

IRG-1 MICROSTRUCTURED POLYMERS

IRG-1 Publications resulting from PRIMARY MRSEC Support

2007

Won, Y.-Y.; **Bates, F.S.** *Nonionic Block Copolymer Wormlike Micelles*, in: Giant Micelles. Eds: Zana, R.; Kaler, E.W. **2007**, CRC Press, New York.

Tyler, C.; Qin, J.; **Bates, F.S.**; **Morse, D.C.** *SCFT Study of Non-Frustrated ABC Triblock Copolymer Melts*. *Macromolecules* **2007**, *40*, 4654.

Lan, Q.; **Francis, L.F.**; **Bates, F.S.** *Silica Nanoparticle Dispersions in Homopolymer Versus Block Copolymer*. *J. Polm. Sci., Polym. Phys.* **2007**, *45*, 2284.

Lynd, N.A.; **Hillmyer, M.A.** *Effects of Polydispersity on the Order–Disorder Transition in Block Copolymer Melts*. *Macromolecules*, **2007**, *40*, 8050.

Lynd, N.A.; Hamilton, B.D.; **Hillmyer, M.A.** *The Role of Polydispersity in the Lamellar Mesophase of Model Diblock Copolymers*. *J. Poly. Sci. Polym. Phys.* **2007**, *45*, 3386.

Mahanthappa, M.K.; Lim, L.S.; **Hillmyer, M.A.**; **Bates, F.S.** *Control of Mechanical Behavior in Polyolefin Composites: Integration of Glassy, Rubbery, and Semicrystalline Components*. *Macromolecules*, **2007**, *40*, 1585.

Meuler, A.J.; Mahanthappa, M.K.; **Hillmyer, M.A.**; **Bates, F.S.** *Synthesis of Monodisperse α -Hydroxy-Polystyrene in Hydrocarbon Media using a Functional Organolithium*. *Macromolecules*, **2007**, *40*, 760.

Wanamaker, C.L.; O'Leary, L.E.; Lynd, N.A.; **Hillmyer, M.A.**; **Tolman, W.B.** *Renewable Resource Thermoplastic Elastomers Based on Polylactide and Polymenthide*. *Biomacromolecules*, **2007**, *8*, 3634. (*cross-referenced in Seed*)

Abbas, S.; Li, Z.; Hassan, H.; **Lodge, T.P.** *Thermoreversible Morphology Transitions of Poly(styrene-*b*-dimethylsiloxane) Diblock Copolymer Micelles in Dilute Solution*. *Macromolecules*, **2007**, *40*, 4048.

Abbas, S.; **Lodge, T.P.** *Depletion Interactions: A New Control Parameter for the Self-Assembly of Block Copolymer Micelles*. *Phys. Rev. Lett.* **2007**, *99*, 137802.

Bang, J.; **Lodge, T.P.** *Effect of Shear on Poly(styrene-*b*-isoprene) Copolymer Micelles*. *Korea-Australia Rheology Journal*, **2007**, *4*, 227.

Zhou, N.; **Lodge, T.P.**; **Bates, F.S.**; Burghardt, W. *Shear Flow Behavior of a Dynamically Symmetric Polymeric Bicontinuous Microemulsion*. *J. Rheol.* **2007**, *51*, 1027.

Pyun, A.; Bell, J.R.; Won, K.H.; Weon, B.M.; Seol, S.K.; Je, J.H.; **Macosko, C.W.** *Synchrotron X-ray Microtomography for 3D Imaging of Polymer Blends*. *Macromolecules*, **2007**, *40*, 2029.

Zhu, Z.X.; Anacker, J.L.; Ji, S.X.; Hoye, T.R.; **Macosko, C.W.**; Prud'homme, R.K. *Formation of Block Copolymer-Protected Nanoparticles via Reactive Impingement Mixing*. *Langmuir*, **2007**, *23*, 10499.

Grzywacz, P.; Qin, J.; **Morse, D.C.** *Renormalization of the One-Loop Theory of Fluctuations in Polymer Blends and Diblock Copolymer Melts.* Phys. Rev. E, **2007**, 76, 061802.

2008

Bang, J.; **Lodge, T.P.** *On the Selection of FCC and BCC Lattices in Poly(styrene-*b*-isoprene) Copolymer Micelles.* Macromolecular Research, **2008**, 16, 51.

Ranjan, A.; Qin, J.; **Morse, D.C.** *Linear Response and Stability of Ordered Phases of Block Copolymer Melts.* Macromolecules, **2008**, 41, 942.

IRG-1 Publications resulting from PARTIAL MRSEC Support

2006

Grosberg, A.Y.; Nechaev, S.; Tamm, M.; Vasilyev, O. *How Long Does It Take to Pull an Ideal Polymer Into a Small Hole?* Phys. Rev. Lett. **2006**, 96, 228105.

Kussell, E.; Leibler, S.; **Grosberg, A.Y.** *Polymer-Population Mapping and Localization in the Space of Phenotypes.* Phys. Rev. Lett. **2006**, 97, 068101.

Lodge, T.P.; Taribagil, R.; Yoshida, T.; **Hillmyer, M.A.** *SANS Evidence for the Crosslinking of Wormlike Micelles by a Model Hydrophobically Modified Polymer.* Macromolecules, **2006**, 40, 4728.

2007

Chatterjee, J.; Jain, S.; **Bates, F.S.** *Comprehensive Phase Behavior of Poly(isoprene-*b*-styrene-*b*-ethylene oxide) Triblock Copolymers.* Macromolecules, **2007**, 40, 2882.

Switek, K.A.; Chang, K.; **Bates, F.S.**; **Hillmyer, M.A.** *ABA Triblock Copolymers using a Ring-Opening Metathesis Polymerization/Macromolecular Chain Transfer Agent Approach.* J. Polym. Sci. Part A: Polym. Chem. **2007**, 45, 361.

Grosberg, A.Y.; Rabin, Y. *Metastable Tight Knots in a Worm-Like Polymer.* Physical Review Letters, **2007**, 99, 217801.

Hu, L.; **Grosberg, A.Y.** *Heteropolymer Sequence Design and Preferential Solvation of Hydrophilic Monomers: One More Application of Random Energy Model.* Physical Review E, **2007**, 75, 041921.

Kubo, T.; Parker, J.S.; **Hillmyer, M.A.**; **Leighton, C.** *Characterization of Pattern Transfer in the Fabrication of Magnetic Nanostructure Arrays by Block Copolymer Lithography.* Appl. Phys. Lett. **2007**, 90, 233113-1.

Schreck, K.M.; **Hillmyer, M.A.** *Block Copolymers and Melt Blends of Polylactide with Nodax™ Microbial Polyesters: Preparation and Mechanical Properties.* J. Biotechnology, **2007**, 132, 295.

2008

Mahanthappa, M.K.; **Hillmyer, M.A.**; **Bates, F.S.** *Mechanical Consequences of Molecular Composition on Failure in Polyolefin Composites Containing Glassy, Elastomeric, and Semicrystalline Components.* Macromolecules, **2008**, 41, 1341.

IRG-1 Publications resulting from the USE OF SHARED FACILITIES

2006

Ahmed, F.; Pakunlu, R.I.; Brannon, A.; **Bates, F.S.**; Minko, T.; Disher, D.E. *Biodegradable Polymersomes Loaded with Both Paclitaxel and Doxorubicin Permeate and Shrink Tumors, Inducing Apoptosis in Proportion to Accumulated Drug*. J. Controlled Release, **2006**, *116*, 150.

Wang, J.; DeRocher, J.P.; Wu, L.; **Bates, F.S.**; Cussler, E.L. *Barrier Films Made With Various Lamellar Block Copolymers*. J. Membrane Sci. **2006**, *270*, 13.

2007

Christian, N.A.; Malone, M.C.; Ranka, S.S.; Li, G.; Frail, P.R.; Davis, K.P.; **Bates, F.S.**; Therien, M.J.; Ghoroghchian, P.P.; June, C.H.; Hammer, D.A. *Tat-Functionalized Near Infrared Emissive Polymersomes for Dendritic Cell Labeling*. Bioconjugate Chem. **2007**, *18*, 31.

Ghoroghchian, P.P.; Frail, P.R.; Zuponcich, J.A.; **Bates, F.S.**; Hammer, D.H.; Therien, M.J. *Controlling Bulk Optical Properties of Emissive Polymersomes Through Intramembranous Polymer-Fluorophore Interactions*. Chem. Mater. **2007**, *19*, 1309.

Maheshwari, S.; Tsapatsis, M.; **Bates, F.S.** *Synthesis and Thermodynamic Properties of Poly(cyclohexylethylene-*b*-dimethylsiloxane-*b*-cyclohexylethylene)*. Macromolecules, **2007**, *40*, 6638.

Francis, L.F.; Grunlan, J.C.; Sun, J.; Gerberich, W.W. *Conductive Coatings and Composites from Latex-Based Dispersions*. Colloids and Surfaces A, **2007**, *311*, 48.

Luo, H.; Scriven, L.E.; **Francis, L.F.** *Cryo-SEM Studies of Latex/Ceramic Nanoparticle Coating Microstructure Development*. J. Colloid Interface Sci. **2007**, *316*, 500.

Sun, J.; Gerberich, W.W.; **Francis, L.F.** *Transparent, Conductive Polymer Blend Coatings From Latex-Based Dispersions*. Prog. Org. Coat. **2007**, *59*, 115.

Chen, L.; Phillip, W.A.; Cussler, E.L.; **Hillmyer, M.A.** *Robust Nanoporous Membranes Templated by a Doubly Reactive Block Copolymer*. J. Am. Chem. Soc., **2007**, *129*, 13786.

Crossland, E.J.W.; Ludwigs, S.; **Hillmyer, M.A.**; Steiner, U. *Freestanding Nanowire Arrays From Soft-Etch Block Copolymer Templates*. Soft Matter, **2007**, *1*, 57.

Edmonds, W.F.; **Hillmyer, M.A.**; **Lodge, T.P.** *Block Copolymer Vesicles in Liquid CO₂*. Macromolecules, **2007**, *40*, 4917.

Meuler, A.J.; Ellison, C.J.; Evans, C.M.; **Hillmyer, M.A.**; **Bates, F.S.** *Polydispersity-Driven Transition from the Orthorhombic Fddd Network to Lamellae in Poly(isoprene-*b*-styrene-*b*-ethylene oxide) Triblock Terpolymers*. Macromolecules, **2007**, *40*, 7072.

Silvernail, C.M.; Yao, L.J.; Hill, L.M.R.; **Hillmyer, M.A.**; **Tolman, W.B.** *Structural and Mechanistic Studies of Bis(phenolato)amine Zinc(II) Catalysts for the Polymerization of ϵ -Caprolactone*. Inorg. Chem. **2007**, *46*, 6565.

Wells, N.P.; Boudouris, B.W.; **Hillmyer, M.A.**; Blank, D.A. *Intramolecular Excitation Relaxation and Migration Dynamics in Poly(3-Hexylthiophene)*. J. Phys. Chem. B, **2007**, *111*, 15404.

Yoshida, T.; Taribagil, R.; **Hillmyer, M.A.**; **Lodge, T.P.** *Viscoelastic Synergy in Aqueous Mixtures of Wormlike Micelles and Model Amphiphilic Triblock Copolymers*. *Macromolecules*, **2007**, *40*, 1615.

Lee, J.; Panzer, M.J.; He, Y.; **Lodge, T.P.**; **Frisbie, C.D.** *Ion Gel Gated Polymer Thin-Film Transistors*. *J. Am. Chem. Soc.* **2007**, *129*, 4532. (*cross-referenced in IRG-2*)

Lodge, T.P.; Taribagil, R.; Yoshida, T.; **Hillmyer, M.A.** *SANS Evidence for the Crosslinking of Wormlike Micelles by a Model Hydrophobically Modified Polymer*. *Macromolecules*, **2007**, *40*, 4728.

Simone, P.M.; **Lodge, T.P.** *Micellization of PS-PMMA Diblock Copolymers in an Ionic Liquid*. *Macromol. Chem. Physic.* **2007**, *208*, 339.

Chang, K.; **Macosko, C.W.**; **Morse, D.C.** *Ultra-Low Interfacial Tensions of Polymer/Polymer Interfaces with Diblock Copolymer Surfactants*. *Macromolecules*, **2007**, *40*, 3819.

Chastek, T.T.; Que, E.L.; Jarzombeck, P.; **Macosko, C.W.**; **Stein, A.** *Synthesis of Lamellar Isobutyl Silicates and Dispersion in Polypropylene Melts*. *J. Appl Polym Sci.* **2007**, *105*, 1456.

Durmus, A.; Kasgoz, A.; **Macosko, C.W.** *Linear Low Density Polyethylene (LLDPE)/clay Nanocomposites. Part I: Structural Characterization and Quantifying Clay Dispersion by Melt Rheology*. *Polymer*, **2007**, *48*, 4492.

Durmus, A.; Woo, M.; Kasgoz, A.; **Macosko, C.W.**; **Tsapatsis, M.** *Intercalated Linear Low Density Polyethylene (LLDPE)/clay Nanocomposites Prepared with Oxidized Polyethylene as a New Type Compatibilizer: Structural, Mechanical and Barrier Properties*. *European Polym. J.* **2007**, *43*, 3737.

Ellison, C.; Phatak, A.; Giles, D.W.; **Macosko C.W.**; **Bates, F.S.** *Melt Blown Nanofibers: Fiber Diameter Distributions and Onset of Fiber Breakup*. *Polymer*, **2007**, *48*, 3306.

Vermant, J.; Ceccia, S.; Dolgovskij, M.K.; Maffettone, P.L.; **Macosko, C.W.** *Quantifying Dispersion of Layered Nanocomposites via Melt Rheology*. *J. Rheol.* **2007**, *51*, 429.

Zhang, L.; Jeon, H.K.; Malsam, J.; Herrington, R.; **Macosko, C.W.** *Substituting Soybean Oil-based Polyol into Polyurethane Flexible Foams*. *Polymer*, **2007**, *48*, 6656.

Zhao, R.; **Macosko, C.W.** *Polymer-Polymer Mutual Diffusion via Rheology of Coextruded Multilayers*. *AIChE J.* **2007**, *53*, 978.

Ramanathan, S.; **Morse, D.C.** *A Brownian Dynamics Algorithm for Entangled Wormlike Threads*. *J. Chem. Phys.* **2007**, *126*, 094906.

Ramanathan, S.; **Morse, D.C.** *Chain Motion and Viscoelasticity in Highly Entangled Solutions of Semiflexible Rods*. *Phys. Rev. E*, **2007**, *76*, 010501(R).

2008

Edgar, J.; Kumar, S.; **Bates, F.S.**; Penn, R.; Shantz, D.; Tsapatsis, M.; Maheshwari, S. *Layer Structure Preservation during Swelling, Pillaring and Exfoliation of a Zeolite Precursor*. *J. Am. Chem. Soc.*, **2008**, *130*, 4048.

Boudouris, B.W.; **Frisbie, C.D.**; **Hillmyer, M.A.** *Nanoporous poly(3-alkylthiophene) Thin Films Generated from Block Copolymer Templates*. *Macromolecules*, **2008**, *41*, 67.

Olson, D.A.; Chen, L.; **Hillmyer, M.A.** *Templating Nanoporous Polymers with Ordered Block Copolymers.* Chem. Mater. **2008**, *20*, 869.

Cho, J.H.; Lee, J.; Kim, B.; He, Y.; **Lodge, T.P.**; **Frisbie, C.D.** *High Capacitance Ion Gel Gate Dielectrics with Faster Polarization Response Times for Organic Thin Film Transistors.* Adv. Mater. **2008**, *20*, 686. (*cross-referenced in IRG-2*)

IRG-2 CRYSTALLINE ORGANIC SEMICONDUCTORS

IRG-2 Publications resulting from PRIMARY MRSEC Support

2007

Kaake, L.G.; Zou, Y.; Panzer, M.J.; **Frisbie, C.D.**; **Zhu, X.-Y.** *Vibrational Spectroscopy Reveals Electrostatic and Electrochemical Doping in Organic Thin Film Transistors Gated with a Polymer Electrolyte Dielectric.* J. Am. Chem. Soc. **2007**, *129*, 7824.

Panzer, M.J.; **Frisbie, C.D.** *Polymer Electrolyte-Gated Organic Field-Effect Transistors: Low-Voltage, High-Current Switches for Organic Electronics and Testbeds for Probing Electrical Transport at High Charge Carrier Density.* J. Am. Chem. Soc. **2007**, *129*, 6599.

Xia, Y.; Kalihari, V.; **Frisbie, C.D.**; Oh, N.K.; Rogers, J.A. *Tetracene Air-Gap Single-Crystal Field-Effect Transistors.* Appl. Phys. Lett. **2007**, *90*, 162106/1.

Nishioka, M.; **Goldman, A.M.** *Spin Transport Through Multilayer Graphene.* Appl. Phys. Lett. **2007**, *90*, 252505.

Nishioka, M.; Lee, Y.-B.; **Goldman, A.M.**; Xia, Y.; **Frisbie, C.D.** *The Negative Magnetoresistance of Organic Field Effect Transistors.* Appl. Phys. Lett. **2007**, *91*, 092117.

Lee, J.; Panzer, M.J.; He, Y.; **Lodge, T.P.**; **Frisbie, C.D.** *Ion Gel Gated Polymer Thin-Film Transistors.* J. Am. Chem. Soc. **2007**, *129*, 4532. (*cross-referenced in IRG-1*)

Pappenfus, T.; Melby, J.H.; Hansen, B.B.; Sumption, D.M.; Hubers, S.A.; Janzen, D.E.; Ewbank, P.C.; McGee, K.A.; Burand, M.W.; **Mann, K.R.** *Reverse Selectivity in m-CPBA Oxidation of Oligothiophenes to Sulfones.* Org. Lett. **2007**, *9*, 3721.

Schroepfer, D.; **Ruden, P.P.**; Xia, Y.; **Frisbie, C.D.**; Shaheen, S. *Hydrostatic Pressure Effects on Poly(3-hexylthiophene) Thin Film Transistors.* Appl. Phys. Lett. **2008**, *92*, 013305/1.

Muntwiler, M.; **Zhu, X.-Y.** *Formation of Two-Dimensional Electron Polarons that are Absent in Three-Dimensional Crystals.* Phys. Rev. Lett. **2007**, *98*, 246801.

2008

Cho, J.H.; Lee, J.; He, Y.; Kim, B.-S.; **Lodge, T.P.**; **Frisbie, C.D.** *High-Capacitance Ion Gel Gate Dielectrics with Faster Polarization Response Times for Organic Thin Film Transistors.* Adv. Mater. **2008**, *20*, 686 (*cross-referenced in IRG-1*).

IRG-2 Publications resulting from PARTIAL MRSEC Support

2006

Kang, J.H.; **Zhu, X.-Y.** *Layer by Layer Growth of Incommensurate, Polycrystalline, Lying-Down Pentacene Thin Films on Au(111).* Chem. Mater. **2006**, *18*, 1318.

2007

Coropceanu, V.; Cornil, J.; da Silva Filho, D.A.; Olivier, Y.; Silbey, R.; **Brédas, J.L.** *Charge Transport in Organic Semiconductors* Chemical Reviews, **2007**, *107*, 926.

Barlow, S.; Zhang, Q.; Kaafarani, B.R.; Risko, C.; Amy, F.; Chan, C.K.; Domercq, B.; Starikova, Z.A.; Antipin, M. Yu.; Timofeeva, T.V.; Kippelen, B.; **Brédas, J.L.**; Kahn, A.; Marder, S.R. *Synthesis Ionization Potentials, and Electron Affinities of Hexaazatrinaphthylene Derivatives*, Chemistry – A European Journal, **2007**, *13*, 3537.

Cornil, J.; **Brédas, J.L.**; Zaumseil, J.; Serrinhaus, H. *Ambipolar Transport in Organic Conjugated Materials*. Advanced Materials, **2007**, *19*, 1791.

da Silva Filho, D.A.; Coropceanu, V.; Fichou, D.; Gruhn, N.E.; Bill, T.G.; Gierschner, J.; Cornil, J.; **Brédas, J.L.** *Hole-Vibronic Coupling in Oligothiophenes: Impact of Backbone Torsional Flexibility on Relaxation Energies*. Philosophical Transactions of the Royal Society, **2007**, *365*, 1435.

Starikova, Z.A.; Antipin, M.Yu.; Timofeeva, T.V.; Kippelen, B.; **Brédas, J.L.**; Kahn, A.; Marder, S.A. *Synthesis Ionization Potentials, and Electron Affinities of Hexaazatrinaphthylene Derivatives*. Chem. Eur. J. **2007**, *13*, 3537.

Dylla, A.G.; Janzen, D.E.; Pomije, M.K.; **Mann, K.R.** *A Comparison of Isomers: trans- and cis-Dicyanobis(para-ethylisocyanobenzene)Platinum*. Organometallics, **2007**, *26*, 6243.

McGee, K.A.; **Mann, K.R.** *Selective Low-Temperature Syntheses of Facial and Meridional Tris-cyclometalated Iridium(III) Complexes*. Inorg. Chem. **2007**, *46*, 7800.

McGee, K.A.; Veltkamp, D.J.; Marquardt, B.J.; **Mann, K.R.** *Porous Crystalline Ruthenium Complexes are Oxygen Sensors*. J. Am. Chem. Soc. **2007**, *129*, 15092.

Lindstrom, C.D.; Muntwiler, M.; **Zhu, X.-Y.** *Electron Dynamics at Polyacene/Au(111) Interfaces*. J. Phys. Chem. B. **2007**, *111*, 6913.

IRG-2 Publications resulting from the USE OF SHARED FACILITIES

2006

Parendo, K.A.; Tan, K.H.; Sarwa, B.; **Goldman, A.M.** *The Evolution Towards Superconductivity of Granular Films of Bismuth*. Phys. Rev. B, **2006**, *76*, 100508.

2007

Adams, L.L.A.; Lang, B.W.; Chen, Y.; **Goldman, A.M.**, *Signatures of Random Matrix Theory in the Discrete Energy Spectra of Subnanosize Metallic Clusters*. Phys. Rev. B, **2007**, *75*, 205107.

IRG-3 MAGNETIC HETEROSTRUCTURES

IRG-3 Publications resulting from PRIMARY MRSEC Support

2007

Bolon, B.; Haugen, M.A.; Abin-Fuentes, A.; Deneen, J.; **Carter, C.B.**; **Leighton, C.** *Multiple Antiferromagnet/Ferromagnet Interfaces as a Probe of Grain-Size-Dependent Exchange Bias in Polycrystalline Co/Fe₅₀Mn₅₀*. J. Mag. Mag. Mat. **2007**, 309, 54. (*cross-referenced in proto-IRG*)

Crooker, S.A.; Furis, M.; Lou, X.; **Crowell, P.A.**; Smith, D.L.; Adelman, C.; **Palmstrøm, C.J.** *Optical and Electrical Spin Injection and Spin Transport in Hybrid Fe/GaAs Devices*. J. Appl. Phys. **2007**, 101, 081716.

Kubo, T.; Parker, J.S.; **Hillmyer, M.A.**; **Leighton, C.** *Characterization of Pattern Transfer in the Fabrication of Magnetic Nanostructure Arrays by Block Copolymer Lithography*. Appl. Phys. Lett. **2007**, 90, 233113.

Leighton, C.; Manno, M.; Cady, A.; Freeland, J.W.; Wang, L.; Umamoto, K.; **Wentcovitch, R.M.**; Chen, T.Y.; Chien, C.L.; Kuhns, P.L.; Hoch, M.J.R.; Reyes, A.P.; Moulton, W.G.; **Dahlberg, E.D.**; Checkelsky, J.*; Eckert, J.* *Composition Controlled Spin Polarization in Co_{1-x}Fe_xS₂ Alloys*. J. Phys.: Condens. Matter, **2007**, 19, 315219. (**Summer 2003 Faculty/Student Team Participants, Harvey Mudd College*).

Lund M.S.; **Leighton, C.** *Interplay Between Reversal Asymmetry, Training, and Induced Anisotropy, in Epitaxial Exchange Biased Bilayers*. Phys. Rev. B, **2007**, 76, 104433.

Saha, J.; Bolon, B.; Abin-Fuentes, A.; Parker, J.S.; **Leighton, C.**; **Victoria, R.** *Comparison Between Micromagnetic Simulation and Experiment for the Co/ γ -Fe₅₀Mn₅₀ Exchange-biased System*. J. Appl. Phys. **2007**, 102, 073901.

Fitzsimmons, M.R.; Kirby, B.J.; Hengartner, N.W.; Trouw, F.; Erickson, M.J.; Flexner, S.D.; Kondo, T.; Adelman, C.; **Palmstrøm, C.J.**; **Crowell, P.A.**; Chen, W.C.; Gentile, T.R.; Borchers, J.A.; Majkrzak, C.F.; Pynn, R. *Suppression of Nuclear Polarization Near the Surface of Optically Pumped GaAs*. Phys. Rev. B, **2007**, 76, 245301.

Lou, X.; Adelman, C.; Crooker, S.A.; Garlid, E.S.; Zhang, J.; Reddy, K.S.M.; Flexner, S.D.; **Palmstrøm, C.J.**; **Crowell, P.A.** *Electrical Detection of Spin Transport in Lateral Ferromagnet-Semiconductor Devices*. Nat. Phys. **2007**, 3, 197.

Saha, J.; **Victoria, R.H.** *Spontaneous Exchange Bias: Uniaxial Anisotropy in an Otherwise Isotropic System*. Phys. Rev. B, **2007**, 76, 100405(R).

2008

Chan, M.; Parker, J.S.; **Crowell P.A.**; **Leighton, C.** *Identification and Separation of Two Distinct Contributions to the Training Effect in Polycrystalline Exchange Biased Co/FeMn Bilayers*. Phys. Rev. B, **2008**, 77, 014420.

Tan, L.; McGary, P.D.; **Stadler, B.J.H.** *Controlling the Angular Response of Magnetoresistance in Co/Cu Multilayered Nanowires using Co Crystallographic Orientation*. J. Appl. Phys. **2008**, 103, 07B504.

IRG-3 Publications resulting from PARTIAL MRSEC Support

2006

Carmona-Rodriguez, J.; Lozada-Morales, R.; Jimenez-Sandoval, O.; Melendez-Lira, M.; Zuniga-Romero, C.I.; **Dahlberg, E.D.** *Effect of High Copper and Oxygen Concentrations on the Optical and Electrical Properties of $(\text{CdTe})_x\text{Cu}_y\text{O}_z$ Films.* Sol. Energy Mater. Sol. Cells, **2006**, 90, 2248.

Vergara, J.; Madurga, V.; Eames, P.; **Dahlberg, E.D.** *Magnetic Force Microscopy Observations of Co Nanoparticles Grown on Annealing $\text{Co}_{10}\text{Cu}_{90}$ Melt Spun Ribbons.* J. Appl. Phys. **2006**, 99, 53910-1-4.

2007

Åkerman, J.J.; Ström, V.; Rao, K.V., **Dahlberg, E.D.** *Separation of Exchange Anisotropy and Magnetocrystalline Anisotropy in Co/CoO Bilayers by Means of ac Susceptibility Measurements.* Phys Rev B, **2007**, 76, 144416.

Hathaway, K.; **Dahlberg, E.D.** *Resource Letter STMN-1: Spin Transport in Magnetic Nanostructures.* Am. J. Phys. (invited resource paper), **2007**, 75, 871.

Wu, N.; Losovyj, Ya. B.; Wisbey, D.; Belashchenko, K.; Manno, M.; Wang, L.; **Leighton, C.**; Dowben, P.A. *The Electronic Band Structure of CoS_2 .* J. Phys. Cond. Mat. **2007**, 19, 156224.

Wu, N.; Wisbey, D.; Komesu, T.; Yu Z.X.; Manno, M.; Wang, L.; **Leighton C.**; Dowben, P.A. *The Kinetic Energy Dependent Effective Debye Temperature for $\text{CoS}_2(100)$.* Phys. Lett. A, **2007**, 372, 2484.

Yu, Z.X.; van Hove, M.A.; Tong, S.Y.; Wisbey, D.; Losovyj, Y.B.; Wu, N.; Manno, M.; Wang, L.; **Leighton, C.**; Mei, W.N.; Dowben, P.A. *The Structure of the $\text{CoS}_2(100)-(1 \times 1)$ Surface.* J. Phys. Cond. Mat. **2007**, 19, 156223.

Furis, M.; Smith, D.L.; Kos, S.; Garlid, E.S.; Reddy, K.S.M.; **Palmstrøm, C.J.**; **Crowell, P.A.**; Crooker, S.A. *Local Hanle-Effect Studies of Spin Drift and Diffusion in n:GaAs Epilayers and Spin-Transport Devices.* New J. Phys. **2007**, 9, 347.

IRG-3 Publications resulting from the USE OF SHARED FACILITIES

2007

He, C.; Torija, M.A.; Wu, J.; Lynn, J.W.; Zheng, H.; Mitchell, J.F.; **Leighton, C.** *Non-Griffiths-like Clustered Phase Above the Curie Temperature of the Doped Perovskite Cobaltite $\text{La}_{1-x}\text{Sr}_x\text{CoO}_3$.* Phys. Rev. B. **2007**, 76, 014401.

Hilton, J.L.; Schultz, B.D.; **Palmstrøm, C.J.** *Growth Temperature Dependence of Mn/GaAs Surfaces and Interfaces.* J. Appl. Phys. **2007**, 102, 063513.

Hoch, M.J.R.; Kuhns, P.L.; Moulton, W.G.; Reyes, A.P.; Torija, M.A.; Mitchell, J.F.; **Leighton, C.** *Disorder and Double Exchange Spin Dynamics in $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ and $\text{La}_{0.7}\text{Sr}_{0.3}\text{CoO}_3$ via NMR Hyperfine Couplings.* Phys. Rev. B. **2007**, 75, 104421.

Klie, R.F.; Zheng, J.C.; Zhu, Y.; Varela, M.; Wu, J.; **Leighton, C.** *Direct Measurement of the Low Temperature Spin-State Transition in LaCoO_3 .* Phys. Rev. Lett. **2007**, 99, 047203.

Choi, S.G.; **Palmstrøm, C.J.**; Kim, Y.D.; Aspnes, D.E.; Kim, H.J.; Chang, Y.-C. *Dielectric Functions and Electronic Structure of $\text{InAs}_x\text{P}_{1-x}$ Films on InP*. Appl. Phys. Lett. **2007**, *91*, 041917.

Choi, S.G.; Schultz, B.D.; **Palmstrøm, C.J.**; Wang, Y.Q. *Molecular Beam Epitaxy of $\text{Sc}_x\text{Er}_{1-x}\text{Sb}$ on InAs(100)*. J. Crystal Growth, **2007**, *303*, 433.

2008

Downey, P.R.; Flatau, A.B.; McGary, P.D.; **Stadler, B.J.H.** *Effect of Magnetic Field on the Mechanical Properties of Magnetostrictive Iron-Gallium Nanowires*. J. Appl. Phys. **2008**, *103*, 07D305.

Tan, L.; McGary, P.D.; **Stadler, B.J.H.** *Controlling the Angular Response of Magnetoresistance in Co/Cu Multilayered Nanowires Using Co Crystallographic Orientation*. J. Appl. Phys. **2008**, *103*, 07B504.

PROTO-IRG (NANOPARTICLE-BASED MATERIALS)

Proto-IRG Publications resulting from PRIMARY MRSEC Support

2007

Pi, X.D.; Liptak, R.W.; **Campbell, S.A.**; **Kortshagen, U.** *In-Flight Dry Etching of Plasma-Synthesized Silicon Nanocrystals*. Appl. Phys. Lett. **2007**, *91*, 083112.

Pi, X.D.; Mangolini, L.; **Campbell, S.A.**; **Kortshagen, U.** *Room-Temperature Atmospheric Oxidation of Si Nanocrystals after HF Etching*. Phys. Rev. B, **2007**, *75*, 085423-1.

Bolon, B.T.; Haugen, M.A.; Abin-Fuentes, A.; Deneen, J.; **Carter, C.B.**; **Leighton, C.** *Multiple Antiferromagnet/Ferromagnet Interfaces as a Probe of Grain-Size-Dependent Exchange Bias in Polycrystalline Co/Fe₅₀Mn₅₀*. J. Magn. Magn. Mater. **2007**, *309*, 54. (**cross-referenced in IRG-3**)

Gresback, R.; Holman, Z.; **Kortshagen, U.** *Nonthermal Plasma Synthesis of Size-controlled, Monodisperse, Freestanding Germanium Nanocrystals*. Appl. Phys. Lett. **2007**, *91*, 093119.

Ligman, R.K.; Mangolini, L.; **Kortshagen, U.**; **Campbell, S.A.** *Electroluminescence from Surface Oxidized Silicon Nanoparticles Dispersed in a Polymer Matrix*. Appl. Phys. Lett. **2007**, *90*, 061116.

Holm, J.; **Roberts, J.T.** *Surface Chemistry of Aerosolized Silicon Nanoparticles: Evolution and Desorption of Hydrogen from 6 nm Diameter Particles*. J. Am. Chem. Soc. **2007**, *129*, 2496.

Proto-IRG Publications resulting from PARTIAL MRSEC Support

2006

Deneen, J.; Cernetti, P.; Gresback, R.; **Kortshagen, U.**; **Carter, C.B.** *TEM Study of the Morphology of Nanoparticles*. Microsc. Microanal. **2006**, *12*, 612.

2007

Bapat, A.; Gatti, M.; Ding, Y.-P.; **Campbell, S.A.**; **Kortshagen, U.** *A Plasma Process for the Synthesis of Cubic-Shaped Silicon Nanocrystals for Nanoelectronic Devices*. J. Phys. D: Appl. Phys. **2007**, *40*, 2247.

Cernetti, P.; Gresback, R.; **Campbell, S.A.**; **Kortshagen, U.** *Nonthermal Plasma Synthesis of Faceted Germanium Nanocrystals*. Chemical Vapor Deposition, **2007**, *13*, 345.

Leschkies, K.S.; Divakar, R.; Basu, J.; Enache-Pommer, E.; Boercker, J.E.; **Carter, C.B.**; **Kortshagen, U.R.**; **Norris, D.J.**; **Aydil, E.S.** *Photosensitization of ZnO Nanowires with CdSe Quantum Dots for Photovoltaic Devices*. Nano Letters, **2007**, *7*, 1793.

Barry, C.; Wang, X.; **Kortshagen, U.**; **Jacobs, H.O.**; *Gas Phase Nanoparticle Integration*. Mater. Res. Soc. Symp. Proc. Volume 1002E, Warrendale, PA, **2007**.

Wang, X.; Cole, J.; Dabiran, A.; **Jacobs, H.O.**; *ZnO Nanowire/p-GaN Heterojunction LEDs*. Mater. Res. Soc. Symp. Proc. Volume 1018E, Warrendale, PA, **2007**.

Wang, X.; Cole, J.; Dabiran, A.; **Jacobs, H.O.**; *Electroluminescence of ZnO Nanowire/p-GaN Heterojunction Light Emitting Diodes*. Proceedings of NSTI-Nanotech Conference, Santa Clara, CA, **2007**.

Barry, C.; **Jacobs, H.O.** *Gas Phase Nanoparticle Integration*. Proceedings of NSTI-Nanotech Conference, Santa Clara, CA, **2007**.

Divakar, R.; Basu, J.; Leschkies, K.S.; **Kortshagen, U.R.**; **Aydil, E.S.**; Norris, D.J.; **Carter, C.B.** *TEM Characterization of CdSe Quantum Dot Sensitized ZnO Nanowires*. *Microsc. Microanal.* **2007**, *13*, 756.

Gresback, R.; Holman, Z.; **Kortshagen, U.** *Plasma Synthesis of Highly Monodisperse Ge Nanocrystals and Self-Assembly of Dense Nanocrystal Layers*, in: *Solar Energy Conversion*. Ed: Beard, M. *Mater. Res. Soc. Symp. Proc.* **2007**, *974E*, CC05-08.

Kortshagen, U.; Mangolini, L.; Bapat, A. *Plasma Synthesis of Semiconductor Nanocrystals for Nanoelectronics and Luminescence Applications*. *J. Nano Part. Res.* **2007**, *9*, 39.

Liptak, R.W.; Pi, X.D.; **Kortshagen, U.**; **Campbell, S.A.** *400-900 nm Light Emitting Silicon Nanoparticles Produced By An All-Gas Phase Approach*. Proceedings of Nano Science and Technology International, Santa Clara, **2007**.

Mangolini, L.; **Kortshagen, U.** *Plasma-Assisted Synthesis of Silicon Nanocrystal Inks*. *Adv. Mater.* **2007**, *19*, 2513.

Pi, X.; Liptak, R.; Ligman, R.; **Kortshagen, U.**; **Campbell, S.A.** *Full Spectrum Emission and Hybrid OLEDs from Silicon Nanoparticles*. Proceedings of the 4th International Conference on Group Four Photonics Workshop, IEEE/LEOS, Tokyo, **2007**.

Holm, J.; **Roberts, J.T.** *Thermal Oxidation of 6 nm Aerosolized Silicon Nanoparticles: Size and Surface Chemistry Changes*. *Langmuir*, **2007**, *23*, 11217.

2008

Sykora, M.; Mangolini, L.; Schaller, R.D.; **Kortshagen, U.**; Jurbergs, D.; Klimov, V.I. *Size-Dependent Intrinsic Radiative Decay Rates of Silicon Nanocrystals at Large Confinement Energies*. *Phys. Rev. Lett.* **2008**, *100*, 067401.

Proto-IRG Publications resulting from the USE OF SHARED FACILITIES

2006

Liao, Y.-C.; Nienow, A.M.; **Roberts, J.T.** *Surface Chemistry of Aerosolized Nanoparticles: Thermal Oxidation of Silicon*. *J. Phys. Chem. B*, **2006**, *110*, 6190.

Nienow, A.M.; **Roberts, J.T.** *Chemical Vapor Deposition of Zirconium Oxide on Aerosolized Silicon Nanoparticles*. *Chem. Mater.* **2006**, *18*, 5571.

2008

Zhang, B.; Liao, Y.-C.; **Roberts, J.T.**; **Girshick, S.L.** *Growth of Coatings on Nanoparticles by Photoinduced Chemical Vapor Deposition*. *J. Nanopart. Res.* **2008**, *10*, 173.

MRSEC SEED

Seed Publications resulting from PRIMARY MRSEC Support

2007

Wanamaker, C.L.; O'Leary, L.E.; Lynd, N.A.; **Hillmyer, M.A.**; **Tolman, W.B.** *Renewable Resource Thermoplastic Elastomers Based on Polylactide and Polymenthide. Biomacromolecules*, **2007**, *8*, 3634. (*cross-referenced in IRG-1*)

Kumar, S.; Davis, T.M.; Ramanan, H.; **Penn, R.L.**; **Tsapatsis, M.** *Aggregative Growth of Silicalite-1. J. Phys. Chem. B.* **2007**, *111*, 3398.

Seed Publications resulting from PARTIAL MRSEC Support

2007

Dumitrica, T.; James, R.D. *Objective Molecular Dynamics. J. Mech. Phys. Solids*, **2007**, *55*, 2237.

McGee, K.A.; **Mann, K.R.** *Selective Low-Temperature Syntheses of Facial and Meridional Tris-cyclometalated Iridium(III) Complexes. Inorg. Chem.* **2007**, *46*, 7800.

Chastek, T.T.; Que, E.L.; Jarzombek, P.; **Macosko, C.W.**; **Stein, A.** *Synthesis of Lamellar Isobutyl Silicates and Dispersion in Polypropylene Melts. J. Appl. Polymer Sci.* **2007**, *105*, 1456.

Karanikolos, G.N.; Wydra, J.W.*; Stoeger, J.A.; Garcia, H.; Corma, A.; **Tsapatsis, M.** *Continuous c-Oriented AlPO4-5 Films by Tertiary Growth. Chem. Mater.* **2007**, *19*, 792. (**Summer 2005, 2006 REU Participant, University of Iowa*)

Snyder, M.A.; **Tsapatsis, M.** *Hierarchical Nanomanufacturing: From Shaped Zeolite Nanoparticles to High Performance Separation Membranes. Angew Chemie Int. Ed.* **2007**, *46*, 7560

2008

Valentini, P.; **Dumitrica, T.** *Molecular Dynamics Simulations of Nanoparticle-Surface Collisions in Silicon. J. Nano Res.* **2008**, *1*, 23.

Seed Publications resulting from the USE OF SHARED FACILITIES

2007

Berquo, T.S.; Banerjee, S.K.; Ford, R.G.; **Penn, R.L.**; Pichler, T. *High Crystallinity Si-Ferrihydrite: An Insight into its Neel Temperature and Size Dependence of Magnetic Properties. J. Geophysical Research*, **2007**, *112*, B02102/1.

Jentzsch, T.; Chung, C.L.; Gabor, R.S.; **Penn, R.L.** *Influence of Aluminum Substitution on the Reactivity of Magnetite Nanoparticles. J. Phys. Chem. C.* **2007**, *111*, 10247.

Johnson, R.L.; Anschutz, A.J.; Smolen, J.M.; Simcik, M.F.; **Penn, R.L.** *The Adsorption of Perfluorooctane Sulfonate onto Sand, Clay and Iron Oxide Surfaces. J. Chem. Eng. Data.* **2007**, *52*, 1156.

Myers, J.C.; **Penn, R.L.** *Evolving Surface Reactivity of Cobalt Oxyhydroxide Nanoparticles.* J. Phys. Chem. C. **2007**, *111*, 10597.

Penn, R.L.; Flynn, L.; Johnson, P. *Building a Successful Middle School Outreach Effort: Microscopy Camp.* J. Chem. Edu. **2007**, *84*, 955.

Penn, R.L.; Tanaka, K.; Erbs J. *Size Dependent Kinetics of Oriented Aggregation.* J. Crystal Growth, **2007**, *97*, 309.

Ratkovich, A.S.; **Penn, R.L.** *Controlling Nanosized ZnO Growth Kinetics Using Various ZN:OH Concentration Ratios.* J. Phys. Chem. C. **2007**, *111*, 14098.

Denny, N.R.; Han, S.E.; Norris, D.J.; **Stein, A.** *Structural Effects of Thermal Emission on Monolithic Tungsten and Tungsten Alloy Photonic Crystals.* Chem. Mater. **2007**, *19*, 4563.

Lai, C.Z.; Fierke, M.A.; **Stein, A.**; **Bühlmann, P.** *Ion-Selective Electrodes with Three-Dimensionally Ordered Macroporous Carbon as the Solid Contact.* Anal. Chem. **2007**, *79*, 4621.

Li, F.; Delo, S.A.; **Stein, A.** *Disassembly and Self-Reassembly in Periodic Nanostructures: A Face-Centered to Simple Cubic Transformation.* Angew. Chem. Int. Ed. **2007**, *46*, 6666 (highlighted in Nature, **2007**, *449*, 550; in Nanowerk, posted **September 6, 2007**).

Li, F.; Wang, Z.; Ergang, N.S.; Fyfe, C.A.; **Stein, A.** *Controlling the Shape and Alignment of Mesopores by Confinement in Colloidal Crystals: Designer Pathways to Silica Monoliths with Hierarchical Porosity.* Langmuir, **2007**, *23*, 3996 (cover page).

Wang, Z.; Li, F.; **Stein, A.** *Direct Synthesis of Shaped Carbon Nanoparticles with Ordered Cubic Mesostructure.* Nano Lett. **2007**, *7*, 3223 (highlighted in MRS Bulletin, **2007**, *32*).

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.

2002 - 2007

Bates, F.S.; Pham, H.Q.; Verghese, N.E. *Amphiphilic Block Copolymer-Toughened Epoxy Ester and Unsaturated Polyester Resins*, Filed 2004.

Discher, D.E.; Discher, B.M.; Lee, Y.J.C-M.; **Bates, F.S.;** Hammer, D.A. *Polymersome Related Encapsulating Membranes*. United States Patent 6,835,394; Issued December 28, 2004.

Varma, A.; **Bates, F.S.;** Harada, T.; **Hillmyer, M.A.;** Lim, L.; Chaffin, K.A. *Anisotropic Extruded Block Triblock, Pentablock, and Multiblock Material for Use in Medical Devices*. Application submitted 2004 (pending).

Bates, F.S.; Dean, J.M.; Verghese, N.E.; Pham, H.Q. *Curable Flame Retardant Epoxy Resin Compositions*. United States Patent 6,887,574; Issued May 3, 2005.

Bates, F.S.; Hahn, S.F. *Amphiphilic Block Copolymer-Toughened Epoxy Resins*, Filed 2005.

Frisbie, C. D.; **Lodge, T. P.** *Ion Gels and Electronic Devices Using Ion Gels*, Filed November 29, 2007.

Boaen, N.K.; **Hillmyer, M.A.;** Hahn, S.F. *Oxyfunctionalization of Polyolefins*, United States Patent 6,953,868; Issued 2005.

Carr, P.W.; **Hillmyer, M.A.;** Liu, H.; Luo, H.; Ma, L.; Trammell, B.C. *Silica-Based Materials and Methods*. United States Patent 6,991,852; Issued 2006.

Hillmyer, M.A. *Fluorinated Polymers and Methods for their Preparation*. United States Patent 6,433,101; Issued 2002.

Zhang, D.; **Hillmyer, M.A.;** **Tolman, W.B.** *Polymer Synthesis from Macrocycles*. Application submitted 2005 (pending).

Hoye, T. R. *Hydrophobic Derivatives for Controlled Release*, Provisional Patent filed May 29, 2007.

Barry, C.R.; **Jacobs, H.O.** *Method and Apparatus for Depositing Charge and/or Nanoparticles*. United States Patent No. 7,232,771, Issued June 2007. Continuation in Part, 11/820473, Filed June 2007, (pending).

Kortshagen, U.; Bapat, A.; Mangolini, L.; Thimsen, E.; Thurk, P. *Process and Apparatus for Forming Nanoparticles Using Radiofrequency Plasmas*. Applied for United States Patent; filed June 17, 2005. #Z03207 U/M Docket (pending).

Kortshagen, U.; Bapat, A.; Mangolini, L.; Thimsen, E.; Jurberg, D. *Process and Apparatus for Forming Nanoparticles Using Radiofrequency Plasmas*. #Z03207 U/M Docket, United States Patent applied for June 13, 2005; Japanese patent filed for December 18, 2006; German patent filed for December 18, 2006 (pending).

Mangolini, M.; Jurbergs, D.; Rogojina, E.; Li, X.; **Kortshagen, U.** *Plasma-Initiated In-Flight Grafting of Organic Molecules onto Silicon Nanoparticles*. #Z07107 U/M Docket, United States Patent filed January 22, 2007 (pending).

Lee, J.; Panzer, M.J.; He, Y.; **Lodge, T.P.;** **Frisbie, C.D.** *Ion Gel Gated Polymer Thin Film Transistors*. Provisional Patent filed February 9, 2007.

Anacker, J.L.; **Macosko, C.W.;** **Hoye, T.R.;** Prud'homme, R.K. *Methods for Producing Nanoparticles*. United States PPA 60/700,855; August 2005 (pending).

Stein, A.; Holland, B.T.; Blanford, C.F.; Yan, H. *Synthesis of Macroporous Structures*. United States Patent 6,680,013; Issued January 20, 2004.