/j.tsf.2011.02.068](https://doi.org/10.1016/j.tsf.2011.02.068)
61. Nkorni Katte, Joseph W. Haus, Peter Powers, Andrew Sarangan, Jian Gao, and Michael Scalora. "Z-scan simulations on metallodielectric stacks with nonlinear absorption". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8093, page 80930J, 2011. doi:[10.1117/12.894130](https://doi.org/10.1117/12.894130)
60. Nkorni Katte, Joseph W. Haus, Peter Powers, Andrew Sarangan, Jian Gao, and Michael Scalora. "Third-order nonlinear optical properties of metallodielectric stacks". *Journal of the Optical Society of America B*, 28(9):2277, 2011. doi:[10.1364/JOSAB.28.002277](https://doi.org/10.1364/JOSAB.28.002277)
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