

12. MRSEC-SUPPORTED PUBLICATIONS AND PATENTS
(March 1, 2009 – February 28, 2010)

† denotes publications with international co-authors

IRG-1 ENGINEERED MULTIBLOCK POLYMERS

IRG-1 Publications resulting from PRIMARY MRSEC Support

Demirgöz, D.; Pangburn, T.O.; Davis, K.P.; Lee, S.; **Bates, F.S.**; **Kokkoli, E.** *PR_b-Targeted Delivery of Tumor Necrosis Factor- α by Polymersomes for the Treatment of Prostate Cancer.* *Soft Matter*, **2009**, *5*, 2011.

Katz, J.S.; Levine, D.H.; Davis, K.P.; **Bates, F.S.**; Hammer, D.A.; Burdick, J.A. *Membrane Stabilization of Biodegradable Polymersomes.* *Langmuir*, **2009**, *25*, 4429.

Kim, A.J.; Kaucher, M.S.; Davis, K.P.; Imam, M.R.; Christian, M.A.; Levine, D.H.; Peterca, M.; **Bates, F.S.**; Percec, V.; Hammer, D.A. *Proton Transport from Dendritic Helical Pore Incorporated Polymersomes.* *Advanced Functional Materials*, **2009**, *19*, 2930.

†Shimada, T.; Lee, S.; **Bates, F.S.**; Hotta, A.; Tirrell, M. *Worm-like Micelle Formation in Peptide-Lipid Conjugates Driven by Secondary Structure Transformation of the Headgroups.* *J. Phys. Chem. B.*, **2009**, *113*, 13711.

Ha, J.-M.; Hamilton, B.D.; **Hillmyer, M.A.**; Ward, M.D. *Phase Behavior and Polymorphism of Organic Crystals Confined within Nanoscale Chambers.* *Crystal Growth and Design*, **2009**, *9*, 4766.

†Hamilton, B.D.; Weissbuch, I.; Lahav, M.; **Hillmyer, M.A.**; Ward, M.D. *Manipulating Crystal Orientation in Nanoscale Cylindrical Pores by Stereochemical Inhibition.* *J. Am. Chem. Soc.*, **2009**, *131*, 2588.

Kobayashi, S.; Lu, C.; Hoye, T.R.; **Hillmyer, M.A.** *Controlled Polymerization of a Cyclic Diene Prepared from the Ring-Closing Metathesis of a Naturally Occurring Monoterpene.* *J. Am. Chem. Soc.*, **2009**, *131*, 7960.

Phillip, W.A.; Martono, E.; Chen, L.; **Hillmyer, M.A.**; **Cussler, E.L.** *Seeking an Ammonia Selective Membrane Based on Nanostructured Sulfonated Block Copolymers.* *J. Membr. Sci.*, **2009**, *337*, 39.

Phillip, W.A.; Amendt, M.; O'Neill, B.; Chen, L.; **Hillmyer, M.A.**; **Cussler, E.L.** *Diffusion and Flow across Nanoporous Poly(dicyclopentadiene)-based Membranes.* *ACS Appl. Mater. Interfaces*, **2009**, *1*, 472.

Liu, C.; **Hillmyer, M.A.**; **Lodge, T.P.** *Multicompartement Micelles from pH Responsive Miktoarm Star Block Terpolymers.* *Langmuir*, **2009**, *25*, 13718.

Taribagil, R.; **Hillmyer, M.A.**; **Lodge, T.P.** *A Compartmentalized Hydrogel from a Linear ABC Terpolymer.* *Macromolecules*, **2009**, *42*, 1796.

Pangburn, T.O.; Petersen, M.A.; Waybrant, B.; Maroof, M.A.; **Kokkoli, E.** *Peptide and Aptamer Functionalized Nanovectors for Targeted Delivery of Therapeutics.* *J. Biomech. Eng.*, **2009**, *131*, 074005.

Abbas, S.; Cowman, C.D. *; **Lodge, T.P.** *Effect of Added Homopolymer on the Hexagonal Phase Formed by Cylindrical Block Copolymer Micelles in a Selective Solvent.* *Macromol. Rapid Commun.*, **2009**, *30*, 352. (*UMN Undergraduate)

Jones, B.H.; **Lodge, T.P.** *High-Temperature Nanoporous Ceramic Monolith from a Polymeric Bicontinuous Microemulsion Template.* *J. Am. Chem. Soc.*, **2009**, *131*, 1676.

Meli, L.; **Lodge, T.P.** *Equilibrium versus Metastability: High Temperature Annealing of Spherical Block Copolymer Micelles in an Ionic Liquid.* *Macromolecules*, **2009**, *42*, 580.

Zhang, J.; **Lodge, T.P.**; **Macosko, C.W.** *Models for Adhesion at Weak Polymer Interfaces.* J. Polym. Sci. Part B: Polym. Phys., **2009**, 47(23), 2312.

†Lee, P.C.; **Macosko, C.W.** *Die Design for Layer Thickness Uniformity in Multilayer Coextrusion.* SPE, ANTEC, Technical Papers, **2009**, 1542.

Lopez-Barron, C.; **Macosko, C.W.** *Characterizing Interface Shape Evolution in Immiscible Polymer Blends via 3D IAnalysis.* Langmuir, **2009**, 25(16), 9392.

Lee, P.C.; Park, H.E.; **Morse, D.C.**; **Macosko, C.W.** *Polymer-Polymer Interfacial Slip in Multilayered Films.* J.Rheol., **2009**, 53(4), 893.

Lee, J.; Kaake, L.G.; Cho, J.H.; **Zhu, X.-Y.**; **Lodge, T.P.**; **Frisbie, C.D.** *Ion Gel Gated Polymer Thin-Film Transistors: Operating Mechanism and Characterization of Gate Dielectric Capacitance, Switching Speed, and Stability.* J. Phys. Chem. C, **2009**, 113, 8972.

IRG-1 Publications resulting from PARTIAL MRSEC Support

Ellison, C.J.; Meuler, A.J.; Qin, J.; Evans, C.M.; Wolf, L.M.*; **Bates, F.S.** *Bicontinuous Polymeric Microemulsions from Polydisperse Diblock Copolymers.* J. Phys. Chem B., **2009**, 113, 3726. (*MRSEC REU Participant, 2007, Iowa State)

Wanamaker, C.L.; Bluemle, M.J.; Pitet, L.M.; O'Leary, L.E.; Tolman, W.B.; **Hillmyer, M.A.** *Consequences of Polylactide Stereochemistry on the Properties of Polylactide-Polymenthide-Polylactide Thermoplastic Elastomers.* Biomacromolecules, **2009**, 10, 2904.

Wanamaker, C.L.; Tolman, W.B.; **Hillmyer, M.A.** *Hydrolytic Degradation Behavior of a Renewable Thermoplastic Elastomer.* Biomacromolecules, **2009**, 10, 443.

Wanamaker, C.L.; Tolman, W.B.; **Hillmyer, M.A.** *Poly(d-lactide)-Poly(menthide)-Poly(d-lactide) Triblock Copolymers as Crystal Nucleating Agents for Poly(l-lactide).* Macromol. Symp., **2009**, 130, 283.

Nuxoll, E.E.; **Hillmyer, M.A.**; Wang, R.; **Leighton, C.**; **Siegel, R.A.** *Composite Block Polymer-Microfabricated Silicon Nanoporous Membrane.* ACS Appl. Mater. Interf., **2009**, 1, 888. (*cross-referenced in IRG-3*)

IRG-1 Publications resulting from the USE OF SHARED FACILITIES

Fleury, G.; **Bates, F.S.** *Perpendicular Lamellae in Parallel Lamellae in a Hierarchical CECEC-P Hexablock Terpolymer.* Macromolecules, **2009**, 42, 1691.

Fleury, G.; **Bates, F.S.** *Structure and Properties of Hexa- and Undeca-block Terpolymers with Hierarchical Molecular Architectures.* Macromolecules, **2009**, 42, 3598.

Liu, J.; Sue, H.-J.; Thompson, Z.J.; **Bates, F.S.**; Dettloff, M.; Jacob, G.; Verghese, N.; Pham, H. *Strain Rate Effect on Toughening of Nano-Sized PEP-PEO Block Copolymer Modified Epoxy.* Acta Materialia, **2009**, 57, 2691.

Stefik, M.; Mahajan, S.; Sai, H.; Epps, T.H.; **Bates, F.S.**; Gruner, S.M.; DiSalvo, F.J.; Wiesner, U. *Ordered Three- and Five-ply Nanocomposites from ABC Block Terpolymer Microphase Separation with Niobia and Aluminosilicate Sols.* Chemistry of Materials, **2009**, 21, 5466.

Thio, Y.S.; Wu, J.; **Bates, F.S.** *The Role of Inclusion Size in Toughening of Epoxy Resins by Spherical Micelles.* J. Polym. Sci., Polym. Phys., **2009**, 47, 1125.

Zupancich, J.A.; **Bates, F.S.**; **Hillmyer, M.A.** *Synthesis and Self-Assembly of RGD-functionalized PEO-PB Amphiphiles.* Biomacromolecules, **2009**, 10, 1554.

Choi, S.-H.; **Bates, F.S.**; **Lodge, T.P.** *Structure of Poly(styrene-*b*-ethylene-*alt*-propylene) Diblock Copolymer Micelles in Squalane.* J. Phys. Chem. B, **2009**, 113, 13840.

Boudouris, B.W.; Molins, F.; **Blank, D.A.**; **Frisbie, C.D.**; **Hillmyer, M.A.** *Synthesis, Optical Properties, and Microstructure of a Fullerene-terminated Poly(3-hexylthiophene)*. *Macromolecules*, **2009**, *42*, 4118.

Chen, J.; **Frisbie, C.D.**; **Bates, F.S.** *Lithium Perchlorate-Doped Poly(styrene-*b*-ethylene oxide-*b*-styrene) Lamellae-Forming Triblock Copolymers as High Capacitance, Smooth, Thin Film Dielectrics*. *J. Phys. Chem C*, **2009**, *113*, 3903.

Chang, K.; Robertson, M.L.; **Hillmyer, M.A.** *Morphology of Polylactide / Soybean Oil Blends Compatibilized by Block Copolymers*. *ACS Appl. Mater. Interfaces*, **2009**, *1*, 2390.

Chen, L.; **Hillmyer, M.A.** *Mechanically and Thermally Robust Ordered Nanoporous Monoliths Using Norbornene-Functional Block Polymers*. *Macromolecules*, **2009**, *42*, 4237.

Chen, L.; Hallinan, T.; Elabd, Y.A.; **Hillmyer, M.A.** *Highly Selective Polymer Electrolyte Membranes From Reactive Block Polymers*. *Macromolecules*, **2009**, *42*, 6075.

†Crossland, E.J.W.; Kamperman, M.; Nedelcu, M.; Ducati, C.; Wiesner, U.; Smilgies, D.-M.; Toombes, G.E.S.; **Hillmyer, M.A.**; Ludwigs, S.; Steiner, U.; Snaith, H.J. *A Bicontinuous Double Gyroid Hybrid Solar Cell*. *Nano Letters*, **2009**, *9*, 2807.

†Crossland, E.J.W.; Nedelcu, M.; Ducati, C.; Ludwigs, S.; **Hillmyer, M.A.**; Steiner, U.; Snaith, H.J. *Block Copolymer Morphologies in Dye-sensitized Solar Cells: Probing the Photovoltaic Structure-function Relation*. *Nano Letters*, **2009**, *9*, 2813.

†Hu, Z.; Finlay, J.A.; Chen, L.; Betts, D.E.; **Hillmyer, M.A.**; Callow, M.E.; Callow, J.A.; DeSimone, J.M. *Photochemically Crosslinked Perfluoropolyether-based Elastomers: Synthesis, Physical Characterization and Biofouling Evaluation*. *Macromolecules*, **2009**, *42*, 6999.

Lowe, J.R.; Tolman, W.B.; **Hillmyer, M.A.** *Oxidized Dihydrocarvone as a Renewable Multifunctional Monomer for the Synthesis of Shape Memory Polyesters*. *Biomacromolecules*, **2009**, *10*, 2003.

Pietrangelo, A.; **Hillmyer, M.A.**; Tolman, W.B. *Stereoselective and Controlled Polymerization of rac-Lactide Using Indium(III) Trichloride*. *Chem. Comm.*, **2009**, 2736.

Pitet, L.M.; **Hillmyer, M.A.** *Combining ROMP and ROP to Form ABA Triblock Copolymers from 1,5-cyclooctadiene and D,L-lactide*. *Macromolecules*, **2009**, *42*, 3674.

Qin, Y.; **Hillmyer, M.A.** *Poly(3-hexyl-2,5-thienylene vinylene) by ADMET Polymerization of a Dipropenyl Monomer*. *Macromolecules*, **2009**, *42*, 6429.

Meuler, A.J.; **Hillmyer, M.A.**; **Bates, F.S.** *Ordered Network Mesostuctures in Block Polymer Materials*. *Macromolecules*, **2009**, *42*, 7221.

Meuler, A.J.; Ellison, C.J.; Qian, J.; Evans, C.M.; **Hillmyer, M.A.**; **Bates, F.S.** *Polydispersity Effects in Poly(isoprene-*b*-styrene-*b*-ethylene oxide) Triblock Terpolymers*. *J. Chem. Phys.*, **2009**, *130*, 234903.

Thompson, Z.J.; **Hillmyer, M.A.**; Liu, J.; Sue, H.-J.; Dettloff, M.; **Bates, F.S.** *Block Copolymer Toughened Epoxy: Role of Crosslink Density*. *Macromolecules*, **2009**, *42*, 2333.

Kim, J.Y.; Qin, Y.; Stevens, D.M.; Ugurlu, O.; Kalihari, V.; **Hillmyer, M.A.**; **Frisbie, C.D.** *Low Bandgap Poly(thienylenevinylene)/Fullerene Bulk-Heterojunction Photovoltaic Cells*. *J. Phys. Chem. C*, **2009**, *113*, 10790. (*cross-referenced in IRG-2*)

Stevens, D.M.; Qin, Y.; **Hillmyer, M.A.**; **Frisbie, C.D.** *Enhancement of the Morphology and Open Circuit Voltage in Bilayer Polymer/Fullerene Solar Cells*. *J. Phys. Chem. C*, **2009**, *113*, 11408.

- Bai, Z.; **Lodge, T.P.** *Thermodynamics and Mechanism of the Block Copolymer Micelle Shuttle between Water and an Ionic Liquid.* J. Phys. Chem. B, **2009**, *113*, 14151.
- †Noro, A.; Matsushita, Y.; **Lodge, T.P.** *Gelation Mechanism of Thermoreversible Supramolecular Ion Gels via Hydrogen Bonding.* Macromolecules, **2009**, *42*, 5802.
- †Ueki, T.; Watanabe, M.; **Lodge, T.P.** *Doubly Thermosensitive Self-Assembly of Diblock Copolymers in Ionic Liquids.* Macromolecules, **2009**, *42*, 1315.
- Bluemle, M.J.; Fleury, G.; **Lodge, T.P.**; **Bates, F.S.** *The O^{52} Network by Molecular Design: CECD Tetrablock Terpolymers.* Soft Materials, **2009**, *5*, 1587.
- Ji, S.; Zhu, Z.; Hoyer, T.R.; **Macosko, C.W.** *Maleimide Functionalized poly(ϵ -caprolactone) blockpoly(ethylene glycol) (PCL-PEG-MAL): Synthesis, Nanoparticle Formation, and Thiol Conjugation.* Macromolecular Chemistry and Physics, **2009**, *210(10)*, 823.
- Kim, H.; **Macosko, C.W.** *Processing-property Relationships of Polycarbonate/graphene Composites.* Polymer, **2009**, *50*, 3797.
- Harikrishnan, G.; **Macosko, C.W.**; Choi, J.H.; **Bischof, J.C.**; Singh, S.N. *A Simple Transient Method for Measurement of Thermal Conductivity of Rigid Polyurethane Foams.* J. Cellular Plastics, **2008**, *44*, 481.
- Lei, M.; Baldi, A.; Nuxoll, E.E.; **Siegel, R.A.**; Ziaie, B. *Hydrogel-Based Microsensors for Wireless Chemical Monitoring.* Biomed. Microdev., **2009**, *11*, 529.

IRG-2 ORGANIC OPTOELECTRONIC INTERFACES

IRG-2 Publications resulting from PRIMARY MRSEC Support

- †Coropceanu, V.; Sanchez-Carrera, R.S.; Paramonov, P.; Day, G.M.; **Bredas, J.L.** *The Interaction of Charge Carriers with Lattice Vibrations in Organic Molecular Semiconductors: Naphthalene as a Case Study.* J. of Phys. Chem., **2009**, *113*, 4679.
- †Heimel, G.; Zojer, E.; Romaner, L.; **Bredas, J.L.**; Stallacci, F. *Doping Molecular Wires.* NanoLetters, **2009**, *9*, 2559.
- †Kjelstrup-Hansen, J.; Norton, J.E.; da Silva Filho, D.A.; **Bredas, J.L.**; Rubahn, H.G. *Charge Transport in Oligo Phenylene and Phenylene-Thiophene Nanofibers.* Organic Electronics, **2009**, *10*, 1228.
- †Martinelli, N.G.; Olivier, Y.; Athanasopoulos, S.; Ruiz Delgado, M.C.; Pigg, K.R.; da Silva Filho, D.A.; Sanchez-Carrera, R.S.; Venuti, E.; Della Valle, R.G.; **Bredas, J.L.**; Beljonne, D.; Cornil, J. *Influence of Intermolecular Vibrations on the Electronic Coupling in Organic Semiconductors: The Case of Anthracene and Perfluoropentacene.* Chem. Phys. Chem., **2009**, *10*, 2265.
- †Ruiz Delgado, M.C.; Pigg, K.R.; da Silva Filho, D.A.; Gruhn, N.E.; Sakamoto, Y.; Suzuki, T.; Malave Osuna, R.; Casado, J.; Hernandez, V.; Lopez-Navarrette, J.T.; Coropceanu, V.; Sanchez-Carrera, R.S.; **Bredas, J.L.** *Impact of Perfluorination on the Charge-Transport Parameters of Oligoacene Crystals.* Journal of the American Chemical Society, **2009**, *131*, 1502.
- Salman, S.; Ruiz Delgado, M.C.; Coropceanu, V.; **Bredas, J.L.** *Electronic Structure and Charge-Transport Parameters of Functionalized Tetracene Crystals: Impact of Partial Fluorination and Alkyl or Alkoxy Derivatization.* Chemistry of Materials, **2009**, *21*, 3593.
- Bader, M.*; Pham, P.T.T.; Nassar, B.R.*; Lin, H.; Xia, Y.; **Frisbie, C.D.** *Extended 7,7,8,8-Tetracyano-p-quinodimethane-Based Acceptors: How Molecular Shape and Packing Impact Electron Accepting Behavior.* Crys. Growth Design, **2009**, *9*, 4599. (**MRSEC Faculty-Student Team, 2009, Pennsylvania State University-Hazleton**)
- Xia, Y.; Cho, J.H.; Paulsen, B.; **Frisbie, C.D.**; Renn, M. J. *Correlation of On-State Conductance with Referenced Electrochemical Potential in Ion Gel Gated Polymer Transistors.* Appl. Phys. Lett., **2009**, *94*, 013304/1.
- Xia, Y.; Zhang, W.; Ha, M.; Cho, J.H.; Renn, M.J.; Kim, C.H.; **Frisbie, C.D.** *Printed, Sub-2V Gel Electrolyte-Gated Polymer Transistors and Circuits.* Adv. Funct. Mater., **2010**, *20* (page number not assigned; online 1/12/10).
- Yagodkin, E.; Xia, Y.; Kalihari, V.; **Frisbie, C.D.**; **Douglas, C.J.** *Synthesis, Solid-State Properties, and Semiconductor Measurements of 6,6,11,12-Tetrachlorotetracene.* J. Phys. Chem. C., **2009**, *113*, 16544.
- Luhman, W.A.; **Holmes, R.J.** *Enhanced Exciton Diffusion in an Organic Photovoltaic Cell by Energy Transfer using a Phosphorescent Sensitizer.* Appl. Phys. Lett., **2009**, *94*, 153304.
- Kang, M.S.; Lee, J.; **Norris, D.J.**; **Frisbie, C.D.** *High Carrier Densities Achieved at Low Voltages in Ambipolar PbSe Nanocrystal Thin-Film Transistors.* Nano Lett., **2009**, *9*, 3848.
- Xia, Y.; Cho, J.H.; Lee, J.; **Ruden, P.P.**; **Frisbie, C.D.** *Comparison of the Mobility-Carrier Density Relation in Polymer and Single-Crystal Organic Transistors Employing Vacuum and Liquid Gate Dielectrics.* Adv. Mater., **2009**, *21*, 2174.

IRG-2 Publications resulting from PARTIAL MRSEC Support

Liang, Y.; **Frisbie, C.D.**; Chang, H.C.; **Ruden, P.P.** *Conducting Channel Formation and Annihilation in Organic Field-Effect Structures*. J. Appl. Phys., **2009**, *105*, 024514/1.

Kim, J.Y.; Qin, Y.; Stevens, D.M.; Kalihari, V.; **Hillmyer, M.A.**; **Frisbie, C.D.** *High Open-Circuit Voltage Photovoltaic Cells with a Low Bandgap Copolymer of Isothianaphthene, Thiophene, and Benzothiadiazole*. J. Phys. Chem. C, **2009**, *113* (52), 21928.

Kim, J.Y.; Qin, Y.; Stevens, D.M.; Ugurlu, O.; Kalihari, V.; **Hillmyer, M.A.**; **Frisbie, C.D.** *Low Bandgap Poly(thienylenevinylene)/Fullerene Bulk Heterojunction Photovoltaic Cells*. J. Phys. Chem. C, **2009**, *113*, 10790. (*cross-referenced in IRG-1*)

Zhu, X.-Y.; Yang, Q.; Muntwiler, M. *Charge Transfer Excitons at Organic Semiconductor Surfaces and Interfaces*. Acct. Chem. Res., **2009**, *42*, 1779.

Muntwiler, M.; Yang, Q.; **Zhu, X.-Y.** *Exciton Dynamics at Interfaces of Organic Semiconductors*. J. Elec. Spec. Relat. Phenom., **2009**, *174*, 116.

Yang, Q.; Muntwiler, M.; **Zhu, X.-Y.** *Charge Transfer Excitons and Image Potential States on Organic Semiconductor Surfaces*. Phys. Rev. B, **2009**, *80*, 115214.

Lee, J.; Kaake, L.G.; Cho, J.H.; **Zhu, X.-Y.**; **Lodge, T.P.**; **Frisbie, C.D.** *Ion Gel-Gated Polymer Thin-Film Transistors: Operating Mechanism and Characterization of Gate Dielectric Capacitance, Switching Speed, and Stability*. J. Phys. Chem. C, **2009**, *113*, 8972.

IRG-2 Publications resulting from the USE OF SHARED FACILITIES

†Ribic, P.R.; Kalihari, V.; **Frisbie, C.D.**; Bratina, G. *Growth of Ultrathin Pentacene Films on Polymeric Substrates*. Phys. Rev. B, **2009**, *80*, 115307/1.

Kalihari, V.; Ellison, D.J.; **Haugstad, G.**; **Frisbie, C.D.** *Observation of Unusual Homoepitaxy in Ultrathin Pentacene Films and Correlation with Surface Electrostatic Potential*. Adv. Mater., **2009**, *21*, 3092.

IRG-3 MAGNETIC HETEROSTRUCTURES

IRG-3 Publications resulting from PRIMARY MRSEC Support

†Schultz, B.D.; Marom, N.; Naveh, D.; Lou, X.; Adelman, C.; Strand, J.; **Crowell, P.A.**; Kronik, L.; **Palmstrøm, C.J.** *Spin Injection across the Fe/GaAs Interface: Role of Interfacial Ordering*. Phys. Rev. B, **2009**, *80*, 201309(R).

Guo, F.; McKusky, G.; **Dahlberg, E.D.** *An Investigation of the Magnetic State Dependent Low Frequency Noise in Magnetic Tunnel Junctions*. Applied Physics Letters, **2009**, *95*, 062512.

Kobriniskii, A.I.; **Goldman, A.M.**; Pennycook, S.J.; Varela, M. Thickness Dependence of the Exchange Bias in Epitaxial Manganite Bilayers. Phys. Rev. B., **2009**, *79*, 094405.

Manno, M.; Frakie, R.*; **Leighton, C.** *Synthesis and Characterization of Highly Spin-polarized Single-Phase $Co_{1-x}Fe_xS_2$ Films*. J. Appl. Phys., **2009**, *105*, 093912. (* UMN Undergraduate)

Manno, M.; Frakie, R.*; Bolon, B.; **Leighton, C.** *Spin-dependent Intergranular Transport in Highly Spin-polarized $Co_{1-x}Fe_xS_2$ Thin Films*. Appl. Phys. Lett., **2009**, *95*, 182510. (* UMN Undergraduate)

Huang, X.; Tan L.; Cho, H.; **Stadler, B.J.H.** *Magnetoresistance and Spin Transfer Torque in Electrodeposited Co/Cu Multilayered Nanowire Arrays with Small Diameters*. Journal of Applied Physics, **2009**, *103*, 07B504.

Hsu, H.; Umemoto, K.; Cococcioni, M.; **Wentzcovitch, R.M.** *First Principles Study of Low-spin $LaCoO_3$ with Structurally Consistent Hubbard U* . Phys. Rev. B, **2009**, *79*, 125124.

IRG-3 Publications resulting from PARTIAL MRSEC Support

Nuxoll, E.; **Hillmyer, M.A.**; Wang, R.F.; **Leighton, C.**; **Siegel, R.A.** *Composite Block Polymer-Microfabricated Silicon Nanoporous Membrane*. ACS Appl. Mat. and Int., **2009**, *1*, 888. (*cross-referenced in IRG-1*)

†Cordill, M.J.; Lund, M.S.; Parker, J.; **Leighton, C.**; Nair, A.K.; Farkas, D.; Moody, N.R.; Gerberich, W.W. *The Nano-Jackhammer Effect in Probing Near-surface Mechanical Properties*. Int. J. Plasticity, **2009**, *25*, 2045.

He, C.; Eisenberg, S.*; Jan, C.; Zheng, H.; Mitchell, J.F.; **Leighton, C.** *Heat Capacity Study of Magneto-electronic Phase Separation in $La_{1-x}Sr_xCoO_3$ Single Crystals*. Phys. Rev. B., **2009**, *80*, 214411 (***MRSEC REU Participant, 2008, Harvey-Mudd College**).

He, C.; El-Khatib, S.; Eisenberg, S.*; Manno, M.; Lynn, J.W.; Zheng, H.; Mitchell, J.F.; **Leighton, C.** *Transport Signatures of Percolation and Phase Inhomogeneity in $La_{1-x}Sr_xCoO_3$ Single Crystals*. Appl. Phys. Lett., **2009**, *95*, 222511 (***MRSEC REU Participant, 2008, Harvey-Mudd College**).

Utfeld, C.; Giblin, S.R.; Taylor, J.W.; Duffy, J.A.; Shenton-Taylor, C.; Laverock, J.; Dugdale, S.B.; Manno, M.; **Leighton, C.**; Itou, M.; Sakurai, Y. *Bulk Spin Polarization of $Co_{1-x}Fe_xS_2$* . Phys. Rev. Lett., **2009**, *103*, 226403.

Wu, N.; Sabirianov, R.F.; Mei, W.N.; Losovyj, Y.B.; Lozova, N.; Manno, M.; **Leighton, C.**; Dowben, P.A. *The Minority Spin Surface Bands of $CoS_2(001)$* . J. Phys. Cond. Mat., **2009**, *21*, 295501.

Crooker, S.A.; Garlid, E.; Chantis, A.N.; Smith, D.L.; Reddy, K.S.M.; Hu, Q.; Kondo, T.; **Palmstrøm, C.J.**; **Crowell, P.A.**; *Bias-controlled Sensitivity of Ferromagnet-semiconductor Electrical Spin Detectors*. Phys. Rev. B, **2009**, *80*, 041305(R).

Chen, X.; **Victora, R.H.** *Phase Locking of Spin-Torque Oscillators by Spin-Wave Interactions.* Phys. Rev. B, **2009**, 79, 180402(R).

IRG-3 Publications resulting from the USE OF SHARED FACILITIES

Chan, M.K.; Hu, Q.O.; Zhang, J.; Kondo, T.; **Palmstrøm, C.J.**; **Crowell, P.A.** *Hyperfine Interactions and Spin Transport in Ferromagnet-semiconductor Heterostructures.* Phys. Rev. B, **2009**, 80, 161206(R).

Jing, Y.; Sohn, H.; Kline, T.; **Victora, R.H.**; **Wang, J.P.** *Experimental and Theoretical Investigation of Cubic FeCo Nanoparticles for Magnetic Hyperthermia.* Journal of Applied Physics, **2009**, 105, 07B305.

Srinivasan, B.; Li, Y.; Jing, Y.; Xu, Y.; Yao, X.; Xing, C.; **Wang, J.P.** *A GMR Sensor- and Magnetic Nanoparticle-based Detecting System of Zeptomol Sensitivity: An Integrated Platform Potentially Leading to Personalized Medicine.* Angew. Chem. Int. Edit., **2009**, 48 (15), 2764.

Zeng, P.; Kline, T.; **Wang, J.P.**; Wiedmann, T. *Thermal Response of Superparamagnetic Nanoparticles Suspended in Liquid and Solid Media.* J. Magnetism and Magnetic Materials, **2009**, 321, 373.

†**Wentzcovitch, R.M.**; Justo, J.F.; Wu, Z.; da Silva, C.R.S.; Yuen, D.; Kohlstedt, D. *Anomalous Compressibility of Ferroperricline throughout the Iron Spin Crossover.* Proc. Natl. Acad. Sc. USA, **2009**, 106, 8447.

†Wu, Z.; Justo, J.F.; da Silva, C.R.S.; de Gironcoli, S.; **Wentzcovitch, R.M.** *Anomalous Thermodynamic Properties in Ferroperricline throughout its Spin Crossover Transition.* Phys. Rev. B, **2009**, 80, 014409.

IRG-4 NANOPARTICLE-BASED MATERIALS

IRG-4 Publications resulting from PRIMARY MRSEC Support

Liu, B.; **Aydil, E.S.** *Growth of Oriented Single-Crystalline Rutile TiO₂ Nanorods on Transparent Conducting Substrates for Dye-Sensitized Solar Cells.* J. Am. Chem. Soc., **2009**, *131*, 3985.

Anthony, R.; **Kortshagen, U.** *Photoluminescence Quantum Yields of Amorphous and Crystalline Silicon Nanoparticles.* Physical Review B, **2009**, *80(11)*, 6.

Liu, C.-Y.; Holman, Z.C.; **Kortshagen, U.** *Hybrid Solar Cells from P3HT and Silicon Nanocrystals.* Nano Letters, **2009**, *9(1)*, 449.

Liptak, R. W.; Thomas III, J. H.; **Kortshagen, U.**; **Campbell, S.A.** *SF₆ Dry Etching of Silicon Nanocrystals.* Nanotechnology, **2009**, *20*, 035603.

Kang, M.S.; Lee, J.; **Norris, D.J.**; **Frisbie, C.D.** *High Carrier Densities Achieved at Low Voltages in Ambipolar PbSe Nanocrystal Thin-Film Transistors.* Nano Letters, **2009**, *9*, 3848.

Holm, J.T.; **Roberts, J.T.** *Sintering, Coalescence, and Compositional Changes of Hydrogen-Terminated Silicon Nanoparticles as a Function of Temperature.* Journal of Physical Chemistry, **2009**, *113*, 15955.

Holm, J.T.; **Roberts, J. T.** *Thermally Induced Hydrosilylation at Deuterium-Terminated Silicon Nanoparticles: An Investigation of the Radical Chain Propagation Mechanism.* Langmuir, **2009**, *25*, 7050.

IRG-4 Publications resulting from PARTIAL MRSEC Support

Jeong, S.; **Aydil, E.S.** *Heteroepitaxial Growth of Cu₂O Thin Film on ZnO by Metal Organic Chemical Vapor Deposition.* J. Cryst. Growth, **2009**, *311*, 4188.

Enache-Pommer, E.; Liu, B.; **Aydil, E.S.** *Electron Transport and Recombination in Dye-Sensitized Solar Cells Made from Single Crystal Rutile TiO₂ Nanowires.* Phys. Chem., **2009**, *11*, 9648.

Leschkies, K.S.; Beatty, T.J.*; Kang, M.S.; **Norris, D.J.**; **Aydil, E.S.** *Solar Cells Based on Junctions between Colloidal PbSe Nanocrystals and Thin ZnO Films.* ACS Nano., **2009**, *3*, 3638. (MRSEC REU Participant, 2008, University of California Santa Barbara)

Robel, I.; Gresback, R.; **Kortshagen, U.**; Schaller, R.D.; Klimov, V.I. *Universal Size-Dependent Trend in Auger Recombination in Direct-Gap and Indirect-Gap Semiconductor Nanocrystals.* Physical Review Letters, **2009**, *102(17)*, 4.

Kortshagen, U. *Nonthermal Plasma Synthesis of Semiconductor Nanocrystals.* J. of Physics D Applied Physics, **2009**, *42(11)*, 22.

Pi, X.D.; **Kortshagen, U.** *Nonthermal Plasma Synthesized Freestanding Silicon-Germanium Alloy Nanocrystals.* Nanotechnology, **2009**, *20(29)*, 295602.

IRG-4 Publications resulting from the USE OF SHARED FACILITIES

Leschkies, K.S.; Jacobs, A.G.; **Norris, D.J.**; **Aydil, E.S.** *Nanowire-Quantum-Dot Solar Cells and the Influence of Nanowire Length on the Charge Collection Efficiency.* Appl. Phys. Lett., **2009**, *95*, 193103.

Berquo, T.S.; Erbs, J.J.; Lindquist, A.; **Penn, R.L.**; Banerjee, S.K., *Effects of Magnetic Interactions in Antiferromagnetic Ferrihydrite Particles.* J. Phys. Condensed Matter, **2009**, *21*.

†French, R.A.; Jacobson, A.R.; Kim, B.; Isley, S.L.; **Penn, R.L.**; Baveye, P.C. *Influence of Ionic Strength, pH, and Cation Valence on Aggregation Kinetics of Titanium Dioxide Nanoparticles.*

Environmental Science & Technology, **2009**, *43*, 1354.

Isley, S.L.; Jordan, D.S.; **Penn, R.L.** *Titanium Dioxide Nanoparticles: Impact of Increasing Ionic Strength during Synthesis, Reflux, and Hydrothermal Aging*. Materials Research Bulletin, **2009**, *44*, 119.

Ratkovich, A.S.; **Penn, R.L.** *Zinc Oxide Nanoparticle Growth from Homogenous Solution: Influence of Zn:OH, Water Concentration, and Surfactant Additive*. Materials Research Bulletin, **2009**, *44*, 993.

Yoo, W.; Kumar, S.; **Penn, R.L.**; **Tsapatsis, M.**; **Stein, A.** *Growth Patterns and Shape Development of Zeolite Nanocrystals in Confined Syntheses*. J. American Chemical Society, **2009**, *131*, 12377.

Boies, A.M.; **Roberts, J.T.**, **Girshick, S.L.**; Zhang, B.; Nakamura, T.; Mochizuki, A. *SiO₂ Coating of Silver Nanoparticles by Photoinduced Chemical Vapor Deposition*. Nanotechnology, **2009**, *20*, 295604. (*cross-referenced in Seed*)

MRSEC SEED

MRSEC Seed Publications resulting from PRIMARY MRSEC Support

Zhang, D.-B.; **Dumitrica, T.** *Modulating the Optical and Electronic Properties of Highly Symmetric Si Quantum Dots*. Nanotechnology, **2009**, *20*, 445401.

Lee, S.H.; Bantz, K.C.; Lindquist, N.C.; **Oh, S.-H.**; **Haynes, C.L.** *Self-Assembled Plasmonic Nanohole Arrays*. Langmuir, **2009**, *25*(23), 13685.

MRSEC Seed Publications resulting from PARTIAL MRSEC Support

Boies, A. M.; **Roberts, J. T.**; **Girshick, S. L.**; Zhang, B.; Nakamura, T.; Mochizuki, A. *SiO₂ Coating of Silver Nanoparticles by Photoinduced Chemical Vapor Deposition*. Nanotechnology, **2009**, *20*, 295604. (*cross-referenced in IRG-4*)

MRSEC Seed Publications resulting from the USE OF SHARED FACILITIES

†Cho, H.-G.; Andrews, L.; Vlaisavljevich, B.; **Gagliardi, L.** *Infrared Spectra of Small Insertion and Methylidene Complexes in Reactions of Laser-Ablated Pd Atoms with Halomethanes*. Organometallics, **2009**, *28*(24), 6871.

†Bozoglian, F.; Romain, S.; Ertem, M.; Todorova, T.; Sens, C.; Mola, J.; Rodriguez, M.; Romero, I.; Benet-Buchholz, J.; Fontrodona, X.; Cramer, C. J.; Christopher; **Gagliardi, L.**; Llobet, A. *Ru-Hbpp Water Oxidation Catalyst*. J. Am. Chem. Soc., **2009**, *141*(42), 15176.

Moughal Shahi, A. R.; Cramer, C. J.; **Gagliardi, L.** *Second-Order Perturbation Theory with Complete and Restricted Active Space Reference Functions Applied to Oligomeric Unsaturated Hydrocarbons*. Phys. Chem. Chem. Phys., **2009**, *11*, 10964.

†Cho, H.-G.; Andrews, L.; Vlaisavljevich, B.; **Gagliardi, L.** *Infrared Spectra of Small Insertion and Methylidene Complexes in Reactions of Laser-Ablated Ni Atoms with Halomethanes*. Organometallics, **2009**, *28*(19), 5623.

Nagpal, P.; Lindquist, N.C.; **Oh, S.-H.**; **Norris, D.J.** *Ultra-Smooth Patterned Metals for Plasmonics and Metamaterials*. Science, **2009**, *325*, 594.

Yoo, W. C.; Kumar, S.; **Penn, R. L.**; **Tsapatsis, M.**; **Stein, A.** *Growth Patterns and Shape Development of Zeolite Nanocrystals in Confined Syntheses*. J. Am. Chem. Soc., **2009**, *131*, 12377.

Li, F.; Yoo, W. C.; Beernink, M. B.*; **Stein, A.** *Site-Specific Functionalization of Anisotropic Nanoparticles: From Colloidal Atoms to Colloidal Molecules*. J. Am. Chem. Soc., **2009**, *131* (51), 18548.

Li, F.; **Stein, A.** *Conjugation of Colloidal Clusters and Chains by Capillary Condensation*. J. Am. Chem. Soc., **2009**, *131*, 9920.

Lai, C. Z.; Joyer, M. M.*; Fierke, M. A.; Petkovich, N. D.*; **Stein, A.**; **Buhlmann, P.** *Subnanomolar Detection Limit Application of Ion-Selective Electrodes with Three-Dimensionally Ordered Macroporous (3DOM) Carbon Solid Contacts*. J. Solid State Electrochem., **2009**, *13*, 123.

Wang, Z.; Al-Daous, M. A.; Kiesel, E. R.*; Li, F.; **Stein, A.** *Design and Synthesis of 3D Ordered Macroporous ZrO₂/Zeolite Nanocomposites*. Microporous Mesoporous Mater., **2009**, *120*, 351.

Stein, A.; Li, F.; Wang, Z. *Synthesis of Shaped Particles and Particle Arrays by Disassembly Methods*. J. Mater. Chem., **2009**, *19*, 2102.

MRSEC-SUPPORTED PATENTS

The following patents were based on work related to MRSEC programs, but the personnel performing work that directly produced these patents were supported by other sources. These patents, however, benefited from the general intellectual environment of the MRSEC and the access to Shared Facilities, with user fees charged according to University and Federal guidelines.

Jing, F.; **Hillmyer, M.A.** *Bifunctional Lactide Monomer Derivative and Polymer and Materials Prepared Using the Same*. US Provisional (2008)

Norris, D.J.; Han, S.E.; Nagpal, P.; Lindquist, N.C.; **Oh, S.-H.** *Replication of Patterned Thin-Film Structures for Use in Plasmonics and Metamaterials*. United States Patent Pending; Filed November 24, 2009.

Victoria, R. H. and Chen, X. *Exchange-Assisted Spin Transfer Torque Switching*, United States Patent Application filed on August 13, 2009.