

2012 Publications

IRG 1

E. A. Eliseev, A. N. Morozovska, Y. Gu, A. Borisevich, **L.-Q. Chen**, **V. Gopalan**, and S. V. Kalinin, "Conductivity of Twin Walls-surface Junctions in Ferroelastics-Interplay of Deformation Potential, Octahedral Rotations, Improper Ferroelectricity, and Flexoelectric Coupling," *Physics Review B*, 86, 085416 (2012).

A. N. Morozovska, E. A. Eliseev, S. V. Kalinin, **L. Q. Chen**, and **V. Gopalan**, "Surface Polar States and Pyroelectricity in Ferroelastics induced by Flexo-rotto Field," *Applied Physics Letters*, 100, 142902 (2012).

S. Lei, E. A. Eliseev, A. N. Morozovska, R. C. Haislmaier, T. T. A. Lummen, W. Cao, S. V. Kalinin and **V. Gopalan**, "Origin of Piezoelectric Response under a Biased Scanning Probe Microscopy Tip Across a 180° Ferroelectric Domain Wall," *Physics Review B*, 86, 134115 (2012).

A. N. Morozovska, E. A. Eliseev, M. D. Glinchuk, and **V. Gopalan**, "Interfacial Polarization and Pyroelectricity in Antiferrodistortive Structures induced by a Flexoelectric Effect and Rotostriction," *Physics Review B*, 85, 094107 (2012).

Y. J. Gu, **K. Rabe**, E. Bousquet, **V. Gopalan**, and **L.-Q. Chen**, "A Phenomenological Thermodynamic Potential for CaTiO₃ Single Crystal," *Physics Review B*, 85, 064117 (2012).

J. M. Hu, Z. Li, **L. Q. Chen**, and C. W. Nan, "Design of a Voltage-controlled Magnetic Random Access Memory Based on Anisotropic Magnetoresistance in a Single Magnetic Layer," *Advanced Materials*, 24, 2869-2873 (2012).

D. J. Franzbach, Y. Gu, **L.-Q. Chen**, and K.G. Webber, "Electric Field-induced Tetragonal to Orthorhombic Phase Transitions in [110]_c-oriented BaTiO₃ Single Crystals," *Applied Physics Letters*, 101(23): 232904 (2012).

A. Morozovska, E. A. Eliseev, M. D. Glinchuk, **L-Q. Chen**, S. V. Kalinin, and **V. Gopalan**, "Polarization and Pyroelectricity in Antiferrodistortive Structures and Surfaces Induced by a Flexoelectric Effect: Impact of Free Charges," *Ferroelectrics*, 438, 32-44 (2012).

P. Wu, X. Ma, Y. Li, **V. Gopalan**, and **L-Q. Chen**, "Dipole Spring Ferroelectrics in Superlattice SrTiO₃/BaTiO₃ Thin Films Exhibiting Constricted Hysteresis Loops," *Applied Physics Letters*, 100, 092905 (2012).

M. B. Holcomb, S. Polisetty, A. F. Rodriguez, **V. Gopalan**, and **R. Ramesh**, "Investigating Electric Field Control of Magnetism with Neutron Scattering, Nonlinear Optics and Synchrotron X-ray Spectromicroscopy," *International Journal of Modern Physics B*, 26, 1230004 (2012).

P. Gao, C. T. Nelson, J. R. Jokisaari, Y. Zhang, S. H. Baek, C. W. Bark, E. Wang, Y. M. Liu, J. Y. Li, C. B. Eom, and **X. Q. Pan**, “Direct Observations of Retention Failure in Ferroelectric Memories,” *Advanced Materials*, 24, 1106-1110 (2012).

H. Lu, X. Liu, C. W. Bark, Y. Wang, Y. Zhang, D. J. Kim, A. Stamm, P. Lukashev, D. A. Felker, C. M. Folkman, P. Gao, M. S. Rzchowski, **X. Q. Pan**, C. B. Eom, E. Y. Tsybal, and A. Gruverman, “Enhancement of Ferroelectric Polarization Stability by Interface Engineering,” *Advanced Materials*, 24, 1209-1216 (2012).

Q. He, C.-H. Yeh, J.-C. Yang, G. Singh-Bhalla, C.-W. Liang, P.-W. Chiu, G. Catalan, L.W. Martin, Y.-H. Chu, J. F. Scott, and **R. Ramesh**, “Magnetotransport at Domain Walls in BiFeO₃,” *Physics Review Letters*, 108, 067203 (2012).

S. Zhang, J. Li, I. Gilbert, J. Bartell, M. J. Erickson, Y. Pan, P. E. Lammert, C. Nisoli, K. K. Kohli, R. Misra, **N. Samarth**, C. Leighton, and **P. Schiffer**, “Perpendicular Anisotropy and Generic Realization of the Ising Model in Artificial Spin Ice,” *Physics Review Letters*, 109, 087201 (2012).

P. J. Ryan, J.-W. Kim, T. Birol, P. Thompson, J.-H. Lee, X. Ke, P. S. Normile, E. Karapetrova, **P. Schiffer**, S. D. Brown, **C. J. Fennie**, and **D. G. Schlom**, “Reversible Control of Magnetic Interactions by Electric Field in a Single-phase Material,” *Nature Communications*, DOI: 10.1038/ncomms2329 (2013).

C. M. Brooks, R. Misra, J. A. Mundy, L. A. Zhang, B. S. Holinsworth, K. R. O’Neal, T. Heeg, W. Zander, J. Schubert, J. L. Musfeldt, Z.-K. Liu, D. A. Muller, **P. Schiffer**, and **D. G. Schlom**, “The Adsorption Controlled Growth of LuFe₂O₄ by Molecular-beam-epitaxy,” *Applied Physics Letters*, 101, 132907 (2012).

J. C. Yang, Q. He, S. J. Suresha, C. Y. Kuo, R. Haislmaier, G. Sheng, C. Adamo, H. J. Liu, C. W. Liang, C. Y. Peng, H. J. Lin, Z. Hu, L. Chang, C. T. Chen, L. H. Tjeng, E. Arenholz, **D. G. Schlom**, **V. Gopalan**, **L. Q. Chen**, Y. H. Chu, and **R. Ramesh**, “Orthorhombic BiFeO₃ Multiferroic Thin Films,” *Physical Review Letters*, 109, 247606 (2012).

J. A. Mundy, Q. Y. Mao, C. M. Brooks, **D. G. Schlom**, and D. A. Muller, “Atomic-resolution Chemical Imaging of Oxygen Local Bonding Environments by Electron energy Loss Spectroscopy,” *Applied Physics Letters*, 101, 042907 (2012).

IRG 2

S. Sengupta, K. K. Dey, H. S. Muddana, T. Tabouillot, M. E. Ibele, **P. J. Butler**, and **A. Sen**, “Enzyme Molecules as Nanomotors,” *Journal of the American Chemical Society*, 135, 1406 (2013).

N. Chaturvedi, B. K. Juluri, Q. Hao, **T. J. Huang**, and **D. Velegol**, “Simple Fabrication of Snowman-like Colloids,” *Journal of Colloid & Interface Science*, 317, 28-33 (2012).

X. Ding, S. S. Lin, B. Kiraly, H. Yue, S. Li, J. Shi, S. J. Benkovic, and **T. J. Huang**, “On-Chip Manipulation of Single Microparticles, Cells, and Organisms Using Surface Acoustic Waves,” *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 109, 11105-11109 (2012).

Y. Xie, D. Ahmed, M. Lapsley, S. S. Lin, A. A. Nawaz, L. Wang, and **T. J. Huang**, “Single-Shot Characterization of Enzymatic Reaction Constants K_m and k_{cat} By An Acoustic-Driven, Bubble-Based Fast Micromixer,” *Analytical Chemistry*, 84(17), 7495–7501 (2012.)

X. Ding, J. Shi, S. S. Lin, S. Yazdi, B. Kiraly, and **T. J. Huang**, “Tunable Patterning of Microparticles and Cells using Standing Surface Acoustic Waves,” *Lab on a Chip*, 12, 2491-2497 (2012).

X. Ding, S. S. Lin, M. I. Lapsley, S. Li, X. Guo, C. Y. K. Chan, I.-K. Chiang, J. P. McCoy, and **T. J. Huang**, “Standing Surface Acoustic Wave (SSAW) Based Multichannel Cell Sorting,” *Lab on a Chip*, 12, 4228–4231 (2012).

P.-H. Huang, M. I. Lapsley, D. Ahmed, Y. Chen, L. Wang, and **T. J. Huang**, “A Single-Layer, Planar, Optofluidic Switch Powered By Acoustically Driven, Oscillating Microbubbles,” *Applied Physics Letters*, 101, 141101 (2012).

D. Ahmed, C. Y. Chan, S. S. Lin, H. S. Muddana, N. Nama, and **T. J. Huang**, “Tunable, Pulsatile Chemical Gradient Generation via Acoustically Driven Oscillating Bubbles,” *Lab on a Chip*, 13, 328-331 (2013).

S. S. Lin, B. R. Tittmann, **T. J. Huang**, “Design of Acoustic Beam Aperture Modifier Using Gradient-Index Phononic Crystals,” *Journal of Applied Physics*, 111, 123510 (2012).

Y. B. Zheng, B Kiraly, **P. S. Weiss**, and **T. J. Huang**, “Molecular Plasmonics for Biology and Nanomedicine,” *Nanomedicine*, 7(5), 751-770 (2012).

W. Wang, L. A. Castro, M. Hoyos, and **T. E. Mallouk**, “Autonomous Motion of Metallic Microrods Propelled by Ultrasound,” *ACS Nano*, 6, 6122-6132 (2012).

H. Zhang, K. Yeung, J. S. Robbins, R. A. Pavlick, M. Wu, R. Liu, **A. Sen**, and **S. T. Phillips**, “Self-Powered Microscale Pumps Based on Analyte-Initiated Depolymerization Reactions,” *Angewandte Chemie-International Edition.*, 51, 2400 (2012).

S. Sengupta, M. E. Ibele, and **A. Sen**, “Fantastic Voyage: Designing Self-powered Nanobots,” *Angewandte Chemie-International Edition*, 51, 8434 (2012).

V. Yadav, H. Zhang, R. Pavlick, and **A. Sen**, “Triggered ‘On/Off’ Micropumps and Colloidal Photodiode,” *Journal of the American Chemical Society*, 134, 15688 (2012).

W. Duan, M. Ibele, R. Liu, and **A. Sen**, "Motion Analysis of Light-powered Autonomous Silver Chloride Nanomotors," *European Physical Journal E*, 35, 77 (2012).

W. Duan, R. Liu, and **A. Sen**, "Transition between Collective Behaviors of Micromotors in Response to Different Stimuli," *Journal of the American Chemical Society*, 135, 1280 (2013).

S. Yang, M. I. Lapsley, B. Cao, C. Zhao, Y. Zhao, Q. Hao, B. Kiraly, J. Scott, W. Li, L. Wang, Y. Lei, and **T. J. Huang**, "Large-Scale Fabrication of Three-Dimensional Surface Patterns Using Template-Defined Electrochemical Deposition," *Advanced Functional Materials*, 23, 720-730 (2013).

M. Lu, B. K. Juluri, Y. J. Liu, T. J. Bunning, and **T. J. Huang**, "Single-Step Holographic Fabrication of Large-Area Periodically Corrugated Metal Films," *Journal of Applied Physics*, 112, 113101 (2012).

S. Yang, B. Kiraly, W. Y. Wang, S. Shang, B. Cao, H. Zeng, Y. Zhao, W. Li, Z.-K. Liu, W. Cai, and **T. J. Huang**, "Fabrication and Characterization of Beaded SiC Quantum Rings with Anomalous Red Spectral Shift," *Advanced Materials*, 24, 5598-5603 (2012).

Y. Zhao, T. Walker, Y. B. Zheng, S. S. Lin, A. A. Nawaz, B. Kiraly, J. Scott, and **T. J. Huang**, "Mechanically Tuning the Localized Surface Plasmon Resonances of Gold Nanostructure Arrays," *ASME Journal of Nanotechnology in Engineering and Medicine*, 3, 011007 (2012).

S. Yang, F. Guo, B. Kiraly, X. Mao, M. Lu, and **T. J. Huang**, "Microfluidic Synthesis of Multifunctional Janus Particles for Biomedical Applications," *Lab on a Chip*, 12, 2097-2102 (2012).

M. I. Lapsley, A. Shahravan, Q. Hao, B. K. Juluri, S. Giardinelli, M. Lu, Y. Zhao, I.-K. Chiang, T. Matsoukas, and **T. J. Huang**, "Shifts in Plasmon Resonance Due to Charging of A Nanodisk Array in Argon Plasma," *Applied Physics Letters*, 100, 101903 (2012).

Q. Hao, S. Morton, B. Wang, Y. Zhao, **L. Jensen**, and **T. J. Huang**, "Tuning Surface-Enhanced Raman Scattering from Graphene Substrates using the Electric Field Effect and Chemical Doping," *Applied Physics Letters*, 102, 011102 (2013).

Y. Zhao, Q. Hao, Y. Ma, M. Lu, B. Zhang, M. Lapsley, **I.-C. Khoo**, and **T. J. Huang**, "Light-Driven Tunable Dual-Band Plasmonic Absorber using Liquid-Crystal-Coated Asymmetric Nanodisk Array," *Applied Physics Letters*, 100, 053119 (2012).

Q. Hao, B. Wang, J. Bossard, B. Kiraly, Y. Zeng, I.-K. Chiang, L. J., **D. Werner**, and **T. J. Huang**, "Surface-Enhanced Raman Scattering Study on Graphene Coated Metallic Nanostructure Substrates," *Journal of Physical Chemistry C*, 116, 7249-7254 (2012).

IRG 3

J. E. Brom, Y. Ke, R. Z. Du, D. Won, X. J. Weng, K. Andre, J. C. Gagnon, **S. E. Mohnney**, **Q. Li**, K. Chen, X. X. Xi and **J. M. Redwing**, “Structural and Electrical Properties of Epitaxial Bi₂Se₃ Thin Films Grown by Hybrid Physical-chemical Vapor Deposition,” *Applied Physics Letters*, 100(16), 162110 (2012).

C. M. Eichfeld, S. S. A. Gerstl, T. Prosa, Y. Ke, **J. M. Redwing**, and **S. E. Mohnney**, “Local Electrode Atom Probe Analysis of Silicon Nanowires Grown with an Aluminum Catalyst,” *Nanotechnology*, 23(21), 215205 (2012).

J. Wang, Y. Sun, M. Tian, B. Liu, M. Singh, and **M. H. W. Chan**, “Superconductivity in Single Crystalline Pb Nanowires Contacted by Normal Metal Electrodes,” *Physical Review B*, 86(3), 035439 (2012).

J. Wang, C. Z. Chang, H. Li, K. He, D. Zhang, M. Singh; X. C. Ma; **N. Samarth**, M. Xie, Q. K. Xue, and **M. H. W. Chan**, “Interplay between Topological Insulators and Superconductors,” *Physical Review B*, 85(4), 045415 (2012).

J. Wang, H. Li, C. Z. Chang, K. He, J. S. Lee, H. Lu, Y. Sun, X. C. Ma, **N. Samarth**, S. Shen, Q. Xue, M. Xie and **M. H. W. Chan**, “Anomalous Anisotropic Magnetoresistance in Topological Insulator Films,” *Nano Research*, 5(10), 739-746 (2012).

N. S. Dellas, C. J. Schuh, and **S. E. Mohnney**, “Silicide Formation in Contacts to Si Nanowires,” *Journal of Materials Science*, 47(17), 6189-6205 (2012).

X. Hong, K. Zou, A. M. DaSilva, C. H. Ahn, and **J. Zhu**, “Integrating Functional Oxides with Graphene,” *Solid State Communications*, 12(15), 1365-1374 (2012).

H. Yan, Y. Sun, L. He, J. C. Nie, and **M. H. W. Chan**, “Observation of Landau-level-like Quantization at 77 K Along a Strained-induced Graphene Ridge,” *Physical Review B*, 85(3), 035422 (2012).

Y. Ou, M. Singh, and J. Wang, “Quantum Transport in Topological Insulator Hybrid Structures- A Combination of Topological Insulator and Superconductor,” *Science China-Physics Mechanics and Astronomy*, 55(12), 2226-2236 (2012).

IRG 4

S. Yun, Z. H. Jiang, Q. Xu, **Z. Liu**, **D. H. Werner**, and **T. S. Mayer**, “Low-Loss Impedance-Matched Optical Metamaterials with Zero Phase Delay,” *ACS Nano*, 6(5), 4475-4482 (2012).

Z. H. Jiang, Q. Wu, and **D. H. Werner**, “Demonstration of Enhanced Broadband Unidirectional Electromagnetic Radiation Enabled by a Subwavelength Profile Leaky Anisotropic Zero-index Metamaterial Coating,” *Physical Review B*, 86(12), 125131/1-7 (2012).

Z. H. Jiang, M. D. Gregory, and **D. H. Werner**, “Broadband High Directivity Multi-Beam Emission Through Transformation Optics Enabled Metamaterial Lenses,” *IEEE Transactions on Antennas and Propagation*, 60(11), 5063-5074 (2012).

X. Wang, Q. Wu, J. P. Turpin, and **D. H. Werner**, “BOR-FDTD for Rigorous Analysis of Three-dimensional Axisymmetric Transformation Optics Lenses,” *Optics Letters*, 38(1), 67-69 (2013).

M. Krishnamurthi, J. R. Sparks, R. He, I. A. Temnykh, N. F. Baril, **Z. Liu**, P. J. A. Sazio, **J. V. Badding**, and **V. Gopalan**, “Array of Tapered Semiconductor Waveguides in a Fiber for Infrared Image Transfer and Magnification,” *Optics Express*, 20, 4168-4175 (2012).

M. Krishnamurthi, E. Barnes, J. R. Sparks, R. He, N. F. Baril, P. J. A. Sazio, **J. V. Badding**, and **V. Gopalan**, “A Magnifying Fiber Element with an Array of Sub-wavelength Ge/ZnSe Pixel Waveguides for Infrared Imaging,” *Applied Physics Letters*, 101, 021108 (2012).

R. R. He, P. J. A. Sazio, A. C. Peacock, N. Healy, J. R. Sparks, M. Krishnamurthi, **V. Gopalan**, and **J. V. Badding**, “Integration of GHz Bandwidth Semiconductor Devices inside Microstructured Optical Fibres,” *Nature Photonics*, 6, 174-179 (2012).

N. F. Baril, R. He, T. D. Day, J. R. Sparks, B. Keshavarzi, M. Krishnamurthi, **A. Borhan**, **V. Gopalan**, A. C. Peacock, N. Healy, P. J. A. Sazio, and **J. V. Badding**, “Confined High-Pressure Chemical Deposition of Hydrogenated Amorphous Silicon,” *Journal of the American Chemical Society*, 134, 19-22, 2012.

J. R. Sparks, R. He, N. Healy, S. Chaudhuri, T. C. Fitzgibbons, A. C. Peacock, P. J. A. Sazio, and **J. V. Badding**, “Conformal Coating by High Pressure Chemical Deposition for Patterned Microwires of II-VI Semiconductors,” *Advanced Functional Materials*, 23(13), 1647-1654 (2013).

R. He, T. D. Day, M. Krishnamurthi, J. R. Sparks, P. J. A. Sazio, **V. Gopalan**, and **J. V. Badding**, “Silicon p-i-n Junction Fibers,” *Advanced Materials*, 25(10), 1460 (2013).

B. D. Smith, **T. S. Mayer**, and C. D. Keating, “Deterministic Assembly of Functional Nanostructures Using Nonuniform Electric Fields,” *Annual Review of Physical Chemistry*, 63, 241-263 (2012).

Q. Hao, B. Wang, J. A. Bossard, B. Kiraly, Y. Zeng, I-K. Chiang, **L. Jensen**, **D. H. Werner**, and **T. J. Huang**, “Surface-enhanced Raman Scattering Study on Graphene-coated Metallic Nanostructure Substrates,” *Journal of Physical Chemistry C*, 116(13), 7249-7254, (2012).

Y. Zeng, and **D. Werner**, “Two-dimensional Inside-out Eaton Lens: Wave Properties and Design Technique,” *Optical Express*, 20(2), 2335-2345 (2012).

Z. Bayraktar, J. A. Bossard, X. Wang, and **D. H. Werner**, “A Real-valued Parallel Clonal Selection Algorithm and its Application to the Design Optimization of Multi-layered Frequency Selective Surfaces,” *IEEE Transactions on Antennas and Propagation*, 60(4), 1831-1843 (2012).

Q. Wu, J. P. Turpin, and **D. H. Werner**, “Integrated Photonic Systems Based on Transformation Optics Enabled Gradient Index Devices,” *Light: Science and Applications*, 1, e38 (2012).

M. F. Pantoja, M. G. Bray, **D. H. Werner**, P. L. Werner and A. R. Bretones, “A Computationally Efficient Method for Simulating Metal-Nanowire Dipole Antennas at Infrared and Longer Visible Wavelengths,” *IEEE Transactions on Nanotechnology*, 11(2), 239-246 (2012).

N. Vukovic, N. Healy, P. Mehta, T. D. Day, P. J. A. Sazio, **J. V. Badding**, and A. C. Peacock, “Thermal Nonlinearity in Silicon Microcylindrical Resonators,” *Applied Physics Letters*, 100, 181101 (2012).

SEED PROJECTS

R. Lu, **Q. Li**, A. R. Botello-Méndez, T. Hayashi, B. Wang, A. Berkdemir, Q. Hao, A. L. Elías, R. Cruz-Silva, H. R. Gutiérrez, Y. A. Kim, H. Muramatsu, **J. Zhu**, M. Endo, H. Terrones, J.-C. Charlier, M. Pan, and **M. Terrones**, “Nitrogen-doped Graphene: Beyond Single Substitution and Enhanced Molecular Sensing,” *Nature Scientific Reports*, 2, 586 (2012).

N. E. Motl, J. F. Bondi, and **R. E. Schaak**, “Synthesis of Colloidal Au-Cu₂S Heterodimers via Chemically Triggered Phase Segregation of AuCu Nanoparticles,” *Chemistry of Materials*, 24, 1552-1554 (2012).

H. Terrones, R. T. Lv, **M. Terrones**, and M. S. Dresselhaus, “The Role of Defects and Doping in 2D Graphene Sheets and 1D Nanoribbons,” *Reports on Progress in Physics*, 75, 062501 (2012).

R. T. Lv, and **M. Terrones**, “Towards New Graphene Materials: Doped Graphene Sheets and Nanoribbons,” *Materials Letters*, 78, 209-218 (2012).

E. Gracia-Espino, F. López-Urías, H. Terrones, and **M. Terrones**, “Novel Nanocarbons for Adsorption,” Pp. 3-35 in J.M.D. Tascon, *Novel Carbon Adsorbents* (Elsevier Publishers), (2012).

R. D. Pensack, C. Guo, K. Vakhshouri, **E. D. Gomez**, and **J. B. Asbury**, “Influence of Acceptor Structure on Barriers to Charge Separation in Organic Photovoltaic Materials,” *Journal of Physical Chemistry C*, 116, 4824-4831 (2012).

T. J. Larrabee, **T. E. Mallouk**, and **D. L. Allara**, “An Atomic Layer Deposition Reactor with Dose Quantification for Precursor Adsorption and Reactivity Studies,” *Review of Scientific Instruments*, 84(1), 014102 (2013).

M. Pan and **M. Terrones**, “Nitrogen-doped Graphene: Beyond Single Substitution and Enhanced Molecular Sensing,” *Scientific Reports*, 2, 586 (2012).

J. Campos-Delgado, D. L. Baptista, M. Fuentes-Cabrera, B. G. Sumpter, V. Meunier, H. Terrones, Y. A. Kim, H. Muramatsu, T. Hayashi, M. Endo, **M. Terrones**, and C. A. Achete, "Iron Particle Nanodrilling of Few Layer Graphene at Low Electron Beam Accelerating Voltages," *Particle & Particle Systems Characterization*, 30, 76-82 (2013).

H. Varela-Rizo, I. Martin-Gullon, and **M. Terrones**, "Hybrid Films with Graphene Oxide and Metal Nanoparticles Could Now Replace Indium Tin Oxide," *ACS Nano*, 6, 4565-4572 (2011).

P. T. Araujo, **M. Terrones**, and M. S. Dresselhaus, "Defects and Impurities in Graphene-like Materials," *Materials Today*, 15, 98-109 (2012).

Y. W. Yin, M. Raju, W. J. Hu, X. J. Weng, K. Zou, **J. Zhu**, X. G. Li, Z. D. Zhang, and **Q. Li**, "Multiferroic Tunnel Junctions," *Frontiers of Physics*, 7, 380 (2012).

X. Hong, K. Zou, B. Wang, S.-H. Cheng and **J. Zhu**, "Evidence for Spin-Flip Scattering and Local Moments in Dilute Fluorinated Graphene," *Physical Review Letters*, 108, 226602 (2012).

Shared Facilities

F. Guo, M. I. Lapsley, A. A. Nawaz, Y. Zhao, S.-C. Lin, Y. Chen, S. Yang, X.-Z. Zhao, and **T. J. Huang**, "A Droplet-based, Optofluidic Device for High-throughput, Quantitative Bioanalysis," *Analytical Chemistry*, 84, 10745-10749 (2012).

X. Mao, A. A. Nawaz, S. S. Lin, M. I. Lapsley, Y. Zhao, J. P. McCoy, W. S. El-Deiry, and **T. J. Huang**, "An Integrated, Multi-parametric Flow Cytometry Chip using 'Microfluidic Drifting' Based Three-dimensional (3D) Hydrodynamic Focusing," *Biomicrofluidics*, 6, 024113 (2012).

J. J. McDermott, A. Kar, M. Daher, S. Klara, **A. Sen**, and **D. Velegol**, "Self-generated Diffusioosmotic Flows from Calcium Carbonate Micropumps," *Langmuir*, 28, 15491-15497 (2012).

L. M. Ramirez, A. S. Smith, D. B. Unal, R. H. Colby, and **D. Velegol**, "Self-assembly of Doublets from Flattened Polymer Colloids," *Langmuir*, 28, 4086-4094 (2012).

I. Jordanov, K. Gunaratne, C. L. Harmon, **J. O. Sofo** and W. Castleman, "Broad Photoelectron Spectrum and Lowered Electron Affinity Due to Hydrogen in ZnOH: A Joint Experimental and Theoretical Study," *Journal of Chemical Physics*, 136, 214314 (2012).

J. O. Sofo, G. Usaj, P. S. Cornaglia, A. M. Suarez, A. D. Hernández-Nieves, and C. A. Balseiro, "Magnetic Structure of Hydrogen-induced Defects on Graphene," *Physical Review B*, 85, 115405 (2012).

D. J. Wesolowski, **J. O. Sofo**, A. V. Bandura, Z. Zhang, E. Mamontov, M. Predota, N. Kumar, J. Kubicki, P. R. C. Kent, L. Vlcek, M. L. Machesky, P. Fenter, P. T. Cummings, L. M. Anovitz,

A. A. Skelton, and J. Rosenqvist, "Comment on 'Structure and Dynamics of Liquid Water on Rutile TiO₂(110)'," *Physical Review B*, 85, 167401 (2012).

S. Liang and **J. O. Sofo**, "The Impurity State and Variable Range Hopping Conduction in Graphene," *Physical Review Letters*, 109, 256601 (2012).

J. Kubicki, **J. O. Sofo**, A. A. Skelton, and A. V. Bandura, "A New Hypothesis for the Dissolution Mechanism of Silicates," *Journal of Physical Chemistry C*, 116, 17479-17491 (2012).

C. Berkdemir, W. Castleman, and **J. O. Sofo**, "Metal-substituted Ti₈C₁₂ Metallo-carbohedrynes: Toward Less Reactive Clusters as Building Blocks of Cluster-assembled Materials," *Physical Chemistry Chemical Physics*, 14, 9642-9653 (2012).

Patents and Inventions

P. J. A. Sazio, **J. V. Badding**, D. W. Hewak, and S. M. Howdle, "Fabrication of Metamaterials," U.S. Patent No. 8268394 (2012).