

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

IRG-1 Publications resulting from PRIMARY MRSEC Support

Kinney, J.; Garcia-Barriocanal, J.; **Goldman, A.M.** *Homes scaling in ionic liquid gated La_2CuO_{4+x} thin films.* Physical Review B., **2015**, 100505(R).

<http://dx.doi.org/10.1103/PhysRevB.92.100505> **DMR-1420013**

Xu, P.; Droubay, T.C.; Jeong, J. S.; **Mkhoyan, K.A.**; Sushko, P. V.; Chambers, S. A.; **Jalan, B.** *Quasi 2D ultra-high carrier density in a complex oxide broken-gap heterojunction.* Adv. Mater. Interfaces, **2016**, 3, 1500432. <http://dx.doi.org/10.1002/admi.201500432>

Collaboration with IRG-2. DMR-0819885 and 1420013

Comes, R.B.; Xu, P.; **Jalan, B.**; Chambers, S.A. *Band alignment of epitaxial $SrTiO_3$ thin films with $(LaAlO_3)_{0.3}-(Sr_2AlTaO_6)_{0.7}(001)$.* Appl. Phys. Lett., **2015**, 107, 131601.

<http://dx.doi.org/10.1063/1.4932063> **DMR-1420013**

Haratipour, N.; **Koester, S.J.** *Ambipolar black phosphorus MOSFETs with record n-channel transconductance.* IEEE Elect. Dev. Lett., **2016**, 37, 103-106.

<http://dx.doi.org/10.1109/LED.2015.2499209> **DMR-1420013**

Haratipour, N.; Robbins, M.C.; **Koester, S.J.** *Black phosphorus n-MOSFETs with record transconductance,* 73rd Device Research Conference (DRC), Columbus, OH, Jun. 21-25, **2015**.

<http://dx.doi.org/10.1109/DRC.2015.7175659> **DMR-1420013**

IRG-1 Publications resulting from PARTIAL MRSEC Support

Christie, K.D.; Geppert, C.C.; Patel, S.J.; Hu, Q.O.; **Palmstrøm, C.J.**; **Crowell, P.A.** *Knight shift and nuclear spin relaxation in $Fe/n-GaAs$ heterostructures.* Phys. Rev. B., **2015**, 92, 155204. <http://dx.doi.org/10.1103/PhysRevB.92.155204> **DMR-0819885**

<http://dx.doi.org/10.1103/PhysRevB.92.155204> **DMR-0819885**

Liu, C.; Patel, S.J.; Peterson, T.A.; Geppert, C.C.; Christie, K.D.; **Palmstrøm, C.J.**; **Crowell, P.A.** *Dynamic detection of electron spin accumulation in ferromagnet-semiconductor devices by ferromagnetic resonance.* Nat. Comm., **2016**, 7, 10296.

<http://dx.doi.org/10.1038/ncomms10296> **DMR-0819885**

Prakash, A.; Dewey, J.; Yun, H.; Jeong, J. S.; **Mkhoyan, K.A.**; **Jalan, B.** *Hybrid molecular beam epitaxy growth for stoichiometric $BaSnO_3$.* J. Vac. Sci. Technol. A., **2015**, 33, 060608.

<http://dx.doi.org/10.1116/1.4933401> **Collaboration with IRG-2. DMR-1420013**

Olson, E. J.; Ma, R.; Sun, T.; Ebrish, M. A.; Haratipour, N.; Min, K.; Aluru, N. R.; **Koester, S.J.** *Capacitive sensing of intercalated H_2O molecules using graphene.* ACS Appl. Mater. Interfaces, **2015**, 7, 25804-25812. <http://dx.doi.org/10.1021/acsami.5b07731> **DMR-1420013**

<http://dx.doi.org/10.1021/acsami.5b07731> **DMR-1420013**

Su, Y.; Kshirsagar, C.; Robbins, M.; Haratipour, N.; **Koester, S.J.** *Symmetric complementary logic inverter using integrated black phosphorus and MoS_2 transistors.* 2D Materials, **2016**, 3, 011006. <http://dx.doi.org/10.1088/2053-1583/3/1/011006> **DMR-1420013**

<http://dx.doi.org/10.1088/2053-1583/3/1/011006> **DMR-1420013**

Su, Y.; Haratipour, N.; Robbins, M. C.; Kshirsagar, C.; **Koester, S.J.** *Integrated MoS_2 n-MOSFETs and black phosphorus p-MOSFETs with HfO_2 dielectrics and local backgate electrodes.* 73rd Device Research Conference, **2015**, (DRC), Columbus, OH, Jun. 21-25.

<http://dx.doi.org/10.1109/DRC.2015.7175602> **DMR-1420013**

Gilbert, I.; Lao, Y.; O'Brien, L. †; Watts, J. D.; Manno, M.; **Leighton, C.**; Scholl, A.; Nisoli, C.; Schiffer, P. *Emergent reduced dimensionality by vertex frustration in tetris artificial spin ice.* Nat. Phys., **2015**, 12; 162-165. <http://dx.doi.org/10.1038/nphys3520> **DMR-1420013**

<http://dx.doi.org/10.1038/nphys3520> **DMR-1420013**

Shukla, G.; Topsakal, M.; **Wentzcovitch, R.M.** *Spin crossovers in iron-bearing MgSiO₃ and MgGeO₃: Their influence on the post-perovskite transition.* *Physics of the Earth and Planetary Interiors*, **2015**, 249, 11-17. <http://dx.doi.org/10.1016/j.pepi.2015.10.002> **DMR-1420013**

IRG-1 Publications resulting from the USE OF SHARED FACILITIES

Wu, Y.; Chew, A.R.; Rojas, G.A.; †Sini, G.; **Haugstad, G.**; Belianinov, A.; Kalinin, S.V.; Li, H.; Risko, C.; †Bredas, J.L.; Salleo, A.; **Frisbie, C.D.** *Strain Effects on the Work Function of an Organic Semiconductor.* *Nature Commun.*, **2016**, 7, 10270.

<http://dx.doi.org/10.1038/ncomms10270> **DMR-1420013**

Li, Y.-L.; Porter, W.M.; Ma, R.; Reynolds, M.A.; Gerbi, B.J.; **Koester, S.J.** *Capacitive-based dosimetry of Co-60 radiation using fully-depleted silicon-on-insulator devices.* *IEEE Trans. Nucl. Sci.*, **2015**, 62, 3012-3019. <http://dx.doi.org/10.1109/TNS.2015.2487239> **DMR-1420013**

IRG-2 Publications resulting from PRIMARY MRSEC Support

Ahadi, A.M.; Hunter, K.I.; Kramer, N.J.; Strunskus, T.; Kersten, H.; Faupel, F.; **Kortshagen, U.R.** *Controlled synthesis of germanium nanoparticles by nonthermal plasmas.* *Applied Physics Letters*, **2016**, 108, 093105. <http://dx.doi.org/10.1063/1.4942970> **DMR-1420013**

Li, T.; Heinzer, M.J.; **Francis, L.F.**; **Bates, F.S.** *Engineering Superior Toughness in Commercially Viable Block Copolymer Modified Epoxy Resin.* *J. Polym. Sci. Part B.*, **2016**, 54, 189-204. <http://dx.doi.org/10.1002/polb.23894> **Collaboration with IRG-3. DMR-1420013**

Chen, T.; Reich, K.V.; Kramer, N.J.; Fu, H.; **Kortshagen, U.R.**; **Shklovskii, B.I.** *Metal-Insulator Transition in Films of Doped Semiconductor Nanocrystals.* *Nature Materials*, **2016**. Published online. <http://dx.doi.org/10.1038/nmat4486> **DMR-1420013**

Greenberg, B.L.; Ganguly, S.; Held, J.T.; Kramer, N.J.; **Mkhoyan, K.A.**; **Aydil, E.S.**; **Kortshagen, U.R.** *Nonequilibrium-Plasma-Synthesized ZnO Nanocrystals with Plasmon Resonance Tunable via Al Doping and Quantum Confinement.* *Nano Letters*, **2015**, 15, 8162. <http://dx.doi.org/10.1021/acs.nanolett.5b03600> **DMR-1420013**

Miller, J.B.; Dandu, N.; Velizhanin, K.A.; Anthony, R.J.; **Kortshagen, U.R.**; Kroll, D.M.; Kilina, S.; Hobbie, E.K. *Enhanced Luminescent Stability through Particle Interactions in Silicon Nanocrystal Aggregates.* *ACS Nano*, **2015**, 9, 9772. <http://dx.doi.org/10.1021/acs.nano.5b02676> **DMR-1420013**

Wu, J. J.; **Kortshagen, U. R.** *Photostability of Thermally-Hydrosilylated Silicon Quantum Dots.* *RSC Advances* **2015**, 5, 103822. <http://dx.doi.org/10.1039/c5ra22827a> **DMR-1420013**

Hintsala, E.D.; Wagner, A.J.; Gerberich, W.W.; **Mkhoyan, K.A.** *The role of back stress in sub-50 nm Si nanocubes.* *Scripta Mater.*, **2016**, 114, 51. <http://dx.doi.org/10.1016/j.scriptamat.2015.12.004> **DMR-0819885 and 1420013**

Wagner, A.J.; Hintsala, E.D.; Kumar, P.; Gerberich, W.W.; **Mkhoyan, K.A.** *Mechanisms of plasticity in near-theoretical strength sub-100 nm Si nanocubes.* *Acta Materialia*, **2015**, 100, 256. <http://dx.doi.org/10.1016/j.actamat.2015.08.029> **DMR-0819885 and 1420013**

Nelson, J.; Reich, K.V.; Sammon, M.; **Shklovskii, B.I.**; **Goldman, A.M.** *Hopping conduction via ionic liquid induced silicon surface states.* *Phys. Rev. B.*, **2015**, 92, 085424. <http://dx.doi.org/10.1103/PhysRevB.92.085424> **Collaboration with IRG-1. DMR-1420013**

IRG-2 Publications resulting from PARTIAL MRSEC Support

Kortshagen, U. *Nonthermal Plasma Synthesis of Nanocrystals: Fundamentals, Applications, and Future Research Needs.* Plasma Chemistry and Plasma Processing, **2016**, 36, 73-84. <http://dx.doi.org/10.1007/s11090-015-9663-4> **DMR-0819885 and 1420013**

Shu, Y.N.; **Kortshagen, U.R.**; Levine, B.G.; Anthony, R.J. *Surface Structure and Silicon Nanocrystal Photoluminescence: The Role of Hypervalent Silyl Groups.* Journal of Physical Chemistry C., **2015**, 119, 26683. <http://dx.doi.org/10.1021/acs.jpcc.5b08578> **DMR-0819885 and 1420013**

Zhang, P.; Feng, Y.; Wen, X.; Cao, W.; Anthony, R.; **Kortshagen, U.**; Conibeer, G.; Huang, S. *Generation of Hot Carrier Population in Colloidal Silicon Quantum Dots for High-Efficiency Photovoltaics.* Sol Energ Mat Sol C., **2016**, 145, 391. <http://dx.doi.org/10.1016/j.solmat.2015.11.002> **DMR-0819885 and 1420013**

Kim, S.Y.; Jeong, J.S.; **Mkhoyan, K.A.**; Jang, H.S. *Direct observation of core/double-shell architecture of intense dual-mode luminescent tetragonal bipyramidal nanophosphors.* Nanoscale, **2016**, <http://dx.doi.org/10.1039/C5NR05722A> **DMR-1420013**

O'Brien, L.; Spivak, D.; Jeong, J.S.; **Mkhoyan, K.A.**; **Crowell, P.A.**; **Leighton C.** *Interdiffusion-controlled Kondo suppression of injection efficiency in metallic nonlocal spin valves,* Phys. Rev. B., **2016**, 93, 14413. <http://dx.doi.org/10.1103/PhysRevB.93.014413>
Collaboration with IRG-1. DMR-0819885 and 1420013

IRG-2 Publications resulting from the USE OF SHARED FACILITIES

Kramer, N. J.; Schramke, K.S.; **Kortshagen, U.R.** *Plasmonic Properties of Silicon Nanocrystals Doped with Boron and Phosphorus.* Nano Letters, **2015**, 15, 5597. <http://dx.doi.org/10.1021/acs.nanolett.5b02287> **DMR-1420013.**

Yang, J.; Kramer, N.J.; Schramke, K.S.; Wheeler, L.M.; Besteiro, L.V.; **Hogan, C.J.**; Govorov, A.O.; **Kortshagen, U.R.** *Broadband Absorbing Exciton-Plasmon Metafluids with Narrow Transparency Windows.* Nano Lett., **2016**. <http://dx.doi.org/10.1021/acs.nanolett.5b05142> **DMR-1420013.**

Almasi, H.; Hickey, D.R.; Newhouse-Illige, T.; Xu, M.; Rosales, M.R.; Nahar, S.; Held, J.T.; **Mkhoyan, K.A.**; Wang, W.G. *Enhanced tunneling magnetoresistance and perpendicular magnetic anisotropy in Mo/CoFeB/MgO magnetic tunnel.* Appl. Phys. Lett., **2015**, 106, 182406. <http://dx.doi.org/10.1063/1.4919873> **DMR-1420013.**

Lee, J.S.; Richardella, A.; Hickey, D.R.; **Mkhoyan, K.A.**; Samarth, N. *Mapping the chemical potential dependence of current-induced spin polarization in a topological insulator.* Physical Review B., **2015**, 92. <http://dx.doi.org/10.1103/PhysRevB.92.155312> **DMR-1420013.**

Yang, J. H.; Kramer, N. J.; **Hogan, C.J.**; **Kortshagen, U.R.** *Self-Assembly of Plasmonic/Excitonic Silicon Nanocrystals into Photonic Crystals.* MRS Communications, **2015**, 5, 573-577. <http://dx.doi.org/10.1557/mrc.2015.77> **DMR-1420013.**

IRG-3 Publications resulting from PRIMARY MRSEC Support

Li, T.; Zhang, J.; Schneiderman, D.K.; **Francis, L.F.**; **Bates, F.S.** *Toughening Glassy Poly(lactide) with Block Copolymer Micelles.* ACS Macro Lett., **2016**, 5, 359-364. <http://dx.doi.org/10.1021/acsmacrolett.6b00063> **Collaboration with IRG-2. DMR-1420013**

Laaser, J. E.; Jiang, Y.; Petersen, S.R.; **Reineke, T.M.**; **Lodge, T.P.** *Interpolyelectrolyte Complexes of Polycationic Micelles and Linear Polyanions: Structural Stability and Temporal Evolution.* J. Phys. Chem. B., **2015**, 119, 15919-15928. <http://dx.doi.org/10.1021/acs.jpcc.5b09010> **DMR-1420013**

Sinturel, C.; **Bates, F.S.**; **Hillmyer, M.A.** *High χ -Low N Block Polymers: How Far Can We Go?* ACS Macro Letters, **2015**, 4, 1044-1050. <http://dx.doi.org/10.1021/acsmacrolett.5b00472> **DMR-1420013**

Ruud, E.D.; Wilkinson, N.A.; **Dutcher, C.S.** *Polymer and Particle Dynamics and Assembly in Varied Hydrodynamic Fields.* Macromolecular Chemistry and Physics, **2016**, 217, 3, 390–402. <http://dx.doi.org/10.1002/macp.201500392> **DMR-1420013**

Schulze, M.W.; Sinturel, C. †; **Hillmyer, M.A.** *Poly(cyclohexylethylene)-block-poly(ethylene oxide) Block Polymers for Metal Oxide Templating* ACS Macro Lett., **2015**, 4, 1027–1032. <http://dx.doi.org/10.1021/acsmacrolett.5b00458> **DMR-1420013**

IRG-3 Publications resulting from PARTIAL MRSEC Support

McAllister, J.W.; Schmidt, P.W.; **Dorfman, K.D.**; **Lodge, T.P.**; **Bates, F.S.** *Thermodynamics of Aqueous Methylcellulose Solutions.* Macromolecules, **2015**, 48, 7205-7215. <http://dx.doi.org/10.1021/acs.macromol.5b01544> **DMR-1420013**

Reineke, T.M. *Stimuli Responsive Polymers For Biological Detection and Delivery.* ACS Macro. Lett., **2016**, 5, 14-18. <http://dx.doi.org/10.1021/acsmacrolett.5b00862> **DMR-1420013**

IRG-3 Publications resulting from the USE OF SHARED FACILITIES

Boyer, H.; Wexler, A.S.; **Dutcher, C.S.** *Parameter Interpretation and Reduction for a Unified Statistical Mechanical Surface Tension Model.* Journal of Physical Chemistry Letters, **2015**, 6, 3384–3389. <http://dx.doi.org/10.1021/acs.jpcclett.5b01346> **DMR-1420013**

Hickey, R.J.; Gillard, T.M.; Irwin, M.T.; **Lodge, T.P.**; **Bates, F.S.** *Structure, Viscoelasticity, and Interfacial Dynamics of a Model Polymeric Bicontinuous Microemulsion.* Soft Matter, **2016**, 12, 53-66. <http://dx.doi.org/10.1039/C5SM02009C> **DMR-1420013**

Ting, J.M.; Navale, T.S.; Jones, S.D.; **Bates, F.S.**; **Reineke, T.M.** *Deconstructing HPMCAS: Excipient Design to Tailor Polymer-drug Interactions for BCS Class II Drugs.* ACS Biomater. Sci. Eng., **2015**, 1, 978-990. <http://dx.doi.org/10.1021/acsbiomaterials.5b00234> **DMR-1420013**

Wang, Z.; Macosko, C.W.; **Bates, F.S.** *Fluorine Enriched Melt Blown Fibers from Polymer Blends of Poly(butylene terephthalate) and a Perfluorinated Multiblock Copolyester.* ACS Applied Materials & Interfaces, **2016**, 54, 754-761. <http://dx.doi.org/10.1021/acsami.5b09976> **DMR-1420013**

Metcalf, A.R.; Boyer, H.C.; **Dutcher, C.S.** *Interfacial Tensions of Aged Organic Aerosol Particle Mimics using a Biphasic Microfluidic Platform.* Environmental Science and Technology, **2016**, 50, 1251-1259. <http://dx.doi.org/10.1021/acs.est.5b04880> **DMR-1420013**

Jackson, E.A.; Lee, Y.; Radlauer, M.R.; **Hillmyer, M.A.** *Well-Ordered Nanoporous ABA Copolymer Thin Films via Solvent Vapor Annealing, Homopolymer Blending, and Selective Etching of ABAC Tetrablock Terpolymers.* ACS Appl. Mater. Interfaces, **2015**, 7, 27331–27339. <http://dx.doi.org/10.1021/acsami.5b08856> **MRSEC Program**

SEED Publications resulting from PRIMARY MRSEC Support

Sharma, A.; Orłowski, G.M.; Zhu, T.; Shore, D.; Kim, S.Y.; DiVito, M.D.; Hubel, A.; **Stadler, B.J.H.** *Inducing cells to self-disperse non-toxic Ni nanowires via integrin-mediated responses.* *Nanotechnology*, **2015**, 26, 135102. <http://dx.doi.org/10.1088/0957-4484/26/13/135102>
DMR-0819885

Kucukgok, B.; Wu, X.W.; **Wang, X.J.**; Liu, Z.Q.; Ferguson, I.T.; Lu, N. *The Structural Properties of InGaN Alloys and the Interdependence on the Thermoelectric Behavior.* *AIP Advances*, **2016**, 6, 025305. <http://dx.doi.org/10.1063/1.4941934> **DMR-1420013**

Wu, X.W.; Ni, Y.X.; Zhu, J.; Burrows, N.D.; Murphy, C.J.; Dumitrica, T.; and **Wang, X.J.** *Thermal Transport across Surfactant Layers on Gold Nanorods in Aqueous Solution.* *ACS Applied Materials & Interfaces*, **2016**, <http://dx.doi.org/10.1021/acsami.5b12163> **DMR-1420013**

SEED Publications resulting from PARTIAL MRSEC Support

Youngdong Y.; Degregorio, Z.P.; **Johns, J.E.** *Seed Crystal Heterogeneity Controls Lateral and Vertical Heteroepitaxy of Monolayer MoS₂ and WS₂.* *JACS*, **2015**, 137, 14281–14287.
<http://dx.doi.org/10.1021/jacs.5b06643> **DMR-1420013**

Zhu, J.; Chen, J-Y; Park, H.; Gu, X; Zhang, H.; Karthikeyan, S.; Wendel, N.; **Campbell, S.**; Dawber, M.; Du, X.; Wang, J-P.; Yang, R.; **Wang, X.** *Revealing the Origins of 3D Anisotropic Thermal Conductivities of Black Phosphorus.* *Adv. Electronic Mats.*, **2016**,
<http://onlinelibrary.wiley.com/doi/10.1002/aelm.201600040>
Collaboration with IRG-2. DMR-1420013

SEED Publications resulting from the USE OF SHARED FACILITIES

Cremons, D.R.; **Flannigan, D.J.** *Diffraction-Ring Contraction as a Method of In Situ Thermometry in TEM.* *Microsc. Microanal.*, **2015**, 21, 967-968.
<http://dx.doi.org/10.1017/S1431927615005632> **MRSEC Program**

Suri, P. K.; Yan, J.; Mandrus, D.; **Flannigan, D. J.** *Dynamical Effects on Atomic-Resolution Imaging and Diffraction of the Tetragonal and Orthorhombic Phases of LaFeAsO.* *Microsc. Microanal.*, **2015**, 21, 813-814. <http://dx.doi.org/10.1017/S1431927615004869>
DMR-0819885 and 1420013

MRSEC-supported Patents

Patent Applications

Bates, F.S.; Francis, L.F.; Li, T. *Toughened PLA and Thermoplastics*. University of Minnesota case # 20150168.

Kortshagen, U.R.; Kramer, N.J.; Wheeler, L.M.; Chen, T. *Group IV nanocrystals having a surface substantially free of oxygen*, **2015**, US Patent App 14690970.

Zhou, Y.; Sachweh, B.; Thimsen, E.; **Aydil, E.; Kortshagen, U.** *Gas phase process for producing conductive metal oxide films*, **2015**, US Patent App PCT/EP2015/058060.

Patents Granted

Mangolini, L.; **Kortshagen, U.R.;** Anthony, R.; Jurbergs, D.; Li, X.; Rogojina, E. *Nanoparticles with grafted organic molecules*, **2015**, U.S. Patent: US 8,945,673.

Hillmyer, M.A.; Pitet, L.; Amendt, M. *Nanoporous linear polyolefin linear polyolefin membranes and block copolymer precursors for the same*, **2015**, U.S. Patent 9,051,431.

Patents Licensed

Stadler, B.J.H.; Hien, M.; Foster, D.; Wulffman, D. *Modular Disc Array for Minimally Invasive Medical Device*, **2016**, US Patent App. 62/274,352.