## 14. MRSEC-SUPPORTED PUBLICATIONS AND PATENTS
## †Denotes Publications with International Co-Authors

### IRG-1 Publications resulting from PRIMARY MRSEC Support

Lin, C.-H.; Polisetty, S.; O'Brien, L.; Baruth, A.; **Hillmyer, M.A.**; **Leighton, C.**; Gladfelter, W.G. *Size-tuned ZnO Nanocrucible Arrays for Magnetic Nanodot Synthesis via ALD-assisted Block Polymer Lithography*. ACS Nano **2015**, *9*, 1379. http://dx.doi.org/10.1021/nn505731n **Collaboration with IRG-3. DMR #0819885 and 1420013.**

Haratipour, N.; Robbins, M. C.; **Koester, S. J.** *Black Phosphorus p-MOSFETs With 7-nm $HfO_2$ Gate Dielectric and Low Contact Resistance*. IEEE Elect. Dev. Lett. **2015**, *36*, 411-413. http:/dx.doi.org/10.1109/LED.2015.2407195 **DMR#1420013.**

Xie, W.; Wang, S.; Zhang, X.; **Leighton, C**.; **Frisbie, C.D**. *High Conductance Transport at the Hall Mobility Peak in Electrolyte-gated Rubrene Crystals*. Phys. Rev. Lett. **2014**, *113*, 246602. http://dx.doi.org/10.1103/PhysRevLett.113.246602 **DMR #0819885 and 1420013.**

Ganguly, K.; Ambwani, P.; Xu, P.; Jeong, J. S.; **Mkhoyan, K. A.; Leighton, C.; Jalan, B.** *Structure and Transport in High Pressure Oxygen Sputter-Deposited $BaSnO_{3-d}$*. APL Mat, **2015**, *3*, 062509. http://dx.doi.org/10.1063/1.4919969 **Collaboration with IRG-2. DMR #0819885.**

### IRG-1 Publications resulting from PARTIAL MRSEC Support

Zhang, X.; Scott, T.; Socha, T.*; Nielsen, D.*; Manno, M., Johnson, M.; Yan, Y.*; Losovyj, Y.; Dowben, P.; **Aydil, E.S**.; **Leighton, C**. *Phase Stability and Stoichiometry in Thin Film Pyrite: Impact on Electronic Transport Properties*. ACS Appl. Mater. Int. **2015**, *7*, 14130-14139. ***(*Undergraduate, University of Minnesota)*** http://dx.doi.org/10.1021/acsami.5b03422 **Collaboration with IRG-2. DMR #0819885 and 1420013.**

Anugrah, Y.; Robbins, M.C.; **Crowell, P.A.; Koester, S.J.** *Determination of the Schottky Barrier Height of Ferromagnetic Contacts to Few-layer Phosphorene*. Appl. Phys. Lett., **2015**, *106,* 103108. http://dx.doi.org/10.1063/1.4914978 **DMR#1420013.**

†Szabó, A.; **Koester, S**. J.; †Luisier, M. *Ab-Initio Simulation of van der Waals $MoTe_2$–$SnS_2$ Heterotunneling FETs for Low-Power Electronics*. IEEE Elect. Dev. Lett. **2015**, *36*, 514-516. http://dx.doi.org/ 10.1109/LED.2015.2409212 **DMR#1420013.**

Johnson, M.; Wrasman, C.*; Zhang, X.; Manno, M.; **Leighton, C**.; **Aydil, E.S**. *Self-regulation of Cu/Sn Ratio in the Synthesis of $Cu_2ZnSnS_4$ Films*. Chem. Mater, **2015**, *27*, 2507-2514. ***(*UROP Program and IREE, University of Minnesota)*** http://dx.doi.org/10.1021/acs.chemmater.5b00108 **Collaboration with IRG-2. DMR #0819885 and 1420013.**

Wu, R.J.; Topsakal, M.; Low, T.; Robbins, M.C.; Haratipour, N.; Jeong, J.S.; **Wentzcovitch, R.**; **Koester, S.J.**; **Mkhoyan, K.A.** *Atomic and Electronic Structure of Exfoliated Black Phosphorous*. J. Vac. Sci. Technol. A **2015**, 33, 060604. http://dx.doi.org/10.1116/1.4926753 **Collaboration with IRG-2. DMR #0819885.**

### IRG-1 Publications resulting from the USE OF SHARED FACILITIES

Nelson, J.; **Goldman, A.M.** *Thin Film Cryogenic Thermometers Defined with Optical Lithography for Thermomagnetic Measurements on Films*. Rev. Sci, Instrum, **2015**, *86*, 053902-1- 053902-5. http://dx.doi.org/10.1063/1.4919734

Lin, Yen-Hsiang; Nelson, J.; **Goldman, A.M.** *Superconductivity of Very Thin Films: The Superconductor-unsulator Transition*. Physica. C, **2015**, *514*, 130-141.

http://dx.doi.org/10.1016/j.physc.2015.01.005

Wang, T.; Prakash, A.; Warner, E.; Gladfelter, W.G.; **Jalan, B**. *Molecular Beam Epitaxy Growth of $SnO_2$ Using a Tin Chemical Precursor*. J. Vac. Sci. Technol, **2015**, *33*, 020606. http://dx.doi.org/10.1116/1.4913294

Youngblood, N.; Chen, C.; **Koester, S. J.; Li, M.** *Waveguide-integrated Black Phosphorus Photodetector with High Responsivity and Low Dark Current*. Nat. Photonics, **2015**, *9*, 247-252.

http://dx.doi.org/10.1038/NPHOTON.2015.23

Hsu, H.; **Wentzcovitch, R.** *First Principles Study of Intermediate-spin Ferrous Iron in the Earth's Lower Mantle***.** Phys. Rev. **2015**, B *90*, 195205 (2014). http://dx.doi.org/10.1103/PhysRevB.90.195205

Umemoto, K.; Himmetoglu, B.; Wang, J.P.; **Wentzcovitch, R.**; Cococcioni, M. *Searching for High Magnetization Density in Bulk Fe: the New Metastable $Fe_6$ Phase*. J. Phys.: Cond. Matt., **2015,** 27, 016001 (2015). http://dx.doi.org/10.1088/0953-8984/27/1/016001

## IRG-2 Publications resulting from PRIMARY MRSEC Support

*(note 1 other in collaboration with IRG-1)*

Williams, B.A.; Mahajan, A.; Smeaton, M.A.*; Holgate, C.S.*; **Aydil, E.S.; Francis, L.F.** *Formation of Copper Zinc Tin Sulfide Thin Films from Colloidal Nanocrystal Dispersions via Aerosol-Jet Printing and Compaction*. ACS Applied Materials & Interfaces, **2015**, *7*, 11526-11535. ***(*UROP Program and IREE, University of Minnesota)*** http://dx.doi.org/10.1021/acsami.5b02484 **DMR #0819885 and 1420013.**

Declet-Perez, C.; **Francis, L.F**; **Bates, F.S.** *Deformation Processes in Block Copolymer Toughened Epoxy*. Macromolecules, **2015,** *48,* 3672–3684. http://dx.doi.org/10.1021/acs.macromol.5b00243 **Collaboration with IRG-3. DMR #0819885.**

Thimsen, E.; **Kortshagen, U.R.**; **Aydil, E.S.** *Nonthermal Plasma Synthesis of Metal Sulfide Nanocrystals from Metalorganic Vapor and Elemental Sulfur*. Journal of Physics D: Applied Physics, **2015,** *48*, 314004. http://dx.doi.org/10.1088/0022-3727/48/31/314004 **DMR #0819885 and 1420013.**

Reich, K. V.; Schecter, M.; **Shklovskii, B.I.** *Accumulation, Inversion, and Depletion Layers in SrTiO3*. Phys. Rev. B, **2015**, *91*, 115303. http://dx.doi.org/10.1103/PhysRevB.91.115303 **DMR #1420013.**

## IRG-2 Publications resulting from PARTIAL MRSEC Support

*(note 3 others in collaboration with IRG-1)*

†Wen, X.; †Zhang, P.; †Smith, T.A.; Anthony, R.J.; **Kortshagen, U.R.**; †Yu, P.; †Feng, Y.; †Shrestha, S.; †Coniber, G.; †Huang, S. *Tunability Limit of Photoluminescence in Colloidal Silicon Nanocrystals*. Scientific Reports, **2015,** *5*, 12469. http://dx.doi.org/10.1038/srep12469 **DMR #0819885 and 1420013.**

Thimsen, E.; Johnson, M.; Zhang, X.; Wagner, A.J.; **Mkhoyan, K.A.; Kortshagen, U.R.; Aydil, E.S.** *High Electron Mobility in Thin Films Formed via Supersonic Impact Deposition of Nanocrystals Synthesized in Nonthermal Plasmas*. Nature Communications, **2014**, *5*, 5822. http://dx.doi.org/10.1038/ncomms6822 **DMR #0819885 and 1420013.**

Fu, H.; **Shklovskii B.I.**; Skinner, B. *Correlation Effects in the Capacitance of a Gated Carbon Nanotube*. Phys. Rev. B, **2015**, 91, 155118. http://dx.doi.org/10.1103/PhysRevB.91.155118 **DMR #1420013.**

## IRG-2 Publications resulting from the USE OF SHARED FACILITIES

Bilik, N.; Anthony R.; Merritt, B. A.; **Aydil, E. S.; Kortshagen, U. R.** *Langmuir Probe Measurements of Electron Energy Probability Function in Dusty Plasmas*. Journal of Physics D: Applied Physics, **2015**, *48*, 105204. http://dx.doi.org/10.1088/0022-3727/48/10/105204

Mahajan, A.; Hyun, W.J.; Walker, S.B.; Lewis, J.A.; **Francis, L.F.**; **Frisbie,C.D.** *High-Resolution, High-Aspect Ratio Conductive Wires Embedded in Plastic Substrates*. ACS Applied Materials & Interfaces, **2015,** *7,* 1841-1847. http://dx.doi.org/10.1021/am507539a

Agrawal,K.V.; Topuz, B.; Pham, T.C.T.; Nguyen, T.H.; Sauer, N.; Rangnekar, N.; Zhang, H.; Narasimharao, K.; Basahel, S.N.; **Francis, L.F**.; Macosko,C.W.; Al-Thabaiti, S.; Tsapatsis, M.; Yoon, K.B.;*Oriented MFI Membranes by Gel-Less Secondary Growth of Sub-100 Nm MFI-Nanosheet Seed Layers*. Adv Mater, **2015,** *27,* 3243-3249. http://dx.doi.org/10.1002/adma.201405893

Hyun, W.J.; Secor, E.B.; Hersam, M.C.; **Frisbie, C.D.**, **Francis, L.F**.; *High-Resolution Patterning of Graphene by Screen Printing with a Silicon Stencil for Highly Flexible Printed Electronics*. Adv Mater, **2015,** *27,* 109-115. http://dx.doi.org/10.1002/adma.201404133

Egger, S.M.; Hurley, K.R.; Datt, A.; Swindlehurst, G.; **Haynes**, **C.L.** *Ultraporous Mesostructured Silica Nanoparticles*. Chemistry of Materials, **2015**, *27*, 3193-3196. http://dx.doi.org/10.1021/cm504448u

Gopalakrishnan, R.; McMurry, P.H.; **Hogan C.J.** *The Electrical Mobilities and Scalar Friction Factors of Modest-to-High Aspect Ratio Particles in the Transition Regime*. J. Aerosol Sci., **2015**, *82*, 24-39. http://dx.doi.org/10.1016/j.jaerosci.2015.01.001

Thajudeen T.; Jeon S.; **Hogan C. J.** *The Mobility of Flame Synthesized Aggregates/Agglomerates in the Transition Regime*. J. Aerosol Sci., **2015**, *80*, 45-57. http://dx.doi.org/10.1016/j.jaerosci.2014.11.003

## IRG-3 Publications resulting from PRIMARY MRSEC Support

*(note 1 other in collaboration with IRG-1)*

*(note 1 other in collaboration with IRG-2)*

Zhou, C.; Toombes, G. E.; Wasbrough, M. J.; **Hillmyer**, **M.A.; Lodge**, **T.P**.; *Structure of Two-Compartment Hydrogels from Thermoresponsive ABC Triblock Terpolymers*. Macromolecules, **2015**, *48*, ASAP. http://dx.doi.org/10.1021/acs.macromol.5b00584 **DMR #0819885 and 1420013.**

Laaser, J.E.; Jiang, Y.; Sprouse, D.; **Reineke, T.M**.; **Lodge, T.P.** *pH- and Ionic-Strength-Induced Contraction of Polybasic Micelles in Buffered Aqueous Solutions*. Macromolecules, **2015**, *48*, 2677-2685 http://dx.doi.org/10.1021/acs.macromol.5b00360 **DMR #0819885 and 1420013.**

## IRG-3 Publications resulting from PARTIAL MRSEC Support

None.

## IRG-3 Publications resulting from the USE OF SHARED FACILITIES

McAllister, J.W.; Lott, J.R.; Schmidt, P.W.; Sammler, R.L.; **Bates, F.S.**; **Lodge, T.P.** *Linear and Non-linear Rheological Behavior of Fibrillar Methylcellulose Hydrogels*. ACS Macro Letters, **2015**, *4*, 538-542. http://dx.doi.org/10.1021/acsmacrolett.5b00150

Lu, J.; **Bates, F.S.**; **Lodge, T.P.** *Remarkable Effect of Molecular Architecture on Chain Exchange in Triblock Copolymer Micelles*. Macromolecules, **2015**, *48*, 2667-2676. http://dx.doi.org/10.1021/acs.macromol.5b00294

Schneiderman, D.K.; Hill, E.M.*; Martello, M.T.; **Hillmyer, M.A.** *Poly(lactide)-block-poly(ε-caprolactone-co-ε-decalactone)-block-poly(lactide) Copolymer Elastomers*. Polymer Chemistry, **2015**, *6*, 3641–3651. (***UROP student, 2012-14, University of Minnesota***) http://dx.doi.org/10.1039/C5PY00202H

Ricarte, R.G.; **Lodge, T.P.**; **Hillmyer, M.A.** *Detection of Pharmaceutical Drug Crystallites in Solid Dispersions by Transmission Electron Microscopy*. Mol. Pharmaceutics, **2015**, *12*, 983–990. http://dx.doi.org/10.1021/mp500682x

Hickey, R. J.; Gillard, T. M.; **Lodge, T.P.; Bates, F.S.** *Influence of Composition Fluctuations on the Linear Viscoelastic Properties of Symmetric Diblock Copolymers Near the Order-Disorder Transition*. ACS Macro Lett. **2015**, *4* 260-265 http://dx.doi.org/acsmacrolett.5b00014

Widanapathirana, L.; Tale, S.; **Reineke, T.M.** *Dissolution and Solubility Enhancement of the Highly Lipophilic Drug Phenytoin via Interaction with Poly(N-isopropylacrylamide-co-vinylpyrrolidone) Excipients*. Mol. Pharm., **2015,** *Article ASAP,* http://dx.doi.org/10.1021/acs.molpharmaceut.5b00202

**SEED Publications resulting from PRIMARY MRSEC Support**

Plemmons, D.A.; Suri, P.K.; **Flannigan, D.J.** *Probing Structural and Electronic Dynamics with Ultrafast Electron Microscopy*. Chemistry of Materials, **2015**, *27*, 3178-3192. http://dx.doi.org/10.1021/acs.chemmater.5b00433 **DMR #1420013.**

**SEED Publications resulting from PARTIAL MRSEC Support**

None.

**SEED Publications resulting from the USE OF SHARED FACILITIES**

None.

## MRSEC-supported Patents

### Patent Applications

Li, T.; Lianggliang, G.; **Francis, L.; Bates, F.S.** *Toughened Thermoplastic Blends*, **2015**, provisional application for patent.

**Hillmyer, M.A.**; **Lodge, T.P.**; Schulze, M. W.; McIntosh, L. D. *Polymer Electrolyte Membranes*, **2014**, US Patent App 14/666,715.

### Patents Granted

None.

### Patents Licensed

None.