APPENDIX A

RUSSELL J. HOLMES
Distinguished McKnight University Professor and Christenson Chair in Rewewable Energy
Department of Chemical Engineering and Materials Science, University of Minnesota (UMN),
Minneapolis, MN 55455, Phone: 612-624-9058, email:rholmes@umn.edu,
URL: https://holmes.cems.umn.edu/

RESEARCH AREAS:
Optoelectronic properties of organic and hybrid organic-inorganic (perovskite) semiconductors; Energy transfer and exciton transport; OLEDs; Solar cells; Interaction of light and matter in photonic structures.

EDUCATION:

2006	**Ph.D.** - Electrical Engineering - Princeton University (with S.R. Forrest)
2002	**M.A.** - Electrical Engineering - Princeton University
2000	**B.Sc.(Hons.)** with First Class Honours - Physics - University of Manitoba

POSITIONS/EMPLOYMET (all at UMN):

2022-present	Piercy Professor in Chemical Engineering and Materials Science
2022-present	Graduate Faculty Member, Chemical Physics
2021-present	Distinguished McKnight University Professor
2020-present	Ronald L. and Janet A. Christenson Chair in Renewable Energy
2018-2019	Amundson Professor in Chemical Engineering and Materials Science
2017-present	*Professor*, Chemical Engineering and Materials Science
2016-present	Distinguished University Teaching Professor
2012-2017	*Associate Professor*, Chemical Engineering and Materials Science
2009-2012	Mayon Plastics Professor of Chemical Engineering and Materials Science
2008-present	Graduate Faculty Member, Electrical and Computer Engineering
2006-2012	*Assistant Professor*, Chemical Engineering and Materials Science

HONORS AND AWARDS:

2024-2025	Member, College of Science and Engineering (CSE) and College of Biological Science (CBS) Leads Leadership Development Program
2024	BASF Distinguished Lectureship in Chemical Engineering and Materials Science, Wayne State University
2022-present	Piercy Professor in Chemical Engineering and Materials Science
2021	Distinguished McKnight University Professor
2021	Senior Member, IEEE
2020-present	Ronald L. and Janet A. Christenson Chair in Renewable Energy
2019	Life Member, Clare Hall, University of Cambridge
2018-2019	Amundson Professor in Chemical Engineering and Materials Science
2018-2019	Leverhulme Trust Visiting Professor, Cavendish Laboratory, University of Cambridge
2018-2019	Visiting Fellow, Clare Hall, University of Cambridge
2018	Fellow, University of Minnesota Institute on the Environment
2016	Member of the UMN Academy of Distinguished Teachers

2016	Horace T. Morse – UMN Alumni Association Award for Outstanding Contributions to Undergraduate Education
2015	Inducted as a Friend of the Breck School Advanced Science Research Program
2012	ASM Bradley Stoughton Award for Young Teachers
2011	Outstanding Teacher Award, UMN College of Science and Engineering
2011	Young Faculty Award, UMN Initiative for Renewable Energy and Environment
2009-2012	Mayon Plastics Professor of Chemical Engineering and Materials Science
2009-2012	3M Nontenured Faculty Grant

SERVICE ROLES AND ACTIVITIES:

Internal (Active)

07/2024-pres.	Department Executive Officer – Materials Science
2024-present	Chair, Materials Science Undergraduate Curriculum Review Committee
2024-present	Co-Lead, College of Science and Engineering 999 Initiative - *Energy Conversion and Storage*
2024-present	Selection Committee, UMN Distinguished McKnight Professorship
2024-present	Co-organizer, Virtual CEMS Graduate Program Information Sessions
2022-present	Chair, Tenure Committee for Prof. C. Bartel
2021-present	Member, College of Science and Engineering Consultative Committee
2014-present	Program Leader, Optoelectronics and Metamaterials Program, UMN Industrial Partnership for Research in Interfacial and Materials Engineering (IPRIME)
2008-present	Faculty Moderator, Materials Research Society Graduate Student Chapter

Internal (Concluded)

2023-2024	Chair, Department Head Search Committee
2021-2023	Member, Faculty Search Committee
2022-2023	Member, Department Strategic Planning Team, Organizing Team and Initiative Co-Leader
2021	Reviewer, MN Futures Program
2021	Selection Committee, Whitby Professorship in Mechanical Engineering
2019-2020	Acting Director of Graduate Studies – Chemical Engineering
2018-2020	Co-Director, UMN Institute on the Environment Discovery Grant
2017-2018	Department Diversity Committee
2016-2017	Chair, College of Science and Engineering Graduate Education Committee
2014-2017	Member, College of Science and Engineering Graduate Education Committee
2014	Reviewer, MnDrive Exploratory Research Programs
2014	Reviewer/Panelist, UMN OVPR Research Infrastructure Investment Program
2013	Member, Special Committee on Graduate Education – Student Experience/Program Quality (Graduate School)
2013-2020	Director of Graduate Studies – Materials Science
2012-2013	Acting Director of Graduate Studies – Materials Science
2012-2013	Amundson Hall Building Expansion Committee
2008-2024	Undergraduate Advisor, Materials Science Program
2006-2020	Graduate Student Admissions Committee – Materials Science
2007, 2008	Member, Faculty Search Committee – Materials Science
Various	Tenure committee member for Prof. B. Jalan, Prof. D. Flannigan, Prof. V. Ferry

External (Active)

2023-present	Organizing Committee, SPIE Conference on Organic and Hybrid Light-Emitting Diodes
2017-present	Editor, *Synthetic Metals* (Elsevier)
2015-present	Director, Minnesota Chapter of ASM
Various	Proposal review for National Science Foundation (NSF) and Department of Energy (DOE)

External (Concluded)

2022-2023	Program Committee, Optica Advanced Photonics Congress
2021	Panelist, Department of Energy Solid-State-Lighting Annual Workshop
2020-2022	Guest Editor, Emerging Materials and Devices for Efficient Light Generation, *Journal of Applied Physics*
2011-2020	Organizer, UMN-ASM MN Chapter Annual On-Campus Technical Evenings
2017-2019	Co-organizer, Bluff Creek Elementary School STEM Fest
2017-2018	Symposium Organizer, *Excitonic Materials: Physics, Characterization, and Devices*, 2018 Spring Meeting of the Materials Research Society
2014	Judge, Materials Research Society Graduate Student Award, Spring Meeting
2013	General Chair – OSA Solid State and Organic Lighting Meeting
2011, 2012	Vice-Chair, Chair for Area 08E (Electronics and Photonics) - Meeting of the American Institute of Chemical Engineers
2011	Focus Session Co-organizer, American Physical Society March Meeting
2011	Co-organizer, Council for Chemical Research Workshop on OLEDs
2009	Symposium Organizer and Tutorial Instructor, *Organic Materials and Devices for Sustainable Energy Systems*, 2009 Fall Meeting of the Materials Research Society

Proposal Review Panels

NSF Energy for Sustainability (CBET) (05/2009, 01/2010, 06/2011)
NSF Electronic, Photonic and Magnetic Devices (ECCS) (12/2009, 06/2010, 12/2010, 01/2016)
NSF Designing Materials to Revolutionize and Engineer our Future (DMREF) (06/2014, 05/2017, 05/2021)
NSF Solid-State and Materials Chemistry (DMR) (02/2015)
DOE Program in Solid-State Lighting (07/2008, 03/2017)

Ad-Hoc Reviewer (Selected)

DOE Program in Basic Energy Sciences (Various since 2010)
NSF Programs in the Divisions of Materials Research, Chemistry, and Engineering (since 2008)
DOE Program in Solid-State Lighting (Various since 2006)

Program Review Experience

DOE Solid-State Lighting OLED Roundtable, 2021 (Virtual), 2022 (Virtual)
DOE BES-EERE Solid-State Lighting Roundtable, Bethesda, MD, 2011
Member of panel charged with updating program objectives for the DOE Solid-State Lighting Program, Organized by Navigant Consulting, Washington, D.C., 2008

TEACHING:

- Advances in Chemical Engineering and Materials Science (ChEn/MatS 1001, F2008, F2009)
- Mass Transport and Kinetics (MatS 3002, S2020, S2021, S2022, S2023, S2024)

- Electrical and Magnetic Properties of Materials (MatS 3013/4013, F2007, F2008, F2009, F2010, F2011, F2012, F2013, F2014)
- Intro. to Materials Science and Engineering (MatS 3011, F2006, S2007, S2008, S2009, S2010, S2011, F2019)
- Nanoparticle Science and Engineering Seminar (NPSE 8101, F2008)
- Principles and Applications of Solar Cells (MatS 4312, F2020 (new course), F2021, F2022, F2023, F2024)
- Project-Based Inquiry – Projects in Additive Manufacturing (CSE 1012, S2017, new course)
- Senior Product Design (MatS 4400, S2012, S2013, S2014, S2015, S2016, S2017, S2018)
- Thermodynamics of Materials (MatS 3001, F2015, F2016, F2017)

CONSULTING:

- Expert Legal Witness (concluded cases only)
    - For Semiconductor Energy Laboratory Co, Ltd. v. BOE Technology Group Co. Ltd., Case No. 3:20-cv-4297 (N.D. Cal.) (No deposition or testimony)
    - For Semiconductor Energy Laboratory Co, Ltd. v. TCL China Star Optoelectronics Technology Co., Ltd., Case No. 8:210-cv-554 (N.D. Cal.) (Deposed)
- Split Rock Consulting LLC – 2021
- DuPont Electronics and Imaging, Marlborough, MA and Wilmington DE – 2019
- 3M, Maplewood, MN – 2016
- Dow Chemical Co., Midland MI – 2012-2017
- Veeco, St. Paul MN – 2010

ADVISEES:

Doctoral Degrees Granted (18):

1. Wade A. Luhman, Mat. Sci., 2011, "Paradigms for Overcoming the Exciton Diffusion Bottleneck in Organic Photovoltaic Cells."
2. Grant H. Lodden, Mat. Sci., 2011, "Light-matter interactions in optical nanostructures based on organic semiconductors."
3. Richa Pandey, Chem. Eng., 2012, "Nanoscale engineering of thin film morphology for efficient organic photovoltaic cells."
4. Kai-Yuan Cheng, Chem. Eng., 2012, "Realizing efficient electroluminescence from silicon nanocrystals."
5. Nicholas C. Erickson, Elec. Eng., 2014, "On the Properties and Design of Organic Light-Emitting Devices."
6. S. Matthew Menke, Mat. Sci., 2015, "Exciton Transport in Organic Semiconductors."
7. Yunlong Zou, Mat. Sci., 2015, "Realizing Efficient Energy Harvesting from Organic Photovoltaic Cells."
8. Tyler K. Mullenbach, Mat. Sci., 2016, "Energy Migration in Organic Thin Films-From Excitons to Polarons."
9. Nathan T. Morgan, Chem. Eng., 2016, "An Engineered Approach to Specialty Chemicals Purification."
10. Thomas R. Fielitz, Chem. Eng., 2017, "Understanding and Engineering Molecular Order in Organic Semiconductors."

11. Ian J. Curtin, Mat. Sci., 2018, "Measuring Nanoscale Exciton Transport and Carrier Recombination in Organic Solar Cells."
12. Kyle W. Hershey, Mat. Sci., 2018, "Multi-scale Dynamics of Organic Light-Emitting Devices."
13. Tao Zhang, Mat. Sci., 2019, "Overcoming Energy Losses for Efficient Organic Solar Cells"
14. Deepesh Rai, Mat. Sci, 2020, "Engineering Excited State Transport and Relaxation in Organic Semiconductors."
15. John S. Bangsund, Mat. Sci., 2020, "Kinetics of degradation and exciton quenching in organic light-emitting devices."
16. Catherine P. Clark, Mat. Sci., 2020, "Thin-Film Synthesis of Metal Halide Perovskites for Optoelectronics."
17. Kaicheng Shi, Mat. Sci., 2021, "Engineering Exciton Transport in Organic Semiconductor Thin Films for Photoconversion and Electroluminescence."
18. Nolan Concannon, Chem. Eng., 2022, "Luminescent Probes of Emergent Physics from Organic Semiconductor Interfaces."

Masters Degrees Granted (5):
1. Salil Bapat, Mat. Sci., 2011, "Study of organic light-emitting transistors."
2. Meng Li, Mat. Sci., 2014, "Electrical and optical characterization of colloidal silicon nanocrystals."
3. Abbey Chanda, Mat. Sci., 2015, Coursework.
4. Preston Groethe, Mat. Sci., 2015, Professional Masters.
5. Robert Newcomb, Mat. Sci., 2019, "On the role of molecular structure on the lifetime of organic-light emitting devices."

Current Doctoral Students (7): Evgeny Pakhomenko, Mat. Sci., Wan-Ju Hsu, Chem. Eng., Abhinav Kapur, Chem. Phys., Betty Liu, Chem. Eng., Emma Pettit, Chem. Eng., Brian He, Chem. Eng., Akib Zaman, Mat. Sci.

External Thesis Reviewer/Examiner (5): Shuwei Liu (Nanyang Technological Univ., Elec. Eng., 2013, External Reviewer), Qi Wang (Univ. of Waterloo, Elec. Eng., 2015, External Reviewer/In-person examiner), Ross A. Kerner (Princeton Univ., Elec. Eng., 2018, External Reviewer), Patrick Conaghan (Univ. of Cambridge, Physics, 2019, External Reviewer/In-person examiner), Jordan T. Dull (Princeton Univ., Elec. Eng., 2022, External Reviewer).

Post-Doctoral Advisees (3): Dr. Yi Zhang, Dr. Gang Qian, Dr. Rajiv Kaudal.

Undergraduates Advised: Adam Pieterick, Physics, 2007-2009, Jason Houle, Chem. Eng., 2007-2008, Ahmad Syafiq Ahmad Hazmi, Chem. Eng., 2008, Jersin Nguetio, Elec. Eng., 2009, Jon Bertram, Mat. Sci., 2009, Bob Halperin, Mat. Sci., 2009, Scott Isaacson, Chem. Eng., 2009-2010, Gareth Westler, Mat. Sci., 2009-2010, Patrick Duffy, Mat. Sci., 2009-2010, Ross Kerner, Mat. Sci., 2009-2013, Joe Loof, Mat. Sci, 2012, Alan Wang, Chem. Eng. 2012, Kayla Simmion, Florida A&M, 2012, Luke Balhorn, Mat. Sci., 2012-2014, Chris Lindsay, Mat. Sci., 2012-2014, Chris Phenicie, Physics, 2014-2016, Caroline Qian, Chem. Eng., 2014-2016, Kyle Miller, U. Puget Sound, 2016, Trevor Steiner, Mat. Sci., 2016-2019, Nick Rothbacher, U. Puget Sound,

2017, Jack Van Sambeek, Mat. Sci., 2017-2020, Katherine Gramling, Mat. Sci., 2018-2019, Carly Reller, Mat. Sci., 2019-2020, Taylor Kettering, Chem. Eng., 2019-2020, Colton Gerber, Mat. Sci., 2019-2021, Brian Torini, Mat. Sci., 2020-2021, Aaditya Nandakumar, Mat. Sci., 2020-2023, Isabelle Jones, Mat. Sci., 2021-2022, Sage Miller, 2021-present, Sebastian Montero, Florida, 2023.

High School Students Advised: Michael Crump, Breck School, 2008, Brandon Onopa, Breck, 2009, Addison Weilier, Breck, 2010, Partha Naidu, Wayzata High School, 2011, Robert Dorn, Breck, 2011, Saeed Hakim-Hashemi, Breck, 2011, Peter Metzger, Breck, 2012, Wolfgang Ofstedal, Breck, 2014, Easton McChesney, Breck, 2014, Sung-Wah Huh, Breck, 2016, Julien He, Breck, 2016.

PUBLICATIONS: (Google Scholar h-index=44, i10-index=95, >13,000 citations)

121. "Chemical Reactions as a Means of Installing Adlayers on Electron Transport Layers," K.C. DePope, S. He, Y. Liu, E. Pakhomenko, R.J. Holmes, J.W. Ciszek, J. Mater. Chem C, In-revision.

120. "Efficient metal-halide perovskite photovoltaic cells deposited via vapor transport deposition," W.-J. Hsu, E.C. Pettit, R. Swartwout, T. Zhitomirsky Kadosh, S. Srinivasan, E.L. Wassweiler, G. Haugstad, V. Bulović, R.J. Holmes, Solar RRL, 8, 2300758 (2024).

119. "Design of a custom vapor transport co-deposition system for scalable production of perovskite solar cells," E. Wassweiler, A. Panda, T. Kadosh, T. Nguyen, W.-J. Hsu, E. Pettit, R.J. Holmes, H. Tuller, V. Bulović, J. Vac. Sci. Technol. A, 41, 052801 (2023).

118. "Influence of codeposition on methylammonium iodide degradation during vapor transport deposition," E. Wassweiler, T. Kadosh, D. Gupta, T. Nguyen, W.-J. Hsu, E. Pettit, R.J. Holmes, H. Tuller, V. Bulović, J. Phys. Chem. C, 127, 24626 (2023).

117. "Vapor transport deposition of metal-halide perovskite solar cells," W.-J. Hsu, E.C. Pettit, R. Swartwout, T. Kadosh, S. Srinivasan, E.L. Wassweiler, V. Bulović, R.J. Holmes, Proc. SPIE 12660, Organic, Hybrid, and Perovskite Photovoltaics XXIV, 27 (2023).

116. "Understanding and Engineering Spontaneous Orientation Polarization in Organic Light-Emitting Devices (Invited Review)", E. Pakhomenko, S. He, R.J. Holmes, Chem. Phys. Rev., 4, 021308 (2023).

115. "Process Engineered Spontaneous Orientation Polarization in Organic Light-Emitting Devices," S. He, E. Pakhomenko, R.J. Holmes, ACS Appl. Mater. Interfaces, 15, 1652 (2023).

114. "The role of OLED emissive layer polarization in sub-turn-on charge accumulation," E. Pakhomenko, R.J. Holmes, Proc. SPIE 12208, Organic and Hybrid Light Emitting Materials and Devices XXVI, 122080A (2022).

113. “Polarization-induced exciton-polaron quenching in organic light-emitting devices and its control by dipolar doping,” E. Pakhomenko, R.J. Holmes, Adv. Opt. Mater., 10, 2201348 (2022).

112. “Emerging materials and devices for efficient light emission (Editorial),” S. Murai, R.J. Holmes, J. Lin, M. Anaya, G. Lozano, J. Appl. Phys., 131, 160401 (2022).

111. “Reducing spontaneous orientational polarization via semiconductor dilution improves OLED efficiency and lifetime,” E.O. Afolayan, I. Dursun, C. Lang, E. Pakhomenko, M. Kondakova, M. Boroson, M. Hickner, R. J. Holmes, N.C. Giebink, Phys. Rev. App., 17, L051002 (2022)

110. “Impact of Grain Boundaries on Triplet Exciton Diffusion in Organic Singlet-Fission Materials,” K. Shi., A.T. Healy, I.J. Curtin, T. Zhang, D.A. Blank, R.J. Holmes, J. Phys. Chem. C, 126, 4792 (2002).

109. “Consensus statement: Standardized reporting of power-producing luminescent solar concentrator performance,” C. Yang, H.A. Atwater, M.A. Baldo, D. Baran, C.J. Barile, M. C. Barr, M. Bates, M.G. Bawendi, M.R.Bergren, B. Borhan, C.J. Brabec, S. Brovelli, V. Bulović, P. Ceroni, M.G. Debije, J.-M. Delgado-Sanchez, W.-J. Dong, P.M. Duxbury, R.C.Evans, S.R. Forrest, D.R. Gamelin, N.C. Giebink, X. Gong, G. Griffini, F. Guo, C.K. Herrera, A.W.Y. Ho-Baillie, R.J. Holmes, S.-K. Hong, T. Kirchartz, B.G. Levine, H. Li, Y. Li, D. Liu, M.A.Loi, C.K. Luscombe, N.S. Makarov, F. Mateen, R. Mazzaro, H. McDaniel, M.D. McGehee, F. Meinardi, A. Menéndez-Velázquez, J. Min, D.B. Mitzi, M. Moemeni, J.H. Moon, A. Nattestad, M.K. Nazeeruddin, A.F. Nogueira, U.W. Paetzold, D.L. Patrick, A. Pucci, B.P. Rand, E. Reichmanis, B.S. Richards, J. Roncali, F. Rosei, T.W. Schmidt, F. So, C.-C. Tu, A. Vahdani, W.G.J.H.M.van Sark, R. Verduzco, A. Vomiero, W.W.H. Wong, K. Wu, H.-L. Yip, X. Zhang, H. Zhao, R.R. Lunt, Joule, 6, 8 (2022).

108. “Device-based Probe of Triplet Exciton Diffusion in Singlet Fission Materials,” T. Zhang, D. Rai, R.J. Holmes, J. Phys. Chem. Lett., 12, 966 (2021).

107. “Pulsed Electron Beams for Mitigating Damage in Next-generation Electronic Materials,” E. VandenBussche, C.P. Clark, R.J. Holmes, D. Flannigan, Microscopy and Microanalysis, 26, 2866 (2020).

106. “Mitigating Damage to Hybrid Perovskites Using Pulsed-Beam TEM,” E. VandenBussche, C.P. Clark, R.J. Holmes, D. Flannigan, ACS Omega, 5, 31867 (2020).

105. “Formation of Stable Metal-Halide Perovskite-Perovskite Heterojunctions,” C.P. Clark, J. Mann, J.S. Bangsund, W.-J. Hsu, E.S. Aydil, R.J. Holmes, ACS Energy Letters, 5, 3443 (2020).

104. “Solid State Properties and Spectroscopic Analysis of Thin-Film TPBi,” J. Calimano, F. Li, J. Florian, D. M. Piñero Cruz, T.R. Fielitz, R.J. Holmes, J.W. Ciszek, J. Phys. Chem. C., 124, 23716 (2020).

103. "Sub-turn-on exciton quenching due to molecular orientation and polarization in organic light-emitting devices," J.S. Bangsund, J.R. Van Sambeek, N.M. Concannon, R.J. Holmes, Science Advances, 6, eabb2659 (2020).

102. "Migration of charge-transfer states at organic semiconductor heterojunctions," T. Zhang, N.M. Concannon, R.J. Holmes, ACS Appl. Mater. Interfaces, 12, 31677 (2020).

101. "Plasmonic nanocomposites of zinc oxide and titanium nitride," C.A. Beaudette, J.T. Held, B.L. Greenberg, P.H. Nguyen, N.M. Concannon, R.J. Holmes, K.A. Mkhoyan, E.S. Aydil, U.R. Kortshagen, J. Vac. Sci. Tech. A, 38, 042404 (2020).

100. "Impact of molecular structure on singlet and triplet exciton diffusion in phenanthroline derivatives," D. Rai, J.S. Bangsund, J.G. Barriocanal, R.J. Holmes, J. Mater. Chem. C., 8, 6118 (2020).

99. "Probing Enhanced Exciton Diffusion in a Triplet-Sensitized Organic Photovoltaic Cell," K. Shi, I.J. Curtin, A.T. Healy, T. Zhang, D. Rai, D.A. Blank, R.J. Holmes, J. Phys. Chem. C, 124, 3489 (2020).

98. "Role of host excimer formation in the degradation of organic light-emitting devices," R. Newcomb, J.S. Bangsund, K.W. Hershey, D.C.K. Rathwell, H.-Y. Na, J.-H. Jeon, P. Trefonas, R.J. Holmes, App. Phys. Lett., 116, 063302 (2020). Selected as Editor's Pick.

97. "Early career leaders in organic electronic materials," R.J. Holmes, I.D.W. Samuel, Syn. Met., 116270 (2020).

96. "Measurements of dark triplet exciton diffusion in a phosphor-sensitized organic photovoltaic cell," K. Shi, I.J. Curtin, A.T. Healy, T. Zhang, D.A. Blank, R.J. Holmes, SPIE Organic, Hybrid, and Perovskite Photovoltaics XX 11094, 110941Q (2019). (Proceedings)

95. "Impacts of degradation on annihilation and efficiency roll-off in organic light-emitting devices," J.S. Bangsund, R.J. Holmes, SPIE Organic and Hybrid Light Emitting Materials and Devices XXIII 11093, 110930L (2019). (Proceedings)

94. "Engaging First-Year Students with a Hands-On Course using Student-Driven Projects," L. Francis, D.J. Orser, K. Bazargan, S. Mantell, J.M. Feinberg, R.J. Holmes, ASEE Annual Conference Proceedings (2019).

93. "Best practices for measuring emerging light-emitting diode technologies," M. Anaya, B.P. Rand, R.J. Holmes, D. Credgington, H.J. Bolink, R.H. Friend, J. Wang, N.C. Greenham, S.D. Stranks, Nature Photon., 13, 818 (2019).

92. "Carrier-gas assisted vapor deposition for highly tunable morphology of halide perovskite thin films," C.P. Clark, B. Voigt, E.S. Aydil, R.J. Holmes, Sustainable Energy and Fuels, 3, 2447 (2019).

91. “Lead-free double perovskites Cs2InCuCl6 and (CH3NH3)2InCuCl6: Electronic, Optical, and Electrical Properties,” H.Q. Pham, R.J. Holmes, E.S. Aydil, L. Gagliardi, Nanoscale, 11, 11173 (2019).

90. “Measurement of the triplet exciton diffusion length in organic semiconductors,” D. Rai, R.J. Holmes, J. Mat. Chem. C, 7, 5695 (2019).

89. “Formation of aligned periodic patterns during the crystallization of organic semiconductor thin films,” J.S. Bangsund, T.R. Fielitz, T.J. Steiner, K. Shi, J.R. Van Sambeek, C.P. Clark, R.J. Holmes, Nature Mater., 18, 725 (2019).

88. “Improved Stability in Organic Light-Emitting Devices by Mixing Ambipolar and Wide Energy Gap Hosts,” J.S. Bangsund, K.W. Hershey, D.C.K. Rathwell, H.-Y. Na, J.-H. Jeon, P. Trefonas, R.J. Holmes, J. Society for Information Display, 27, 434 (2019)

87. “Intrinsic measurements of exciton transport in photovoltaic cells,” T. Zhang, D.B. Dement, V.E. Ferry, R.J. Holmes, Nature Comm., 10, 1156 (2019).

86. “Investigation of Excitonic Gates in Organic Semiconductor Thin Films,” D. Rai, R.J. Holmes, Phys. Rev. App., 11, 014048 (2019).

85. “Enhancing energy transport in conjugated polymers,” R.J. Holmes, Science, 360, 6391 (2018).

84. “Overcoming the trade-off between exciton dissociation and charge recombination in organic photovoltaic cells,” T. Zhang, R.J. Holmes, Appl. Phys. Lett., 113, 143302 (2018).

83. “Computational Study of Structural and Electronic Properties of Lead-Free CsMI3 Perovskites (M = Ge, Sn, Pb, Mg, Ca, Sr, and Ba),” D. Ray, C. Clark, H.Q. Pham, J. Borycz, R.J. Holmes, E.S. Aydil, L. Gagliardi, J. Phys. Chem. C, 122, 7838 (2018).

82. “Isolating Degradation Mechanisms in Mixed Emissive Layer Organic Light-Emitting Devices,” J.S. Bangsund, K.W. Hershey, R.J. Holmes, ACS Applied Mater. Interfaces, 10, 5693 (2018).

81. “Decoupling Photocurrent Loss Mechanisms in Photovoltaic Cells Using Complementary Measurements of Exciton Diffusion,” I.J. Curtin, R.J. Holmes, Adv. Energy Mater., 8, 1702339 (2018)

80. “Decoupling degradation in exciton formation and recombination during lifetime testing of organic light-emitting devices,” K.W. Hershey, J.S. Bangsund, G. Qian, R.J. Holmes, Appl. Phys. Lett., 111, 113301 (2017).

79. “Photovoltage as a quantitative probe of carrier generation and recombination in organic photovoltaic cells,” T. Zhang, R.J. Holmes, J. Mater. Chem. C, 5, 11885 (2017).

78. "Effects of Additives on Crystallization in Thin Organic Films," T.R. Fielitz, C.M. Phenicie, R.J. Holmes, Cryst. Growth. Des., 17, 4522 (2017).

77. "Unified Analysis of Transient and Steady-State Electroluminescence–Establishing an Analytical Formalism for OLED Charge Balance," K.W. Hershey, R.J. Holmes, SID Symposium Digest of Technical Papers, 48, 115 (2017). (Proceedings)

76. "Impact of Thermal Annealing on Organic Photovoltaic Cells Using Regioisomeric Donor–Acceptor–Acceptor Molecules," T. Zhang, H. Han, Y. Zou, Y.C. Lee, H. Oshima, K.-T. Wong, R.J. Holmes, ACS Applied Mater. Interfaces, 9, 25418 (2017).

75. "Volume diffusion in purification by sublimation," N. Singh, T.E. Schwartzentruber, R.J. Holmes, E.L. Cussler, AIChE Journal, 63, 1757 (2017).

74. "Probing dark exciton diffusion using photovoltage," T.K. Mullenbach, I.J. Curtin, T. Zhang, R.J. Holmes, Nature Comm., 8, 14215 (2017).

73. “Blue-Emitting Arylalkynyl Naphthalene Derivatives via a Hexadehydro-Diels–Alder Cascade Reaction,” F. Xu, K.W. Hershey, R.J. Holmes, T.R. Hoye, J. Am. Chem. Soc., 138, 12739 (2016).

72. “Unified analysis of transient and steady-state electrophosphorescence using exciton and polaron dynamics modeling,” K.W. Hershey and R.J. Holmes, J. App. Phys., 120, 195501 (2016).

71. “Crystal morphology and growth in annealed rubrene thin films,” T.R. Fielitz and R.J. Holmes, Cryst. Growth and Des., 16, 4720 (2016).

70. Erratum - “Evaluating the Role of Energetic Disorder and Thermal Activation in Exciton Transport,” T.R. Fielitz, S.M. Menke and R.J. Holmes, J. Mater. Chem. C, 4, 7508 (2016).

69. “Role of impurities in determining the exciton diffusion length in organic semiconductors,” I.J. Curtin, D.W. Blaylock, and R.J. Holmes, Appl. Phys. Lett., 108, 163301 (2016).

68. “Exciton Transport in an Organic Semiconductor Exhibiting Thermally Activated Delayed Fluorescence,” S.M. Menke and R.J. Holmes, J. Phys. Chem. C, 120, 8502 (2016).

67. “Evaluating the Role of Energetic Disorder and Thermal Activation in Exciton Transport,” S.M. Menke and R.J. Holmes, J. Mater. Chem. C, 4, 3437 (2016).

66. “Femtosecond to Nanosecond Excited State Dynamics of Vapor Deposited Copper Phthalocyanine Thin Films,” B.W. Caplins, T.K. Mullenbach, R.J. Holmes, and D.A. Blank, Physical Chemistry Chemical Physics, 18, 11454 (2016).

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PRESENTATIONS AND DEPARTMENT SEMINARS: (All are <u>invited</u> unless denoted with *)

124. "The Role of Molecular Orientation and Glassy Film Behavior in Organic Light-Emitting Devices (OLEDs)," BASF Distinguished Lecture, Department of Chemical Engineering and Materials Science, Wayne State University, Detroit, MI, 02/07/24.

123. "Engineering Polarization-Induced Efficiency Loss in OLEDs via Processing Conditions and Stack Architecture," 30th International Display Workshops (IDW '23). Niigata, Japan, 12/07/23.

122. "Probing Exciton Transport in Organic Semiconductors to Guide OLED Design," Display Night Evening Keynote, 30th International Display Workshops (IDW '23). Niigata, Japan, 12/06/23.

121. "A Framework for Composition- and Process- Control of Spontaneous Orientation Polarization in OLEDs," SPIE Optics and Photonics, San Diego, CA, 08/21/23.

120. "Polarization-induced exciton-polaron quenching and efficiency loss in OLEDs – Role of stack architecture and processing conditions," Society for Information Display (SID) Symposium – Display Week, Los Angeles, CA, 05/25/2013.

119. "A General Framework for the Process-Control of Spontaneous Orientation Polarization in OLEDs," International Conference on Display Technology (ICDT 2023), Nanjing, China, 04/03/23 (Virtual).

118. "Why Energy Transfer? An Essential Role in Organic Electronics," Why Energy Transfer (y-et) 2022, Online Workshop hosted by University of Exeter, 9/30/22 (Virtual).

117. "Role of processing conditions on molecular alignment, polarization, and OLED efficiency," Department of Energy Solid-State Lighting OLED Roundtable, 9/27/22 (Virtual).

116. "Controlling polarization-induced exciton-polaron quenching in OLEDs via materials selection, mixtures, and processing conditions," SPIE Optics and Photonics, San Diego, CA, 08/23/22.

115. “Spontaneous Polarization-Induced Exciton-Polaron Quenching in OLEDs and Its Control via Processing Conditions and Mixing,” Optica Advanced Photonics Congress, Maastricht, Netherlands, 07/25/22.

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112. “Harnessing light using organic semiconductor devices,” UMN College of Continuing and Professional Studies Headliners Public Seminar, 04/07/22 (Virtual).

111. “Tuning charge transfer state diffusion in donor-acceptor blends exhibiting thermally activated delayed fluorescence,” 6th International Workshop on TADF, Kyushu, Japan, 12/10/21 (Virtual).

110. “Low-bias exciton quenching due to spontaneous orientation polarization and its role in determining maximum OLED efficiency,” ICAMD 2021, Jeju, South Korea, 12/9/21 (Virtual).

109. “Understanding the Physics of Organic Light-Emitting Devices (OLEDs) and the Factors that Limit Efficiency,” Department of Physics, Macalester College, St. Paul, MN, 11/17/21.

108. “Engineering molecular orientation and polarization in organic semiconductor thin films – Impact on optoelectronic device design and performance,” Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC, 11/12/21.

107. “Spontaneous Orientation Polarization in OLEDs – Impact on Stack Design and Performance,” Department of Energy Solid-State Lighting OLED Roundtable, 10/12/21 (Virtual).

106. “Formation of Stable Metal-Halide Perovskite-Perovskite Heterojunctions,” Physical Electronics User Conference, 9/21/21 (Virtual).

105. “Low-bias Quenching due to Spontaneous Orientation Polarization and its Impact on OLED Efficiency,” SPIE Optics and Photonics, San Diego, CA, 08/02/21.

104. “In-operando Measurements of Photoluminescence to Probe Degradation and Low-Bias Exciton-Polaron Quenching in OLEDs,” International Conference on Display Technology (ICDT 2021), Beijing, China, 05/31/21 (Virtual).

103. “The impact of spontaneous orientation polarization and low-bias quenching on OLED efficiency,” Department of Energy Solid-State Lighting Workshop, 02/02/21 (Virtual).

102. “In-operando measurements of photoluminescence to probe degradation and low-bias exciton-polaron quenching in OLEDs,” Universal Display Corporation, 08/28/20 (Virtual).

101. “Probing nanoscale energy transport in organic semiconductors,” Department of Physics, University of Vermont, Burlington, VT, 02/19/2020.

100. “The importance of nanoscale energy transport in organic semiconductor devices,” DuPont, Marlborough, MA, 11/06/2019.

99. “Probing nanoscale energy transport in organic semiconductor devices,” Department of Electrical Engineering, Pennsylvania State University, State College, PA, 10/24/2019.

98. “Probing nanoscale exciton transport in organic semiconductor thin films and devices,” Department of Chemistry, Loyola University, Chicago, IL, 09/19/2019.

97. “How electronic devices based on organic molecules are revolutionizing how we generate and harvest light,” Clare Hall, University of Cambridge, Cambridge, England, U.K., 07/24/2019.

96. “Device-based probes of exciton transport in organic semiconductors,” Centre for Plastic Electronics, Imperial College, London, England, U.K., 06/11/2019.

95. “Device-based probes of exciton transport in organic semiconductors,” Department of Physics, University of Oxford, Oxford, England, U.K., 05/24/2019.

94. “Characterizing nanoscale energy transport in organic semiconductors,” Department of Physics, University of Durham, Durham, England, U.K., 05/02/2019.

93. “Device-based probes of dark exciton transport in organic semiconductors,” Department of Physics, University of Cambridge, Cambridge, England, U.K., 05/20/2019.

92. “Characterizing and engineering nanoscale energy transport in organic semiconductors,” Department of Physics, University of St. Andrews, St. Andrews, Scotland, U.K., 03/08/2019.

*91. “Intrinsic Measurements of Exciton Transport in Photovoltaic Cells,” Interfaces in Organic and Hybrid Thin-Film Electronics (INFORM), Valencia, Spain, 03/06/2019.

90. “Characterizing and engineering nanoscale energy transport in organic semiconductors,” Department of Physics, University of Sheffield, Sheffield, England, U.K., 02/26/2019.

89. “How materials and interfacial engineering have enabled the commercialization of OLEDs in next generation displays,” University of Minnesota IPRIME Annual Meeting – Plenary Talk, Minneapolis, MN, 05/30/2018.

88. “Organic light-emitting devices (OLEDs) – Electroluminescence from molecular materials,” – Department of Physics, Coe College, Cedar Rapids, IA, 11/09/2017.

87. “Fundamentals of Organic Light-Emitting Device Design and Operation,” – Dow Seoul Technology Center, Hwaseong, South Korea, 09/14/2017.

86. “Collaborative Efforts in OLEDs Between UMN and Dow,” – Dow Seoul Technology Center, Hwaseong, South Korea, 09/13/2017.

85. “Decoupling Efficiency and Degradation Loss Mechanisms in Organic Optoelectronic Devices,” – Graduate School of Convergence Science and Technology (GSCST) at Seoul National University, Suwon, South Korea, 09/12/2017.

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83. “Unified analysis of transient and steady-state electroluminescence – Establishing an analytical formalism for OLED charge balance,” – SPIE Optics and Photonics, San Diego, CA, 08/07/2017.

82. “Photovoltage as a Probe of Carrier Generation and Recombination in Organic Photovoltaic Cells,” – 12th International Conference on Optical Probes of Organic and Hybrid Semiconductors, Quebec City, Canada, 06/22/2017.

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79. “Unified Analysis of Transient and Steady-State Electrophosphorescence in Organic Light-Emitting Devices (OLEDs),” – Optical Society of America – Light, Energy, and the Environment – Solid-State Lighting, Leipzig, Germany 11/16/2016.

*78. “Probing dark exciton diffusion using photovoltage,” – International Conference on Electroluminescence, Raleigh, NC, 10/04/2016.

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*72. “Exciton Transport in an Organic Semiconductor Exhibiting Thermally Activated Delayed Fluorescence,” – 2016 Spring Meeting of the Materials Research Society, Phoenix, AZ, 3/31/2016.

71. “Directing excited state transport in organic semiconductors for enhanced photoconversion in solar cells,” – Department of Physics, St. Olaf College, Northfield, MN, 12/09/15.

*70. “Extracting dark exciton diffusion lengths using photovoltage measurements,” – 2015 Fall Meeting of the Materials Research Society, Boston, MA, 12/3/2015.

69. “Device engineering for enhanced exciton transport in organic photovoltaic cells,” – Department of Chemistry, St. Cloud State University, St. Cloud, MN, 10/26/15.

68. “Determining the rate-limiting steps for the purification of organic semiconductors by thermal gradient sublimation,” – SPIE Annual Meeting, San Diego CA, 8/10/2015.

67. “Device engineering for enhanced exciton transport in organic photovoltaic cells,” – Department of Electrical Engineering, University of Iowa, Iowa City, IA, 4/2/15.

66. “Enhanced exciton harvesting in organic photovoltaic cells by engineering intermolecular energy transfer,” – Seoul National University, Seoul, South Korea, 11/21/14.

65. “Engineering nanoscale energy transfer in organic photovoltaic cells,” – Workshop on Photovoltaics, Korea Advanced Institute of Science and Technology (KAIST), Daejon, South Korea, 11/20/14.

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63. “Engineering Exciton Recombination in Organic Light-Emitting Devices,” – Annual Meeting of the American Vacuum Society, Baltimore MD, 11/12/14.

62. “Engineering energy transport in organic photovoltaic cells,” – Department of Chemistry, Augsburg College, Minneapolis MN, 11/4/14.

61. “Engineering film composition for efficient, single-layer organic light-emitting devices,” – Minnesota Chapter of the American Vacuum Society, St. Paul MN, 9/18/14.

60. “Engineering efficiency roll-off in organic light-emitting devices,” – SPIE Annual Meeting, San Diego CA, 8/18/2014.

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55. “Engineering energy transport in organic photovoltaic cells,” Department of Chemistry, University of Wisconsin, Madison, Madison WI, 10/14/2013.

54. “Probing exciton recombination in efficient, single-layer organic light-emitting devices,” – Society for Information Display (SID) - Eurodisplay 2013, London, UK, 09/17/2013.

*53. “Engineering energy transfer and exciton diffusion in organic semiconductors for application in photovoltaic cells,” – SPIE Annual Meeting, San Diego CA, 08/29/2013.

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51. “Realizing efficient electroluminescence in organic and hybrid organic-inorganic light-emitting devices,” – Dow Chemical Company, Freeport TX, 05/14/2013.

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48. “Engineering exciton formation and high efficiency in graded-emissive layer organic light-emitting devices,” – Optical Society of America Solid State and Organic Lighting (SOLED) Topical Meeting, Eindhoven, The Netherlands, 11/12/2012.

47. “Efficient, single-layer organic light-emitting devices based on a continuously graded emissive layer,” – SPIE Annual Meeting, San Diego CA, 08/12/2012.

46. “Engineering exciton diffusion in organic semiconductors for efficient photovoltaic cells,” – I-CAMP'12 Workshop on Nano and Emerging Photovoltaics, University of Colorado, Boulder, Boulder CO, 08/07/2012.

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44. “Engineering film composition and nanostructure for high performance, organic optoelectronic devices,” – University of Minnesota Industrial Affiliates Program (IPrime) Annual Meeting, Minneapolis MN, 05/30/2012.

43. “Engineering film composition and nanostructure for high performance, organic optoelectronic devices,” – Dow Chemical Company, Midland MI, 04/18/2012.

42. “Overcoming obstacles to the ubiquitous implementation of organic electroluminescence for display and lighting applications,” – Dow Chemical Company, Midland MI, 04/17/2012.

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38. “Soft electronic materials for the generation of light and energy,” Department of Physics, Colorado School of Mines, Golden CO, 10/25/2011.

37. “Characterizing and enhancing exciton harvesting in organic photovoltaic cells,” Department of Physics and Atmospheric Science, Dalhousie University, Halifax NS, Canada, 09/29/2011.

36. “Challenges in photoconversion using organic semiconductors,” Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis MN, 09/15/2011.

35. “Characterizing and enhancing exciton harvesting in organic photovoltaic cells,” Workshop on Emerging Materials for Thin Film Solar Cells, University of California, Santa Barbara, Santa Barbara CA, 08/09/2011.

34. “Hybrid approaches for electroluminescence in the regimes of weak and strong exciton-photon coupling,” 2011 Organic Electronics and Applications (OREA)/ICARUS Summer School, Chania, Crete, Greece, 07/07/2011.

33. “Methods for the characterization and enhancement of exciton harvesting in organic photovoltaic cells,” Advanced Photon Source User Meeting, Argonne National Laboratory, Argonne IL, 05/04/2011.

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27. “Engineering film composition and morphology for efficient photovoltaic cells based on organic small molecules,” Department of Chemical and Biological Engineering, Princeton University, Princeton NJ, 09/29/10.

26. “Direct population of microcavity polariton states in an organic semiconductor under optical and electrical excitation” - SPIE Annual Meeting, San Diego CA, 08/02/2010.

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23. “Energy efficient optoelectronic devices based on organic semiconductors” – University of Minnesota Industrial Affiliates Program (IPrime) Annual Meeting, Minneapolis MN, 06/02/2010.

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