

12. MRSEC-SUPPORTED PUBLICATIONS AND PATENTS

(September 1, 2008 – February 28, 2009)

These are all the MRSEC-supported publications since the last annual report. Publications noted with an asterisk (*) include funding from the new MRSEC award, NSF-DMR#-0819885.

IRG-1 ENGINEERED MULTIBLOCK POLYMERS

IRG-1 Publications resulting from PRIMARY MRSEC Support

Hammer, D.A.; Robbins, G.R.; Lin, J.J.; Smith, L.A.; Ghoroghchian, P.P.; Therien, M. J.; **Bates, F.S.** *Leuko-Polymerosomes*. Farady Discussions, **2008**, 139, 1.

Jain, S.; Dyrdal, M.H.E.; Gong, X.; Scriven, L.E.; **Bates, F.S.** *Lyotropic Phase Behavior of Poly(ethyleneoxide)-Poly(butadiene) Diblock Copolymers: Evolution of the Random Network Morphology*. Macromolecules, **2008**, 41, 3305.

*Hamilton, B.D.; **Hillmyer, M.A.**; Ward, M.D. *Glycine Polymorphism in Nanoscale Crystallization Chambers*. Crystal Growth & Design, **2008**, 8, 3368.

*Liu, C.; **Hillmyer, M.A.**; **Lodge, T.P.** *Evolution of Multicompartment Micelles to Mixed Corona Micelles Using Solvent Mixtures*. Langmuir, **2008**, 24, 12001.

Lynd, N.A.; Meuler, A.J.; **Hillmyer, M.A.** *Polydispersity and Block Copolymer Self-Assembly*. Prog. Polym. Sci., **2008**, 33, 875.

Demirgöz, D.; Garg, A.; **Kokkoli, E.** *PR_b-Targeted PEGylated Liposomes for Prostate Cancer Therapy*. Langmuir, **2008**, 24, 13518.

Abbas, S.; **Lodge, T.P.** *Depletion Interactions: Effects of Added Homopolymer on Ordered Phases Formed by Spherical Block Copolymer Micelles*. Macromolecules, **2008**, 41, 8895.

Abbas, S.; **Lodge, T.P.** *Superlattice Formation in Binary Mixtures of Block Copolymer Micelles*. Langmuir, **2008**, 24, 6247.

*Davis, K.P.; **Lodge, T.P.**; **Bates, F.S.** *Vesicle Membrane Thickness in Aqueous Dispersions of Block Copolymer Blends*. Macromolecules, **2008**, 41, 8289.

Saito, N.; Liu, C.; **Lodge, T.P.**; **Hillmyer, M.A.** *Multicompartment Micelles from Polyester-Containing ABC Miktoarm Star Terpolymers*. Macromolecules, **2008**, 41, 8815.

IRG-1 Publications resulting from PARTIAL MRSEC Support

*Kubo, T.; Wang, R.; Olson, D.; Rodwogin, M.; **Hillmyer, M.A.**; **Leighton, C.** *Spontaneous Alignment of Self-assembled ABC Triblock Terpolymers for Large-area Nanolithography*. Appl. Phys. Lett., **2008**, 93, 133112-1. (*cross-referenced in IRG-3*)

Mao, H.; **Hillmyer, M.A.** *Morphological Behavior of Polystyrene-*b*-Polylactide/ Polystyrene-*b*-Poly(ethylene oxide) Blends*. Macromol. Chem. Phys., **2008**, 209, 1647.

Meuler, A.J.; Ellison, C.J.; **Hillmyer, M.A.**; **Bates, F.S.** *Polydispersity-Induced Stabilization of the Core-Shell Gyroid*. Macromolecules, **2008**, 41, 6272.

IRG-1 Publications resulting from the USE OF SHARED FACILITIES

Liu, J.; Sue, H.-J.; Thompson, Z.J.; **Bates, F.S.**; Dettloff, M.; Jacob, G.; Verghese, N.; Pham, H. *Nano-Cavitation in Self-Assembled Amphiphilic Block Copolymer-Modified Epoxy*. Macromolecules, **2008**, 41, 7616.

- Shrivastava, A.; Kumar, S.; **Cussler, E.L.** *Predicting the Effect of Membrane Spacers on Mass Transfer.* J. Memb. Sci., **2008**, 323, 247.
- Shrivastava, A.; **Cussler, E.L.**; Kumar, S. *Mass Transfer Enhancement due to a Soft Elastic Boundary.* Chem. Engr. Sci., **2008**, 63, 4302.
- *Hu, Z.; Chen, L.; Betts, D.; Pandya, A.; **Hillmyer, M.A.**; DeSimone, J.M. *Optically Transparent, Amphiphilic Networks Based on Blends of Perfluoropolyethers and Poly(ethyleneglycol).* J. Am. Chem. Soc., **2008**, 130, 14244.
- Jing, F.; **Hillmyer, M.A.** *A Bifunctional Monomer Derived Directly from Lactide for Toughening Poly(lactide).* J. Am. Chem. Soc., **2008**, 130, 13826.
- Meuler, A.; Fleury, G.; **Hillmyer, M.A.**; **Bates, F.S.** *Structure and Mechanical Properties of an Orthorhombic Fddd Network-Forming Pentablock Terpolymer.* Macromolecules, **2008**, 41, 5809.
- Bai, Z.; He, Y.; Young, N.P.*; **Lodge, T.P.** *A Thermoreversible Micellization-Transfer-Demicellization Shuttle between Water and an Ionic Liquid.* Macromolecules, **2008**, 41, 6615. (***Summer 2007 REU Participant, Bucknell University**)
- Cho, J.H.; Lee, J.; Kim, B.; He, Y.; Xia, Y.; Renn, M. J.; **Lodge, T.P.**; **Frisbie, C.D.** *Printable Ion Gel Gate Dielectrics for Low Voltage Polymer Thin Film Transistors on Plastic.* Nature Materials, **2008**, 7, 900.
- Gaikwad, A.; Wood, E.R.*; Ngai, T.; **Lodge, T.P.** *Two Calorimetric Glass Transitions in Miscible Blends Containing Poly(ethyleneoxide).* Macromolecules, **2008**, 41, 2502. (***Undergraduate student, University of Minnesota**)
- Noro, A.; Matsushita, Y.; **Lodge, T.P.** *Thermoreversible Supramacromolecules via Hydrogen Bonding in an Ionic Liquid.* Macromolecules, **2008**, 41, 5839.
- Simone, P.M.; **Lodge, T.P.** *Lyotropic Phase Behavior of Polybutadiene-Poly(ethylene oxide) Block Copolymers in Ionic Liquids.* Macromolecules, **2008**, 41, 1753.
- Zeroni, I.; Ozair, S.; **Lodge, T.P.** *Component Terminal Dynamics in Poly(ethylene oxide)/Poly(methylmethacrylate) Blends.* Macromolecules, **2008**, 41, 5033.
- Macosko, C.W.**; Hoye T.; Ji, S.J. *Diamino Telechelic Polybutadienes for Solventless Styrene-Butadiene-Styrene (SBS) Triblock Copolymer Formation.* Polymer, **2008**, 49(24), 5307.
- Macosko, C.W.**; Kaşgöv, A.; Durmus, A. *Mechanical Properties of Linear Low-density Polyethylene (LLDPE)/clay Nanocomposites: Estimation of Aspect Ratio and Interfacial Strength by Composite Models.* J. Macromolecular Science Part B: Physics, **2008**, 47, 608.
- Macosko, C.W.**; Kim, H. *Morphology and Properties of Poly Polyester/Exfoliated Graphite Nanocomposites.* Macromolecules, **2008**, 41, 3317.

IRG-2 ORGANIC OPTOELECTRONIC INTERFACES

IRG-2 Publications resulting from PRIMARY MRSEC Support

Cho, J.-H.; Lee, J.; Xia, Y.; Kim, B.-S.; He, Y.; Renn, M.J.; **Lodge, T.P.**; **Frisbie, C.D.** *Printable Ion Gel Gate Dielectrics for Low Voltage Polymer Thin Film Transistors on Plastic*. Nature Materials, **2008**, 7, 900.

Muntwiler, M.; Yang, Q.; Tisdale, W.A.; **Zhu, X.-Y.** *Coulomb Barrier for Charge Separation at an Organic Semiconductor Interface*. Phys. Rev. Lett., **2008**, 101, 196403.

Muntwiler, M.; **Zhu, X.-Y.** *Image Potential States on the Metallic (111) Surface of Bismuth*. New J. Phys., **2008**, 10, 113018.

Schroepfer, D.D.; **Ruden, P.P.**; Xia, Y.; **Frisbie, C.D.**; Shaheen, S.E.; *Hydrostatic Pressure Effects on Poly(3-hexylthiophene) Thin Film Transistors*. Appl. Phys. Lett., **2008**, 92, 013305.

IRG-2 Publications resulting from PARTIAL MRSEC Support

Lindquist, N.C.; Luhman, W.A.; Oh, S.-H.; **Holmes, R.J.** *Plasmonic Nanocavity Arrays for Enhanced Efficiency in Organic Photovoltaic Cells*. Appl. Phys. Lett., **2008**, 93, 123308.

*Kaake, L.; **Zhu, X.-Y.** *Charge Transport, Nanostructure and the Mott Insulator-to-Metal Transition in Poly(3-hexylthiophene)*. J. Phys. Chem. C, **2008**, 112, 16174.

IRG-2 Publications resulting from the USE OF SHARED FACILITIES

None

IRG-3 MAGNETIC HETEROSTRUCTURES

IRG-3 Publications resulting from PRIMARY MRSEC Support

Kubo, T.; Wang, R.F.; Olson, D.A.; Rodwogin, M.; Hillmyer, M.A.; Leighton, C. *Spontaneous Alignment of Self-Assembled ABC Triblock Terpolymers for Large-Area Nanolithography*. Appl. Phys. Lett., **2008**, 93, 133112. (*cross-referenced in IRG-1*)

IRG-3 Publications resulting from PARTIAL MRSEC Support

Mook, W.M.; Lund, M.S.; Leighton, C.; Gerberich, W.W. *Flow Stresses and Activation Volumes for Highly Deformed Nanoposts*. Mat. Sci. & Eng. A., **2008**, 493, 12.

Park, S.; Fitzsimmons, M.R.; Majkrzak, C.F.; Schultz, B.D.; Palmstrøm, C.J. *The Influence of Growth Temperature and Annealing on the Magnetization Depth Profiles Across Ferromagnetic/Semiconductor Interfaces*. J. Appl. Phys., **2008**, 104, 083905.

IRG-3 Publications resulting from the USE OF SHARED FACILITIES

Bruno, F.Y.; Garcia-Barriocanal, J.; Torija, M.A.; Rivera, A.; Sefrioui, Z.; Leighton, C.; Leon, C.; Santamaria, J. *Effects of Interface States on the Transport Properties of All-Oxide $La_{0.82}Sr_{0.18}CoO_3/SrTi_{0.99}Nb_{0.01}O_3$ pn Heterojunctions*. Appl. Phys. Lett., **2008**, 92(8), 082106.

Smith, R.X.; Hoch, M.J.R.; Kuhns, P.L.; Moulton, W.G.; Reyes, A.P.; Boebinger, G.S.; Mitchell, J.; Leighton, C. *Spin Polarons in $La_{1-x}Sr_xCoO_3$ Single Crystals*. Phys. Rev. B, **2008**, 78, 092201.

Orlyanchik, V.; Weissman, M.B.; Torija, M.A.; Sharma, M.; Leighton, C. *Strongly Inhomogeneous Conduction in Cobaltite Films: Non-Gaussian Resistance Noise*. Phys. Rev. B, **2008**, 78, 094430.

LeBeau, J. M.; Hu, Q.; Palmstrøm, C. J.; Stemmer, S. *Atomic Structure of Post Growth Annealed Epitaxial $Fe/(001)GaAs$ Interfaces*. Appl. Phys. Lett., **2008**, 93, 121909.

Khandwal, R.; Qi, X.; Sung, S.; Stadler, B.J.H. *Opening of Hybrid Band Gaps in Two-Dimensional Photonic Crystals of $Pb(Mg_{1/3}Nb_{1/3})O_3-PbTiO_3$ having Very Low Refractive Index Contrast*. IEEE Photonic Technology Letters, **2008**, 20(9), 673.

Yao X. F.; Malmhall R.; Ranjan R; Wang, J. P. *Observation of Intermediate States in Magnetic Tunnel Junctions with Composite Free Layer*. IEEE Transactions of Magnetism, **2008**, 44(11), 2496.

IRG-4 NANOPARTICLE-BASED MATERIALS

IRG-4 Publications resulting from PRIMARY MRSEC Support

Pi, X.D.; Gresback, R.; Liptak, R.W.; **Campbell, S.A.**; **Kortshagen, U.** *Doping Efficiency, Dopant Location, and Oxidation of Si Nanocrystals.* Appl. Phys. Lett., **2008**, 92, 123102.

Pi, X.D.; Liptak, R.W.; Nowak, J.D.; Wells, N.; **Carter, C.B.**; **Campbell, S.A.**; **Kortshagen, U.** *Air-Stable Full-Visible-Spectrum Emission from Silicon Nanocrystal Ensembles Synthesized by an All-Gas-Phase Plasma Approach.* Nanotechnology, **2008**, 19(24), 245603.

Kortshagen, U.; Anthony, R.; Gresback, R.; Holman, Z.; Ligman, R.; Liu, C.-Y.; Mangolini, L.; **Campbell S.A.** *Plasma Synthesis of Group IV Quantum Dots for Luminescence and Photovoltaic Applications.* Pure & Appl. Chem., **2008**, 1901.

Liptak, R.W.; Devetter, B.*; Thomas, J.H. III; **Kortshagen, U.**; **Campbell, S.A.** *SF₆ Plasma Etching of Silicon Nanocrystals.* Nanotechnology, 2009, 20(3), 035603. (***Summer 2008 REU Participant, University of Wisconsin - Madison**)

IRG-4 Publications resulting from PARTIAL MRSEC Support

Carlson, B.; Leschkies, K.; **Aydil, E.S.**; **Zhu, X.-Y.** *Valence Band Alignment at Cadmium Selenide Quantum Dot and ZnO(10 $\bar{1}0$) Interfaces.* J. Phys. Chem. C, **2008**, 112, 8419.

Liu, B.; Boercker, J.E.; **Aydil, E.S.** *Oriented Single Crystalline Titanium Dioxide Nanowires.* Nanotechnology, **2008**, 19, 505604.

Tisdale, W.A.; Muntwiler, M.; **Norris, D.J.**; **Aydil, E.S.**; **Zhu, X.-Y.** *Electron Dynamics at the ZnO(10 $\bar{1}0$) Surface.* J. Phys. Chem. C, **2008**, 112, 14682.

IRG-4 Publications resulting from the USE OF SHARED FACILITIES

Erbs, J.J.; Gilbert, B.; **Penn, R.L.** *Influence of Size on Reductive Dissolution of Six-Line Ferrihydrite.* J. Phys. Chem. C, **2008**, 112, 12127.

Isley, S.L.; **Penn, R.L.** *Titanium Dioxide Nanoparticles: Effect of Sol-Gel pH on Phase Composition, Particle Size, and Particle Growth Mechanism.* J. Phys. Chem. C, **2008**, 112, 4469.

Ratkovich, A.S.; **Penn, R.L.** *Controlling Oriented Aggregation using Increasing Reagent Concentrations and Trihalo Acetic Acid Surfactants.* J. Solid State Chem., **2008**, 181, 1600.

MRSEC SEED

MRSEC Seed Publications resulting from PRIMARY MRSEC Support

None

MRSEC Seed Publications resulting from PARTIAL MRSEC Support

Wang, C.; Pham, P.* *Polymers for Viral Gene Delivery*. *Exp. Opin. Drug Delivery*, **2008**, 5(4), 385. (**Summer 2006 Faculty/Student Team Participant, Penn State University at Scranton*)

MRSEC Seed Publications resulting from the USE OF SHARED FACILITIES

*Beaber, A.R.; Hafiz, J.; Heberlein, J.V.R.; Gerberich, W.W.; **Girshick, S.L.** *Wear Behavior in SiC-TiX Multilayered Nanocomposite Coatings*. *Surface and Coatings Technology*, **2008**, 203, 771.

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.

Hillmyer, M. A.; Chen, L. *Process for Preparing Nanostructured Polymer Composites*, United States Provisional Patent submitted 2007.

Lindquist, N.; Luhman, W.A.; **Holmes, R.J.;** Oh, S.-H. *Plasmonic Nanocavity Arrays and Methods for Enhanced Efficiency in Organic Photovoltaic Cells*, Provisional Patent submitted October 27, 2008.

Anacker, J. L.; **Macosko, C.W.;** Hoyer, T.R.; Prud'homme, R.K. *Methods for Producing Nanoparticles*, United States Patent 2007/0122449 A1, 2007.