

2008 Publications and Patents

1. S. Sundararajan, **P. E. Lammert**, A. W. Zudans, **V. H. Crespi**, and **A. Sen**, “Catalytic Motors for Transport of Colloidal Cargo,” *Nanoletters*, 8, 1271–1276 (2008).
2. V. K. S. Hsiao, Y. B. Zheng, B. K. Juluri, **T. J. Huang**, “Light-Driven Plasmonic Switches Based on Au Nanodisk Arrays and Photoresponsive Liquid Crystals,” *Advanced Materials*, 20, 3528-3522 (2008).
3. V. K. S. Hsiao, Y. B. Zheng, B. K. Juluri, **T. J. Huang**, “Light-Driven Plasmonic Switches Based on Au Nanodisk Arrays and Photoresponsive Liquid Crystals,” *Advanced Materials*, 20, 3528-3522 (2008).
4. **I. C. Khoo**, J. H. Park, and J. D. Liou, “Theory and Experimental Studies of All-optical Transmission Switching in a Twist-alignment Dye-doped Nematic Liquid Crystal,” *Journal of the Optical Society of America B-optical Physics*, 25, 1931-1937 (2008).
5. D. H. Kwon, and **D. H. Werner**, “Transformation Optical Designs for Wave Collimators, Flat Lenses, and Right-angle Bends,” *New Journal of Physics*, 10, 115023/1-13 (2008).
6. L. Tian, A. Vasudevarao, A. N. Morozovska, E. A. Eliseev, S. Kalinin, and **V. Gopalan**, “Quantitative Piezoelectric Force Microscopy: The Influence of Tip Shape, Size and Contact Geometry on the Nanoscale Resolution of an Antiparallel Ferroelectric Domain Wall,” *J. Appl. Phys.*, 104, 074110-1/10 (2008).
7. Y. L. Li, S. Y. Hu, S. Choudhury, M. I. Baskes, A. Saxena, T. Lookman, Q. X. Jia, **D. G. Schlom**, and **L. Q. Chen**, “Influence of Interfacial Dislocations on Hysteresis Loops of Ferroelectric Films,” *J. Appl. Phys.*, 104, 1041101/1-6 (2008).
8. S. Choudhury, Y. Li, N. Odagawa, A. Vasudevarao, L. Tian, P. Capek, V. Dierolf, A. N. Morozovska, E. A. Eliseev., S. Kalinin, Y. Cho, **L.-Q. Chen**, and **V. Gopalan**, “The Influence of 180 Degree Ferroelectric Domain Wall Width on the Threshold Field for Wall Motion,” *J. Appl. Phys.*, 104, 084107/1-7 (2008).
9. X. Ke, J. Li, S. Zhang, C. Nisoli, **V. H. Crespi**, and **P. Schiffer**, “Tuning Magnetic Frustration of Nanomagnets in Triangular-lattice Geometry,” *Appl. Phys. Lett.*, 93, 252504-1-3 (2008).
10. S. Choudhury, J. X. Zhang, Y. L. Li, **L. Q. Chen**, Q X. Jia, and S. V. Kalinin, “Effect of Ferroelastic Twin Walls on Local Polarization Switching: Phase-field Modeling,” *Appl. Phys. Lett.*, 93(16): Art. No. 162901 (2008).
11. H. W. Jang, S. H. Baek, D. Ortiz, C. M. Folkman, R. R. Das, Y. H. Chu, P. Shafer, J. X. Zhang, S. Choudhury, V. Vaithyanathan, Y. B. Chen, D. A. Felker, M. D. Biegalski, M. S. Rzechowski, **X. Q. Pan**, **D. G. Schlom**, **L. Q. Chen**, R. Ramesh, and C. B. Eom, “Strain-Induced Polarization Rotation in Epitaxial (001) BiFeO₃ Thin Films,” *Phys. Rev. Lett.*, 101, 107602/1-4 (2008).

12. M. J. Shuster, A. Vaish, M. E. Szapacs, M. E. Anderson, **P. S. Weiss**, and **A. M. Andrews**, "Biospecific Recognition of Tethered Small Molecules Diluted in Self-Assembled Monolayers," *Advanced Materials*, 20, 164-167 (2008).
13. T. J. Mullen, C. Srinivasan, M. J. Shuster, **M. W. Horn**, **A. M. Andrews**, and **P. S. Weiss**, "Hybrid Approaches to Nanometer-Scale Patterning: Exploiting Intermolecular Interactions," *Journal of Nanoparticle Research*, 10, 1231-1240 (2008).
14. T. J. Mullen, P. P. Zhang, C. Srinivasan, **M. W. Horn**, and **P. S. Weiss**, "Combining Electrochemical Desorption and Metal Deposition on Patterned Self-Assembled Monolayers," *Journal of Electroanalytical Chemistry*, 621, 229-237 (2008).
15. C. Srinivasan, J. N. Hohman, M. E. Anderson, **P. S. Weiss**, and **M. W. Horn**, "Sub-30-Nanometer Patterning on Quartz for Nanoimprint Lithography Templates," *Appl. Phys. Lett.*, 93, 083123 (2008). Also published in the *Virtual Journal of Nanoscale Science & Technology*.
16. S. D. Gillmor and **P. S. Weiss**, "Dimpled Vesicles: The Interplay between Interfaces and Transient Pores," *Journal of Physical Chemistry B*, 112, 13629-13634 (2008).
17. L. E. Weiss, J. P. Badalamenti, J. L. Weaver, A. Tascone, **P. S. Weiss**, **T. L. Richard**, and **P. C. Cirino**, "Engineering Bacterial Motility as a Phenotypic Response to Quorum Sensing," *Biotechnology and Bioengineering*, 100, 1251-1255 (2008).
18. S.-K. Kim, H. Lee, H. Tanaka, and **P. S. Weiss**, "Vertically Aligned Single-Walled Carbon Nanotube Film Formed by Electrodeposition," *Langmuir*, 24, 12936-12942 (2008).
19. **P. S. Weiss**, "Functional Molecules and Assemblies in Controlled Environments: Formation and Measurements," *Accounts of Chemical Research*, 41, 1772-1781 (2008).
20. M. Uppalapati, Y. M. Huang, T. N. Jackson, and **W. O. Hancock**, "Microtubule Alignment and Manipulation using AC Electrokinetics," *Small*, 4(9), 1371-1381 (2008).
21. M. Uppalapati, Y. M. Huang, T. N. Jackson, and **W. O. Hancock**, "Enhancing the Stability of Kinesin Motors for Microscale Transport Applications," *Lab on a Chip*, 8(2), 358-361 (2008).
22. V. Verma, **W. O. Hancock**, and J. M. Catchmark, "The Role of Casein in Supporting the Operation of Surface Bound Kinesin," *Journal of Biological Engineering*, 2, 14 (2008).
23. Y. M. Huang, M. Uppalapati, **W. O. Hancock**, and T. N. Jackson, "Neutravidin Micropatterning by Deep UV Irradiation," *Lab on a Chip*, 8(10), 1745-1747 (2008).

24. A. S. Kumar, T. Ye, T. Takami, B.-C. Yu, A. K. Flatt, **J. M. Tour**, and **P. S. Weiss**, “Reversible Photo-Switching of Single Molecules in Controlled Nanoscale Environments,” *Nano Letters*, 8, 1644-1648 (2008).
25. M. Raab, and **W. O. Hancock**, “Transport and Detection of Unlabeled Nucleotide Targets by Microtubules Functionalized with Molecular Beacons,” *Biotechnology and Bioengineering*, 99(4), 764-773 (2008).
26. T. Sasaki, G. Guerrero, A. D. Leonard, and **J. M. Tour**, “Nanotrains and Self-Assembled Two-Dimensional Arrays Built from Carboranes Linked by Hydrogen Bonding of Dipyrindones,” *Nano Res.*, 1, 412-419 (2008).
27. T. Sasaki, J. M. Guerrero, and **J. M. Tour**, “The Assembly Line: Self-Assembling Nanocars,” *Tetrahedron*, 64, 8522-8529 (2008).
28. T. Sasaki, A. J. Osgood, J. L. Kiappes, **K. F. Kelly**, and **J. M. Tour**, “Synthesis of a Porphyrin-Fullerene Pinwheel,” *Org. Lett.*, 10, 1377-1380 (2008).
29. T. Sasaki, and **J. M. Tour**, “Synthesis of a New Photoactive Nanovehicle: Nanoworm,” *Org. Lett.*, 10, 897-900 (2008).
30. T. Sasaki, A. J. Osgood, L. B. Alemany, **K. F. Kelly**, and **J. M. Tour**, “Synthesis of a Nanocar with an Angled Chassis. Towards Circling Movement,” *Org Lett.*, 10, 229-232 (2008).
31. Y. Shirai, T. Sasaki, J. M. Guerrero, B.-C. Yu, P. Hodge, and **J. M. Tour**, “Synthesis and Photoisomerization of Fullerene- and Oligo(phenylene-ethynylene)-Azobenzene Derivatives,” *ACS Nano*, 2, 97-106 (2008).
32. Y. B. Zheng, **T. J. Huang**, “Surface Plasmons of Metal Nanostructure Arrays: from Nanoengineering to Active Plasmonics,” *Journal of the Association for Laboratory Automation*, 13, 215-226 (2008).
33. J. Shi, X. Mao, D. Ahmed, A. Colletti, **T. J. Huang**, “Focusing Microparticles in a Microfluidic Channel with Standing Surface Acoustic Waves (SSAW),” *Lab on a Chip*, 8, 221-223 (2008).
34. J. Shi, V. K. S. Hsiao, T. R. Walker, **T. J. Huang**, “Humidity Sensing Based on Nanoporous Polymeric Photonic Crystals,” *Sensors and Actuators B: Chemical*, 129, 391-396 (2008).
35. Y. Zheng, B. K. Juluri, X. Mao, T. R. Walker, **T. J. Huang**, “Systematic Investigation of Localized Surface Plasmon Resonance of Long-Range Ordered Au Nanodisk Arrays,” *J. Appl. Phys.*, 103, 014308/1-9, 2008.
36. M. Tian, N. Kumar, **M. H. W. Chan**, and **T. E. Mallouk**, “Evidence of Local Superconductivity in Granular Bi Nanowires Fabricated by Electrodeposition,” *Phys. Rev. B*, 78, 045417/1-7 (2008).

37. N. Kumar, M. L. Tian, J. G. Wang, W. Watts, J. Kindt, **T. E. Mallouk**, and **M. H. W. Chan**, "Investigation of Superconductivity in Electrochemically Fabricated AuSn Nanowires," *Nanotechnology*, 19, 365704/1-5 (2008).
38. T. E. Clark, P. Nimmatoori, K. K. Lew, L. Pan, **J. M. Redwing** and **E. C. Dickey**, "Diameter Dependent Growth Rate and Interfacial Abruptness in Vapor-liquid-solid Si/Si_{1-x}Ge_x Heterostructure," *Nano Letters*, 8, 1246-1252 (2008).
39. C. Highstrete, M. Lee, A. L. Vallett, S. M. Eichfeld, **J. M. Redwing** and **T. S. Mayer**, "Disorder Dominated Microwave Conductance Spectra of Doped Silicon Nanowire Arrays," *Nano Letters*, 8(6), 1557-1561 (2008).
40. T. T. Ho, Y. F. Want, S. Eichfeld, K. K. Lew, B. Z. Liu, **S. E. Mohnney**, **J. M. Redwing** and **T. S. Mayer**, "In-situ Axially Doped N-channel Silicon Nanowire Field-effect Transistors," *Nano Letters*, 8, 4359-4364 (2008).
41. B. Z. Liu, Y. F. Wang, T. T. Ho, K. K. Lew, S. M. Eichfeld, **J. M. Redwing**, **T. S. Mayer** and **S. E. Mohnney**, "Oxidation of Silicon Nanowires for Top-gated Field-effect Transistors," *J. Vac. Sci. Technol., A* 26, 370-374 (2008).
42. M. W. Li, R. B. Bhiladvala, T. J. Morrow, J. A. Sioss, K. K. Lew, **J. M. Redwing**, **C. D. Keating** and **T. S. Mayer**, "Bottom-up Assembly of Large-area Nanowire Resonator Arrays," *Nature Nanotechnology*, 3, 88-92 (2008).
43. **I. C. Khoo**, **D. H. Werner**, D. H. Kwon, and A. Diaz, "Designing Liquid Crystalline Nonlinear Optical Meta-materials with Large Birefringence and Sub-unity Refractive Index," *Molecular Crystals and Liquid Crystals*, 488, 88-99, (2008).
44. **I. C. Khoo**, A. Diaz, S. Kubo, J. Liou, M. Stinger, **T. Mallouk**, and J. H. Park, "Nano-dispersed Organic Liquid and Liquid Crystals for all-time-scales Optical Switching and Tunable Negative- and Zero-index Materials," *Molecular Crystals and Liquid Crystals*, 485, 934-944, (2008).
45. J. A. Bossard, X. Liang, L. Li, S. Yun, **D. H. Werner**, **T. S. Mayer**, P. E. Cristman, A. Diaz, and **I. C. Khoo**, "Tunable Frequency Selective Surfaces and Negative-zero-positive Index Megamaterials Based on Liquid Crystals," *IEEE Transactions on Antennas and Propagation*, 56(5), 1308-1320, (2008).
46. Y. Tang, J. A. Bossard, **D. H. Werner**, and **T. S. Mayer**, "Single-layer Metallodielectric Nanostructures as Dual-band Mid-infrared Filters," *Appl. Phys. Lett.*, 92(26), 263106/1-3 (2008).
47. D.-H. Kwon, **D. H. Werner**, A. V. Kildishev, and V. M. Shalaev, "Material Parameter Retrieval Procedure for General Bi-isotropic Metamaterials and its Application to Optical Chiral Negative-index Metamaterial Design," *Optics Express*, 16, 11822-11829 (2008).

48. D.-H. Kwon, P. L. Werner, and **D. H. Werner**, "Optical Planar Chiral Metamaterial Designs for Strong Circular Dichroism and Polarization Rotation," *Optics Express*, 16, 11802-11807 (2008).
49. D.-H. Kwon, and **D. H. Werner**, "Restoration of Antenna Parameters in Scattering Environments Using Electromagnetic Cloaking," *Appl. Phys. Lett.*, 92, 113507/1-3 (2008).
50. D.-H. Kwon, and **D. H. Werner**, "Two-dimensional Electromagnetic Cloak Having a Uniform Thickness for Elliptic Cylindrical Regions," *Appl. Phys. Lett.*, 92, 113502/1-3 (2008).
51. D.-H. Kwon, and **D. H. Werner**, "Two-dimensional Eccentric Elliptic Electromagnetic Cloaks," *Appl. Phys. Lett.*, 92, 013505/1-3 (2008).
52. D.-H. Kwon, X. Wang, Z. Bayraktar, B. Weiner, and **D. H. Werner**, "Near-infrared Metamaterial Films with Reconfigurable Transmissive/Reflective Properties," *Optics Letters*, 33, 545–547 (2008).
53. B. R. Jackson, P. J. A. Sazio, and **J. V. Badding**, "Single Crystal Silicon Wires Grown within Microstructured Optical Fiber Templates," *Adv. Mater.*, 20, 1135-1140 (2008).
54. **I. C. Khoo**, A. Diaz, S. Kubo, J. Liou, M. Stinger, **T. Mallouk**, and J. H. Park, "Nano-Dispersed Organic Liquid and Liquid Crystals for All-Time-Scales Optical Switching and Tunable Negative- and Zero-Index Materials," *Mol. Cryst. Liq. Cryst.*, 485, 934-944 (2008).
55. **I. C. Khoo**, "Nonlinear Organic Liquid-cored Fiber Array for All-optical Switching and Sensor Protection Against Short-pulsed Lasers," *IEEE Journal of Selected Topics in Quantum Electronics*, 14(3), 946-951 (2008).
56. G. Chen, J. Wu, Q. Lu, H. R. Gutierrez, Q. Xiong, M. E. Pellen, J. S. Petko, **D. H. Werner**, and P. C. Eklund, "Optical Antenna Effect in Semiconducting Nanowires," *American Chemical Society Nano Letters*, 8, 1341-1346 (2008).
57. **V. Gopalan**, **J. V. Badding**, P. J. A. Sazio, and A. C. Peacock, "Microfluidic Chemical Deposition Moves Optical Fiber to the Nanoscale," *Laser Focus World*, 44, 135 (2008).
58. P. Kao, N.A. Malvadkar, H. Wang, **D. L. Allara**, and M.C. Demirel, "Surface Enhanced Raman Detection of Bacteria on Metalized Nanostructured Poly(p-xylylene) Films," *Advanced Materials*, 20, 3562–3565 (2008).
59. P. Kao, A. Patwardhan, **D. L. Allara**, and S. Tadigadapa, "Human Serum Albumin (HSA) Adsorption Study on 62 MHz Miniaturized Quartz Gravimetric Sensors," *Analytical Chemistry*, 80, 5930–5936 (2008).

60. A. Kumar, S. Denev, L. W. Martin, **R. Ramesh**, and **V. Gopalan**, “Linear and Nonlinear Optical Properties of Multifunctional PbVO_3 ,” *Appl. Phys. Lett.*, 92, 231915 (2008).
61. A. Vasudevarao, S. Denev, M. D. Biegalski, Y. Li, **L.-Q. Chen**, S. Trolier-McKinstry, **D. G. Schlom**, and **V. Gopalan**, “Polarization Rotation Transitions in Anisotropically Strained SrTiO_3 Thin Films,” *Appl. Phys. Lett.*, 92, 192902/1-3 (2008).
62. M. O. Ramirez, M. Krishnamurthy, S. Denev, A. Kumar, S.-Y. Yang, Y. H. Chu, E. Saiz, A. P. Pyatakov, A. Bush, D. Viehland, J. Orenstein, **R. Ramesh**, and **V. Gopalan**, “Two-phonon Coupling to the Antiferromagnetic Phase Transition in Multiferroic BiFeO_3 ,” *Appl. Phys. Lett.*, 92, 022511 (2008).
63. A. Kumar, R. C. Rai, N. J. Podraza, S. Denev, M. Ramirez, Y.-H. Chu, L. W. Martin, J. Ihlefeld, T. Heeg, J. Schubert, **D. G. Schlom**, J. Orenstein, R. Ramesh, R. W. Collins, J. L. Musfeldt, and **V. Gopalan**, “Linear and Nonlinear Optical Properties of BiFeO_3 ,” *Appl. Phys. Lett.*, 92, 121915/1-3 (2008).
64. S. Denev, A. Kumar, M. D. Biegalski, H. W. Jang, C. M. Folkman, A. Vasudevarao, Y. Han, I. M. Reaney, S. Trolier-McKinstry, C. B. Eom, **D. G. Schlom**, and **V. Gopalan**, “Magnetic Color Symmetry of Lattice Rotations in a Diamagnetic Material,” *Phys. Rev. Lett.*, 100, 257601/1-4 (2008).
65. Y. L. Li, R. W. Ulbricht, A. Schmehl, T. Heeg, J. Schubert, and **D. G. Schlom**, “Adsorption-controlled Growth of EuO by Molecular-Beam Epitaxy,” *Appl. Phys. Lett.*, 93, 102105/1-3 (2008).
66. C. Adamo, A. Soukiassian, M. Warusawithana, **D. G. Schlom**, X. Ke, **P. Schiffer**, and L. Maritato, “Electrical and Magnetic Properties of Epitaxial $(\text{SrMnO}_3)_n / (\text{LaMnO}_3)_{2n}$ Superlattices,” *Appl. Phys. Lett.*, 92, 112508 – 1-3 (2008).
67. A. N. Morozovska, S. V. Kalinin, E. A. Eliseev, **V. Gopalan**, and S. V. Svechnikov, “The Interaction of a 180° Ferroelectric Domain Wall with a Biased Scanning Probe Microscopy Tip: Geometry and Thermodynamics in Ginzburg-Landau-Devonshire Theory,” *Phys. Rev. B*, 78, 124407/1-11 (2008).
68. A. N. Morozovska, E. A. Eliseev, G. S. Svechnikov, **V. Gopalan**, and S. Kalinin, “Effect of the Intrinsic Width on the Piezoelectric Force Microscopy of a Single Ferroelectric Domain Wall,” *J. Appl. Phys.*, 103, 124110 (2008).
69. X. Ke, J. Li, C. Nisoli, P. E. Lammert, W. McConville, R. F. Wang, **V. H. Crespi**, and **P. Schiffer**, “Energy Minimization and AC Demagnetization in a Nanomagnet Array,” *Physical Review Letters*, 101, 037205 – 1-4 (2008).

70. G. Sheng, J. X. Zhang, Y. L. Li, S. Choudhury, Q. X. Jia, Z. K. Liu, and **L. Q. Chen**, "Misfit Strain-Misfit Strain Diagram of Epitaxial BaTiO₃ Thin Films: Thermodynamic Calculations and Phase-Field Simulations," *Appl. Phys. Lett.*, 93, 232904 (2008).
71. S. Choudhury, Y. L. Li, **L. Q. Chen**, and Q. X. Jia, "Strain Effect on Coercive Field of Epitaxial Barium Titanate Thin Films," *Appl. Phys. Lett.*, 92(14), (2008).
72. J. X. Zhang, Y. L. Li, S. Choudhury, **L. Q. Chen**, Y. H. Chu, F. Zavaliche, M. P. Cruz, **R. Ramesh**, and Q. X. Jia, "Computer Simulation of Ferroelectric Domain Structures in Epitaxial BiFeO₃ Thin Films," *J. Appl. Phys.*, 103(9): Art. No. 094111, (2008).
73. S. Choudhury, Y. Li, N. Odagawa, A. Vasudevarao, L. Tian, P. Capek, V. Dierolf, A. N. Morozovska, E. A. Eliseev, S. Kalinin, Y. Cho, **L. Q. Chen**, and **V. Gopalan**, "The Influence of 180° Ferroelectric Domain Wall Width on the Threshold Field for Wall Motion," *J. Appl. Phys.*, 104, 084107 (2008).
74. J. F. Ihlefeld, N. J. Podraza, Z. K. Liu, R. C. Rai, X. Xu, T. Heeg, Y. B. Chen, J. Li, R. W. Collins, J. L. Musfeldt, **X. Q. Pan**, J. Schubert, **R. Ramesh**, and **D.G. Schlom**, "Optical Band Gap of BiFeO₃ Grown by Molecular-Beam Epitaxy," *Appl. Phys. Lett.*, 92, 142908/1-3 (2008).
75. A. Soukiassian, W. Tian, V. Vaithyanathan, J. H. Haeni, **L. Q. Chen**, **X. X. Xi**, **D. G. Schlom**, D. A. Tenne, H. P. Sun, **X. Q. Pan**, K. J. Choi, C. B. Eom, Y. L. Li, Q. X. Jia, C. Constantin, R. M. Feenstra, M. Bernhagen, P. Reiche, and R. Uecker, "Growth of Nanoscale BaTiO₃/SrTiO₃ Superlattices by Molecular-Beam Epitaxy," *J. Mater. Res.*, 23, 1417-1432 (2008).
76. **D. G. Schlom**, **L. Q. Chen**, **X. Q. Pan**, A. Schmehl, and M. A. Zurbuchen, "A Thin Film Approach to Engineering Functionality into Oxides," *J. Am. Ceram. Soc.*, 91, 2429-2454 (2008).
77. Y. Kobayashi, X. Ke, H. Hata, **P. Schiffer**, and **T. E. Mallouk**, "Soft Chemical Conversion of Layered Double Hydroxides to Superparamagnetic Spinel Platelets," *Chem. Mater.*, 20, 2374-2381 (2008).
78. J. Cai and **G. D. Mahan**, "Transport properties of quantum dot arrays," *Phys. Rev. B*, 78, 035115 (2008).
79. R.D. Pensack, K. M. Banyas, L. W. Barbour, and **J. B. Asbury**, "Interfacial Charge Separation and Trapping in a Photovoltaic Polymer Blend Observed with Ultrafast Vibrational Spectroscopy," *Proc. SPIE 7034*, 703403-703408 (2008).
80. N. H. Chou, X. Ke, **P. Schiffer**, and **R. E. Schaak**, "Room-temperature Chemical Synthesis of Shape-controlled Indium Nanoparticles," *Journal of the American Chemical Society*, 130, 8140-8141 (2008).

81. **J. Das**, A. B. Francies, and **R. D. Redwing**, “Find the Nano in Your Life: Using Interactive Museum Demonstrations to Engage a Public Audience in Nanotechnology Research and Policy,” *Mater. Res. Soc. Symp. Proc.*, 1105E, 1105-0002-03 (2008).
82. **V. H. Crespi**, A. N. Kolmogorov, J. C. Ellenbogen, and M. H. Schleier-Smith, “Directed Flow Method and System for Bulk Separation of Single-walled Tubular Fullerenes Based on Helicity,” U.S. Patent No. 7,347,981, issued by the U. S. Patent Office, March 25, 2008.
83. **D. H. Werner** and D.-H. Kwon, Invention disclosure filed with the Pennsylvania State University on “Flat Transformational Electromagnetic Material Lenses for Near-field and Far-field Focusing Applications,” PSU ID No. 2008-3447. A Provisional Patent Application was filed for this invention with the U.S. Patent and Trademark Office on May 30, 2008.
84. D. Dwight, and **D. Allara**, “Surface Enhanced Raman Spectroscopy (SERS) Substrates Exhibiting Uniform High Enhancement and Stability,” US Patent No. 7,450,227 B2 issued by the U.S. Patent Office, November 11, 2008.