11. Publications & Patents

IRG 1

M. E. Anderson, C. Srinivasan, R. Jayaraman, **P. S. Weiss** and **M. W. Horn**, "Utilizing Self-Assembled Multilayers in Lithographic Processing for Nanostructure Fabrication: Initial Evaluation of the Electrical Integrity of Nanogaps," MicroElectronic Engineering 248 (2005) 78-79 (partial support)

R. K. Smith, P. A. Lewis and **P. S. Weiss,**, "Patterned Self-Assembled Monolayers," Progress in Surface Science 75, 1 (2004) (partial support)

J. D. Monnell, "Molecular-Scale Properties of Functional Materials and Molecules," Department of Chemistry, The Pennsylvania State University, Ph.D. Thesis, University Park, PA (2005) (partial support)

R. Stine, **M. V. Pishko**, J. R. Hampton, A. A. Dameron and **P. S. Weiss**, "Heat-Stabilized Phospholipid Films: Film Characterization and the Production of Protein Resistant Surfaces," Langmuir 21, 11352 (2005) (partial support)

J. R. Hampton, A. A. Dameron and **P. S. Weiss**, "Transport Rates Vary with Deposition Time in Dip-Pen Nanolithography," Journal of Physical Chemistry B 109, 23118 (2005) (partial support)

R. K. Smith, "Precise Nanoscale Assemblies: Undecagold Clusters and Self-Assembled Monolayers," Department of Chemistry, The Pennsylvania State University, Ph.D. Thesis, University Park, PA (2005) (partial support)

J. R. Hampton, A. A. Dameron and **P. S. Weiss,** "Double-Ink Dip-Pen Nanolithography Studies Elucidate Molecular Transport," Journal of the American Chemical Society 128, 1648 (2006) (partial support)

A**.** A. Dameron, "Controlling Molecular Assemblies," Department of Chemistry, The Pennsylvania State University, Ph.D. Thesis, University Park, PA (2006) (partial support)

A. A. Dameron, J. R. Hampton, R. K. Smith, T. J. Mullen, S. D. Gillmor, and **P. S. Weiss,** "Microdisplacement Printing," Nano Letters 5**,** (9) 1834-1837, (2005) (partial support)

A. A. Dameron, L. F. Charles, and **P. S. Weiss,** "Structures and Displacement of 1-Adamantanethiol Self-Assembled Monolayers on Au{111}," J. Am. Chem. Soc., (2005) 127 (24) pp 8697 - 8704; (partial support)

A. A. Dameron, J. R. Hampton, S. D. Gillmor, J. N. Hohman, and **P. S. Weiss**, "Enhanced Molecular Patterning Microdisplacement Printing," Journal of Vacuum Science and Technology 23, 2929-2932, (2005) (partial support)

L. Cai, M. A. Cabassi, H. Yoon, O. M. Cabarcos, C. L. McGuiness, A. K. Flatt, **D. L. Allara, J. M. Tour** and **T. S. Mayer,** "Nanoscale Molecular Switching of Thiol-Substituted Oligoanilines," Nanoletters, (2005), 5, 2365-2372 (partial support)

T. Tighe, T. Daniel, Z. Zhu, S. Upilli, N. Winograd and **D. L. Allara,** "Evolution of the Interface and Metal Film Morphology in the Vapor Deposition of Ti on Hexadecanethiolate Hydrocarbon Monolayers on Au," J. Phys. Chem. B, (2005), 109, 21006-21014 (partial support)

C. L. McGuiness, C. K. Mars, S. Uppili, A. Shaporenko, M. Zharnikov and **D. L. Allara,** "Molecular Self-Assembly at Bare Semiconductor Surfaces: Preparation and Characterization of Highly Organized Octadecanethiolate Monolayers on GaAs (001)," submitted to J. Amer. Chem. Soc. (partial support)

S. Pursel, **M. W. Horn**, **M. C. Demirel** and **A. Lakhtkia**, "Growth of sculptured polymer submicronwire assemblies by vapor deposition," Polymer, 46, (2005), 9544-9548 (primary support)

F. Wang, K. E. Weaver, **A. Lakhtakia** and **M. W. Horn**, "Electromagnetic modeling of near-field phase-shifting contact lithography with broadband ultraviolet illumination," Optik 116 (1): 1-9 (2005) (partial support)

F. Wang, K. E. Weaver, **A. Lakhtakia** and **M. W. Horn**, "On contact lithography of high-aspect-ratio features with incoherent broadband ultraviolet illumination," Microelectronic Engineering 77 (1): 55-57 (Jan 2005) (partial support)

F. Wang, K. E. Weaver, **A. Lakhtakia** and **M. W. Horn**, "Electromagnetic modeling of phase-shifting contact lithography by broadband ultraviolet illumination," Proc. SPIE Int. Soc. Opt. Eng., 5515, 195 (2004) (partial support)

F. Wang, **M. W. Horn** and **A. Lakhtakia**, "Rigorous electromagnetic modeling of near-field phase-shifting contact lithography," Microelectronic Engineering, 71 (2004) pp. 34-53 (partial support)

J. V. Ryan, **M. W. Horn, A. Lakhtakia** and **C. G. Pantano**, "Characterization of sculptured thin films," Proc. SPIE Int. Soc. Opt. Eng. 5593, 643 (2004) (partial support)

IRG 2

Y. Shirai, A. J. Osgood, Y. Zhao, **K. F. Kelly** and **J. M. Tour, "**Directional Control in Thermall Driven Nanocars," Nano Letters 5, 2330-2334 (2005) (primary support)

W. F. Paxton, **A. Sen** and **T. E. Mallouk**, "Motility of Catalytic Nanoparticles through Self-Generated Forces," Chem. Eur. J., 11, 6462-6370 (2005) (primary support)

T. R. Kline, W. F. Paxton, Y. Wang, D. Velegol, **T. E. Mallouk**, and **A. Sen**, "Catalytic Micropumps: Microscopic Convective Fluid Flow and Pattern Formation," J. Am. Chem. Soc.127, 17150-1 (2005) (primary support)

P. Dhar, T. M. Fischer, Y. Wang, **T. E. Mallouk**, and **A. Sen**, "Autonomously moving nanorods at a viscous interface," Nano Letters, 6 66-72 (2006) (partial support)

M. Cetinkaya, **J. Sofo, M. C. Demirel,** "Protein simulations in confined environments," Proceedings of SPIE, NANOMODELING; **A. Lakhtakia,** S. A. Maksimenko; Eds. Vol. 5509, p. 133-137, (2004). (partial support) (Seed)

M. Cetinkaya, A. Zeytun, **J. Sofo and M. C. Demirel,** "How do insertions affect green fluorescent protein?" Chemical Physics Letters, 419, 48-54 (2005) (partial support) (seed)

A. L. Baker, **M. K. Lanagan**, C. A. Randall, E. Semouchkina, G. Semouchkin, R. E. Eitel, K. Z. Rajab, R. Mittra, S. Rhee, "Integration Concepts for the Fabrication of LTCC Structures," Internationnal Journal of Applied Ceramic Technology, 2 (6) pp 514-520 (2005) (partial support) (seed)

C. A. Randall, R. E. Eitel, T. R. Shrout and A. Kelnberger, "High Strain Piezoelectric Multilayer Acutuators – A Materials Science and Engineering Challenge," Journal of Electroceramics, (2005) (partial support)

M. Platt, G. Muthukrishnan, **W. O. Hancock, M. E. Williams**, **"**Selective Alignment of Magnetic Nanoparticle Functionalized Microtubules in Magnetic Fields," J. Am. Chem. Soc. (2005) 127, 15686-15687 (primary support)

T. Takami, D. P. Arnold, A. V. Fuchs, G. D. Will, R. Goh, Eric R. Waclawik, J. M. Bell, **P. S. Weiss,** K.C. Sugiura, W. Liu, and J. Jiang, "Two-dimensional crystal growth and stacking of Bis (phthalocyaninato) Rare Earth Sandwich Complexes at the 1-Phenyloctane/Graphite Interface," Journal of Physical Chemistry B (2006); 110 (4) pp 1661 – 1664: (Article) (partial support) Collaboration with Visionarts, Queensland University of Technology, Tokyo Metropolitan University and Shandong University

A. H. Latham, R. S. Freitas, **P. Schiffer, M. E. Williams**, "Capillary Magnetic Field Flow Fractionation and Analysis of Magnetic Nanoparticles," Analytical Chemistry, 77, 5055-5062 (2005). (partial support)

Y. M. Huang, M. Uppalapati, **W. O. Hancock** and **T. N. Jackson**, "Microfabricated Capped Channels for Biomolecular Motor-Based Transport," IEEE Transactions on Advanced Packaging, Part B, 28, pp. 564-570 (November 2005) (peer reviewed) (primary support)

IRG 3

J. G. Wang, M. L. Tian, N. Kumar, **T. E. Mallouk**, "Controllable Template Synthesis of Superconducting Zn Nanowires with Different Microstructures by Electrochemical Deposition," Nano Letters (2005), 5(7), 1247-1253 (primary support)

M. L. Tian, J. G. Wang, J. S. Kurtz, Y. Liu, **M. H. W. Chan, T. Mayer, T. E. Mallouk,** "Dissipation in quasi-one-dimensional superconducting single-crystal Sn nanowires," Physical Review B: Condensed Matter and Materials Physics (2005), 71(10), 104521/1-104521/7. (primary support)

J. G. Wang, M.-L. Tian, **T. E. Mallouk**, and **M. W. H. Chan**, "Microstructure and interdiffusion of template-synthesized Au/Sn/Au junction nanowires," Nano Letters, 4, 1313-1318 (2004). (primary support)

H. Wang, J. Wang, M. Tian, L. Bell, E. Hutchison, M. M. Rosario, Y. Liu, A. Amma, and **T. E. Mallouk,** "Metallic contacts with individual Ru nanowires prepared by electrochemical deposition and the suppression of superconductivity in ultrasmall Ru grains," Appl. Phys. Lett. 84, 5171-3 (2004) (primary support)

J. Xu, D. H. Cui, B. A. Lewis, A. Y. Wang, S. Y. Xu, and M. Gerhold, "Microcavity light emitting devices based on colloidal semiconductor nanocrystal quantum dots", IEEE Photonics Technology Letters 17, (2005) 2008-2010 (partial support) (seed)

S. Y. Xu, M. L. Tian, J. G. Wang, J. Xu, **J. M. Redwing,** and **M. H. W. Chan, "**Nanometer-scale modification and welding of silicon and metallic nanowires with a high-intensity electron beam," Small 1, (2005) 1221-1229 (featured by **c**over picture) (primary support)

S. Y. Xu, J. Xu and M. L. Tian, "A low-cost platform for bridging transport property to structure of nanomaterials," Nanotechnology 17 (2006) 1470-1475 (primary support) (seed)

M. L. Tian, N. Kumar, S. Y. Xu, J. G. Wang, J. S. Kurtz and **M. H. W. Chan**, "Suppression of superconductivity in nanowires by bulk superconductors," Physical Review Letters 95, (2005) 076802. (primary support)

M. L. Tian, S. Y. Xu, J. G. Wang, N. Kumar, E. Wertz, **Q. Li**, P. M. Campbell and **T. E. Mallouk,** "Penetrating the oxide barrier in situ and separating freestanding porous anodic alumina film in one step," Nano Letters 5, (2005) 697-703. (partial support)

W. Yi, W. MoberlyChan, V. Narayanamurti, Y. F. Hu and **Q. Li**, I. Kaya, M. Burns, and D. M. Chen. "Characterization of spinel iron-oxide nanocrystals grown on Fe whiskers", J. Appl. Phys. 95 (2004) 7136 (partial support) (Seed)

D. Talbayev, H. Zhao, G. Luepker, J. Chen, and **Qi Li**, "Strain and anisotropy effects on spin waves in epitaxial La0.67Sr0.33MnO3 films," Appl. Phys. Lett. 86, 182501 (2005), May 2005 issue of Virtual Journal of Ultrafast Science (partial support) (seed)

H. Wang, M. M. Rosario, N. A. Kurz, B. Y. Rock, M. M. Tian, P. T. Carrigan and Y. Liu, "Possible observation of phase separation near aquantum phase transition in doubly connected ultrathin superconducting cylinders of aluminum," Phys. Rev. Lett. 95, 197003 (2005) (partial support)

Q. Lu, F. Gao. and **S. Komarneni**, "Microwave-assisted synthesis of one-dimensional nanostructures", J. Mater. Res. 19 (2004) 1649-1655 (primary support)

F. Gao, Q. Lu and **S. Komarneni**, "Protein-assisted synthesis of single crystal nanowires of bismuth compounds," Chem. Commun. 531-533 (2005). (partial support).

F. Gao, Q. Lu and **S. Komarneni,** "Interface reaction for the self-assembly of silver nanocrystals under microwave-assisted solvothermal conditions," Chemistry of Materials 17: 856-860 (2005). (partial support)

Q. Lu, F. Gao and **S. Komarneni,** "A green chemical approach to the synthesis of tellurium nanowires," Langmuir 21: 6002-6005 (2005). (partial support)

Lu, Q., F. Gao, D. Li and **S. Komarneni**, "Biomolecule- and/or Microwave-assisted Solvothermal Synthesis of Nanomaterials", Adv. Tech. Materials and Mater. Proc. J. 7: 111-118 (2005) (Partial support)

Qingyi Lu, Feng Gao, **S. Komarneni** "Cellulose-directed growth of selenium nanobelts in solution" Chem. Mater, 18: 159-163 (2006) (partial support)

S. E. Mohney, Y. Wang, M. A. Cabassi, K. K. Lew, S. Dey, **J. M. Redwing**, and **T. S. Mayer,** "Measuring the Specific Contact Resistance of Contacts to Semiconductor Nanowires," Solid-State Electronics 49 (2005) 227-232 (partial support)

T. E. Bogart, S. Dey, K.K. Lew, **S. E. Mohney** and **J. M. Redwing,** "Diameter-controlled synthesis of silicon nanowires using nanoporous alumina membranes,"Adv. Mater. 17 (2005) p. 114. (primary support)

Y. Wang, T. –T. Ho, **T. S. Mayer,** K. K. Lew, L. Pan, **E. C. Dickey** and **J. M. Redwing,** "Synthesis and Electrical Characterization of Phosphine-doped Silicon nanowires," Nano Letters, 5 (112), pp. 2139-2143 (2005) (partial support)

L. Pan, K. K. Lew, **J. M. Redwing** and **E. C. Dickey**, "Stranski-Krastanov growth of germanium on silicon nanowires," Nano Lett. 5 (2005) p. 1081-1085. (primary support)

L. Pan, K. K. Lew, **J. M. Redwing** and **E. C. Dickey**, "Effect of diborane on the microstructure of boron-doped silicon nanowires," J. Crystal Growth 277 (2005) p. 428-436. (primary support)

Y. Wang, K. K. Lew, T. T. Ho, L. Pan, S. W. Novak, **E. C. Dickey, J. M. Redwing** and **T. S. Mayer,** "Use of PH_3 as an n-type dopant source for the vapor-liquid-solid growth of silicon nanowire, Nano Lett. 5 (2005) p. 2137-2143 (partial support)

J. G. Wang, M. L. Tian, **T. E. Mallouk** and **M. H. W. Chan**; "Microtwinning in template-synthesized single-crystal metal nanowires;" J. of Physical Chemistry B 108, 841-845 (2004). (primary support)

G. P. Goodrich, M. R. Helfrich, J. J. Overberg, **C. D. Keating**, "The effect of macromolecular crowding on DNA:Au nanoparticle bioconjugate assembly," Langmuir 2004, 20**,** 10246-10251. (partial support) (seed)

G. C. Lau, R. S. Freitas, B. G. Ueland, **P. Schiffer**, R. J. Cava, "Geometrical Magnetic Frustration in Rare Earth Chalcogenide Spinels," Physical Review B 72, 054411 – 1-5 (2005) (partial support)

R. S. Freitas, J. F. Mitchell and **P. Schiffer,** "Magnetodielectric consequences of phase separation in the colossal magnetoreistance manganite $_{Pr}0.7\ _{Ca}0.3MnO_3$," Physical Review B 72, 144429 – 1-6 (2005) (partial support)

M. B. Stone, D. P. Bernstein, R. Barry, M. D. Pelc, Y. K. Tsui and **P. Schiffer**, "Getting to the bottom of a granular medium," Nature 427, 503-504 (2004) (partial support)

M. B. Stone, R. Barry, D. P. Bernstein, M. D. Pelc, Yl K. Tsui and **P. Schiffer**, "Studies of local jamming via penetration of a granular medium," Physical Review E 70, 041301-1-10 (2004)

R. Wang, C. Nisoli, R. S. Freitas, J. Li, W. McConville, B. Cooley, M. S. Lund, N. Samarth, C. Leighton, **V. H. Crespi and P. Schiffer**, "Artificial 'spin ice' in a geometrically frustrated lattice of nanoscale ferromagnetic islands," Nature 439, 303 -306 (2006) (partial support)

K. W. Adu, H. R. Gutierrez, U. J. Kim, G. U. Sumanasekera, and **P. C. Eklund**, "Confined Phonons in Si Nanowires," Nano Lett. (2005)**,** *5*(3), pp 409-414. DOI: 10.1021/n10486259 (partial support)

E. Chalkova, M. B. Pague, M. V. Fedkin, D. J. Wesolowski and **S. N. Lvov**, "Nafion/TiO_2 Proton Conductive Composite Membranes for PEMFCs Operating at Elevated Temperature and Reduced Relative Humidity," J. Electrochem. Soc. 152, (2005), A1035-A1040, (partial support)

E. Chalkova, M. V. Fedkin, D. J. Wesolowski and **S. N. Lvov**, "Effect of TiO_2 Surface Properties on Performance of Nafion-Based Composite Membranes in High Temperature and Low Relative Humidity PEM Fuel Cell," J. Electrochem, Soc. 152, (2005) A1742-A1747 (partial support)

L. Cai, H. Skulason, J. Kusmerick, S. Pollack, J. Naciri, R. Shashidhar, **D. L. Allara, T. E. Mallouk** and **T. S. Mayer**, "Nanowire-based molecular Monolayer Junctions: Synthesis, Assembly, and Electrical Characteriztion," Journal of Physical Chemistry B, 108, pp. 2827-2832, (2004) (partial support)

S. K. Park, C. C Kuo, J. E. Anthony and **T. N. Jackson**, "High-Mobility Solution-Processed OTFTs, 2005 International Electron Device Meeting Technical Digest, pp. 113-6, (December 2005) (partial support)

IRG 4

N. M. Abrams, R. E. Schaak, "Self-Assembled Colloidal Crystals: Visualizing Atomic Crystal Chemistry Using Microscopic Analogues of Inorganic Solids," Journal of Chemical Education, Vol 82 No. 3, (March 2005) (primary support)

Y. H. Ye, "Enhanced light transmission through cascaded metal films perforated with periodic hole arrays," Optics Letters, 30, 1521 (2005) (partial support)

Y. H. Ye, "Cascaded metal films perforated with periodical hole arrays," Optics and Photonic News, 39 December, 2005, Optics in (2005). (partial support)

J. Zhang, Y. H. Ye, X. Wang, P. Rochon, and M. Xiao, "Coupling between semiconductor quantum dots and two-dimensional surface plasmons," Phys. Rev. B (2005) (partial support)

Y. H. Ye, and J. Zhang, "Middle-infrared transmission enhancement through periodically perforated metal films, Appl. Phys. Lett. 84, 2997 (2004). (partial support)

D. Jeong, Y. H.Ye, and **Q. M. Zhang**, "Electrical Tunable Fabry-Perot Interferometer Using a Poly (vinylidene fluoride-trifluoroethylene-chorofluoroethy) terpolymer," Appl. Phys. Lett. 85, 4857 (2004). (primary support)

J. Zhang, X. Wang, Y. H. Ye and M. Xiao, "Suppression of radiative decay of CdTe quantum dots in a photonic crystal with a pseudogap, Journal of Modern Optics, 51, 2493 (2004) (primary support)

E. Graugnard, J. S. King, S. Jain, C. J. Summers, Y. Z. Williams and **I. C. Khoo**, "Electric field tuning of the Bragg peak in large-pore Ti02 inverse shell opals," Phys. Rev. B 72, 233105 (4 pages) (primary support)

I. C. Khoo, Y. Z. Williams, K. X. Chen, "Nonlinear polymer dispersed liquids and liquid crystals for holographic and photonic crystal applications, Liquid Crystals VIII - Proceedings of SPIE Vol. 5518, Denver, CO. (2004). (partial support)

Y. H. Ye, D. Y. Jeong, **Q. M. Zhang,** "Fabrication of strain tunable infrared frequency selective surfaces on electrostrictive poly(vinylidene fluoride-trifluoroethylene) copolymer films using a stencil mask method" Applied Physics Letters 85 (4): 654-656 JUL 26 2004 (primary support)

D. Y. Jeong, Y. K. Wang. M.Huang and **Q. M. Zhang**, G. Kavarnos, F. Bauer, "Electro-optical response of the ferroelectric relaxor poly(vinylidene fluoride-trifluoroethylene-chlorofluoroethylene) terpolymer " Journal of Applied Physics 96 (1): 316-319 JUL 1 2004 (primary support)

D. Y. Jeong, "Linear electro-optic and piezoelectric coefficients of the relaxor ferroelectric P (VDF-TrFE) copolymer" Journal of the Korean Physical Society 44 (6): 1527-1530 (Jun 2004) (primary support)

R. P. Drupp, J. A. Bossard, Y. H. Ye, **D. H. Werner** and **T. S. Mayer** "Dual-band infrared single-layer metallodielectric Photonic crystals," Applied Physics Letters Vol 85, 10 1835 – 1837 (2004) (primary support)

E. Loken, F. Radlinsky, **V. H. Crespi**, L. Cushing and J. Millet, "Online study behavior of 100,000 students preparing for the SAT, ACT, and GRE," J. Ed. Comp. Res. 30, 255-262 (2004) (partial support)

V. H. Crespi, "The Geometry of Carbon nanostructures," in Introduction to Nanoscale Science and Technology, ED.: Di Ventra, Massimiliano; Evoy, Stephane; Heflin Jr., James R. (Springer Verlag, 2004) p. 103-117 (primary support)

L. I. Halaoui, N. M. Abrams, **T. E. Mallouk**, "Increasing the Conversion Efficiency of Dye-Sensitized TiO_2 Photoelectrochemical Cells by Coupling to Photonic Crystals," Journal of Physical Chemistry B (2005), 109 (13), 6334-6342 (primary support)

J. A. Bossard, **D. H. Werner**, **T. S. Mayer**, and R. P. Drupp, "A Novel Design Methodology for Reconfigurable Frequency Selective Surfaces Using Genetic Algorithms," IEEE Transactions on Antennas and Propagation, Vol. 53, No. 4, pp. 1390-1400, (April 2005) (primary support)

R. P. Drupp, J. A. Bossard, **D. H. Werner**, and **T. S. Mayer**, "Single-layer Multi-band Infrared Metallodielectric Photonic Crystals Designed by Genetic Algorithm Optimization," Applied Physics Letters, Vol. 86, pp. 081102-1-081102-3, (Feb. 2005) (primary support)

L. Li and **D. H. Werner**, "Design of All-Dielectric Frequency Selective Surfaces Using Genetic Algorithms Combined with the Finite Element-Boundary Integral Method," Proceedings of the 2005 IEEE Antennas and Propagation Society International Symposium and C/URSI National Radio Science Meeting, Washington DC, Vol. 4A, pp. 376-379, (July 3-8, 2005) (partial support)

I. Divliansky and **T. S. Mayer,** "Three-dimensional low-index-contrast photonic crystals fabricated using a tunable beam splitter," Nanotechnology, 17 1-4 (2006) (primary support)

D. Scrymgeour, **V. Gopalan**, "Nanowcale Piezoelectric response at a single ferroelectric domain wall," Phys. Rev. B, 72, 024103 (2005) (partial support)

N. Malkova, D. Scrymgeour and **V. Gopalan,** "Numerical study of the light-beam propagation and superprism effect inside two-dimensional hexagonal photonic crystals," Physical Review B, 72, 045144 (2005) (primary support)

Patents & Inventions

D. Dwight, **D. Allara**, "Process for Making Surface Enhanced Raman Spectroscopy Substrates that Exhibit Uniform, High Enhancement Factors and Stability," US Provisional Patent Application #60/612, 9/22/2004 (partial support)

D. Allara "Surface enhanced raman spectroscopy (SERS) substratesexhibiting uniform high enhancement and stability," US patent filed 9/05, (partial support)

E. Chalkova, M. V. Fedkin, **S. Komarneni** and **S. N. Lvov,** "Composite Membrane for Fuel Cells Incorporating Said Membranes," US Patent Application, 11/104,215 (2005) (partial support)

T. C. Chung, **S. Komarneni,** E. Chalkova and **S. N. Lvov**, Composite membrane for Fuel Cells Incorporating Said Membranes, US Provisional Patent Application, 60/670,186 (2005) (primary support)

P. S. Weiss, and R. L. Funk, Chemical Functionalization Nanolithography, U. S. Patent 6,835,534 (2004)

P. S. Weiss, and A. Hatzor, "Molecular Rulers for Scaling Down Nanostructures," U.S. Patent Awarded (2006) App number 09/873,614

Jeffrey Catchmark, "Manufacturing Method for Molecular Ruler Lithograpy," US Patent Appl No. 11/065, 742, filed 2/25/2005 and Patent Appl no. PCT/US2005/006257, filed 2/25/2005.

P. J. Sazio, **J. V. Badding**, Hewak D. William (University of Southampton, UK). "Fabrication of semiconductor metamaterials," PCT Int. Appl. (2005), 74 pp. CODEN: PIXXD2 WO 2005036224

P. J. A. Sazio, **J. V. Badding**, Hewak, D. William, S. M. Howdle, "Fabrication of metamaterials," (University of Southampton, UK). PCT Int. Appl. (2005)

(it has been decided that both of these patents will proceed to the national stage filings in multiple countries)

Invention Disclosure:

D. H. Werner, T. S. Mayer, J. A. Bossard, R. P. Drupp, Patent application filed January 2004 on "Reconfigurable Frequency Selective Surfaces with Application to Remote Sensing of Chemical and/or Biological Agents." PSU invention disclosure number 2003-2855 foreign patent application serial no. PCT/US2005/01295 (primary support)

Susan Trolier-McKinstry, Thomas N. Jackson, Kyusun Choi, Richard L. Tutwiler, Insoo Kim, Hyunsoo Kim, Sungkyu Park and Ioanna Mina, "High Frequency, High Resolution Ultrasonic Transducers with Integrated Electronics."Invention disclosure submitted to the University intellectual property office. (primary support)

M. Lanagan, C. Randall, A. Baker, D. Anderson, S. Rhee and G. Fuhr, "Biological Cell Manipulators Based on Low Temperature Co-fired Ceramic (LTCC) Technology," Invention Disclosure 5/26/04 (partial support) (seed)

News Releases

IRG 1

Amadamantanethiol JACS paper was written up in Nature and elsewhere:
Nature Research Highlights article on adamantanethiol self-assembled monolayers. Nanotechnology: Going for Gold (16 June 2005) on-line at http://www.nature.com/nature/journal/v435/n7044/full/435858a.html

Microdisplacement Printing NanoLetters paper was written up in Science, Nature Materials Update, NSF main site, and is being written up in Science News. It was featured on Pennsylvania public radio and a spot has been recorded for NSF NPR show.

IEE, Engineering Communities: Article on Microdisplacement Printing: Microprinting research points way to build nanometer scale electronics (19 August 2005) on line at: http://www.iee.org/oncomms/sector/electronics/SectionNews/Object/CE728304-C497-DBE8-5EFB652326BA4AC2.

Physorg Article on Microdisplacement Printing: New Microprinting Technique Improves Nanoscale Fabrication (19 August 2005) On line at:
http://www.physorg.com/news5904.html

Space Daily Article on Microdisplacement Printing: New Microprinting Technique

Improves Nanoscale Fabrication (21 August 2005) on-line at:
http://www.spacedaily.com/news/nanotech-05zzzf.htmln-line at:

Penn State Live Story on Microdisplacement Printing on-line at:
http://live.psu.edu/story/13120 (22 August 2005)

Chemie.DE News Center Article on Microdisplacement Printing: New Microprinting Technique Improves Nanoscale Fabrication (22 August 2005) on-line at:
http://www.chemie.de/news/e/48435/

Azonano Article on Microdisplacement Printing (August 2005) on line at:
http://www.azonano.com/news.asp?newsID=1272

NanoTsunami Article on Microdisplacement Printing: New Microprinting Technique Improves Nanoscale Fabrication (22 August 2005) on-line at
http://www.voyle.net/Nano%20imprint%20lithography/Nanoimprint%20lithography-05-0010.htm

Nanotechnology Now Article on Microdisplacement Printing: New Microprinting "Technique Improves Nanoscale Fabrication," Nanotechnology Now (22 August 2005)
http://www.nanotech-now.com/news.cgi?story_id=11105

Russian Article on Microdisplacement Printing on-line at:
http://elementy.ru/news/164742

EurekAlert Article on Microdisplacement Printing (22 August 2005) on-line at:
http://www.eurekalert.org/pub_releases/2005-08/ps-nmt081805.php

NSF Release on Micro displacement Printing (25 August 2005) or (i-Newswire version, 29 August 2005) online at:
http://www.nsf.gov/news/news_summ.jsp?cntn_id=104369&org=NSF

Roland Piquepaille's Technology Trends Article Printing Nanoscale Components (28 August 2005) on-line at http://www.primidi.com/2005/08/28.html

Network World Un aiuto alla nanotecnologia (30 August 2005) on-line at:
http://www.nwi.it/showPage.php?template=notizie&id=7481

Science Daily Article New Microprinting Technique Improves Nanoscale Fabrication (31 August 2005) on-line at:
http://www.sciencedaily.com/releases/2005/08/050819124323.htm

Nature Materials Update Dispersion-free nanoprinting (1 September 2005) on-line at:
http://www.nature.com/materials/nanozone/news/050901/portal/m050901-2.html

Science Editor's Choice Move Away or Stay Put Article on Microdisplacement Printing (9 September 2005)

General approach discussed in the cover story of *TEQ Magazine* of the Pittsburgh Technology Council cover story on Nanoscience. (September 2005) on-line at: http://www.nature.com/materials/nanozone/news/050901/portal/m050901-2.html

Penn State's Sculptured Thin Film (STF) technology led by Akhlesh Lakhtakia has been named a winner in the First Annual Nanotec Briefs' Nano 50 Awards in the Technology Category. The awards were presented at a special awards dinner at the NASA Tech Briefs Nano 2005 conference in Boston, November 11th & 12th, 2005.

IRG 2

A. Sen, W. Paxton, T. Kline, S. Sundararajan, **T. Mallouk,** R. Hernandez, Y. Wang, **J. Catchmark,** S. Subramanian, "Magnetic nanorods on Cruise Control," Science News, Vol. 167, No. 4, Jan. 22, 2005, p. 62

A. Sen, W. Paxton, T. Kline, S. Sundararajan, **T.Mallouk,** R. Hernandez, Y. Wang, **J. Catchmark**, S. Subramanian, V. H. Crespi and P. Lammert, "Catalytic Nanomotors," Chemical and Engineering News, Vol. 83, No. 8, February 21, 2005, pp. 33-35

A. Sen, W. Paxton, T. Kline, S. Sundararajan**, T. Mallouk**, R. Hernandez, Y. Wang, **J. Catchmark**, S. Subramanian, **V. H. Crespi** and Paul Lammert, "Inorganic Chemistry: The Next Generation," Chemical and Engineering News, Vol 83, No. 40, October 3, 2005, pp. 40-42

A. Sen, et. al. "Magnetic field points the way for metallic nanorods with hydrogen peroxide propulsion," Chemie.de, Tuesday, November 29, 2005

IRG 3

Peter Eklund's MRSEC-supported work on confined phonons in silicon nanowires was one of the top twenty most cited papers in Nanoletters in January-June 2005.

Education Outreach News:

"Family: Don't be a Muggle," Newsweek, U.S. Edition, June 27, 2005, p. 70

"Science Enchants Summer Campers: Program with magical theme explores chemistry, fosters scientific literacy," Chemical and Engineering News, Volume 83, Number 33, August 15, 2005, p. 43.