

## Obadiah G. Reid

Renewable and Sustainable Energy Institute  
University of Colorado Boulder  
Boulder, CO 80309, United States

Office: 303-384-6588  
E: obadiah.reid@colorado.edu

### Education:

2010 – Ph.D. Physical Chemistry  
University of Washington, Department of Chemistry, USA.  
Advisor: David S. Ginger

2004 – B.S. Chemistry (major), Physics (minor)  
Pacific University, Department of Chemistry, USA.

### Experience:

Present – Research Associate, Joint Appointment<sup>1-15</sup>  
University of Colorado Boulder, Renewable and Sustainable Energy Institute, Boulder, CO, USA.  
National Renewable Energy Laboratory, Chemistry and Nanoscience Center, Golden, CO, USA.

2014 – Postdoctoral Researcher<sup>16-23</sup>  
National Renewable Energy Laboratory, Chemistry and Nanoscience Center, Golden, CO, USA.

2010 – Graduate Research/Teaching Assistant<sup>24-33</sup>  
University of Washington, Department of Chemistry, Seattle, WA, USA.

2005 – Limited Term Employee  
Pacific Northwest National Laboratory, Richland, WA, USA.

### Publication Record:

Google Scholar Metrics (h=19, i10 = 26, 1727 citations)

- (1) Yang, M.; Li, Z.; Reese, M. O.; Reid, O. G.; Kim, D. H.; Siol, S. Perovskite Ink with Wide Processing Window for Scalable High-Efficiency Solar Cells. *Nature Energy* **2017**, 2, 17038.
- (2) Dolgoplova, E. A.; Brandt, A. J.; Ejegbavwo, O. Electronic Properties of Bimetallic Metal-Organic Frameworks (MOFs): Tailoring Density of Electronic States Through MOF Modularity. *J. Am. Chem. Soc.* **2017**, 139, 5201–5209.
- (3) Larson, B. W.; Reid, O. G.; Coffey, D. C.; Avdoshenko, S. M.; Popov, A. A.; Boltalina, O. V.; Strauss, S. H.; Kopidakis, N.; Rumbles, G. Inter-Fullerene Electronic Coupling Controls the Efficiency of Photoinduced Charge Generation

- in Organic Bulk Heterojunctions. *Adv. Energy Mater.* **2016**, 1601427.
- (4) Nayak, P. K.; Moore, D. T.; Wenger, B.; Nayak, S.; Haghighirad, A. A.; Fineberg, A.; Noel, N. K.; Reid, O. G.; Rumbles, G.; Kukura, P.; *et al.* Mechanism for Rapid Growth of Organic–Inorganic Halide Perovskite Crystals. *Nature Communications* **2016**, *7*, 13303.
  - (5) Hughes, B. K.; Braunecker, W. A.; Bobela, D. C.; Nanayakkara, S. U.; Reid, O. G.; Johnson, J. C. Covalently Bound Nitroxyl Radicals in an Organic Framework. *J. Phys. Chem. Lett.* **2016**, *7*, 3660–3665.
  - (6) Reid, O. G.; Yang, M.; Kopidakis, N.; Zhu, K.; Rumbles, G. Grain-Size-Limited Mobility in Methylammonium Lead Iodide Perovskite Thin Films. *ACS Energy Lett.* **2016**, *1*, 561–565.
  - (7) Dowgiallo, A.-M.; Mistry, K. S.; Johnson, J. C.; Reid, O. G.; Blackburn, J. L. Probing Exciton Diffusion and Dissociation in Single-Walled Carbon Nanotube-C60 Heterojunctions. *J. Phys. Chem. Lett.* **2016**, *7*, 1794–1799.
  - (8) Ihly, R.; Mistry, K. S.; Ferguson, A. J.; Clikeman, T. T.; Larson, B. W.; Reid, O. G.; Boltalina, O. V.; Strauss, S. H.; Rumbles, G.; Blackburn, J. L. Tuning the Driving Force for Exciton Dissociation in Single-Walled Carbon Nanotube Heterojunctions. *Nat. Chem.* **2016**, *8*, 603–609.
  - (9) Ihly, R.; Dowgiallo, A.-M.; Yang, M.; Schulz, P.; Stanton, N. J.; Reid, O. G.; Ferguson, A. J.; Zhu, K.; Berry, J. J.; Blackburn, J. L. Efficient Charge Extraction and Slow Recombination in Organic–Inorganic Perovskites Capped with Semiconducting Single-Walled Carbon Nanotubes. *Energy Environ. Sci.* **2016**, *9*, 1439–1449.
  - (10) Feier, H. M.; Reid, O. G.; Pace, N. A.; Park, J.; Bergkamp, J. J.; Sellinger, A.; Gust, D.; Rumbles, G. Local Intermolecular Order Controls Photoinduced Charge Separation at Donor/Acceptor Interfaces in Organic Semiconductors. *Adv. Energy Mater.* **2016**, *6*, 1502176.
  - (11) Reid, O. G.; Rumbles, G. Resonance Energy Transfer Enables Efficient Planar Heterojunction Organic Solar Cells. *J. Phys. Chem. C* **2015**, *120*, 87–97.
  - (12) Crisp, R. W.; Callahan, R.; Reid, O. G.; Dolzhenkov, D. S.; Talapin, D. V.; Rumbles, G.; Luther, J. M.; Kopidakis, N. Photoconductivity of CdTe Nanocrystal-Based Thin Films: Te 2–Ligands Lead to Charge Carrier Diffusion Lengths Over 2 Mm. *J. Phys. Chem. Lett.* **2015**, *6*, 4815–4821.
  - (13) Ferguson, A. J.; Dowgiallo, A.-M.; Bindl, D. J.; Mistry, K. S.; Reid, O. G.; Kopidakis, N.; Arnold, M. S.; Blackburn, J. L. Trap-Limited Carrier Recombination in Single-Walled Carbon Nanotube Heterojunctions with Fullerene Acceptor Layers. *Phys. Rev. B* **2015**, *91*, 245311.
  - (14) Park, J.; Reid, O. G.; Rumbles, G. Photoinduced Carrier Generation and Recombination Dynamics of a Trilayer Cascade Heterojunction Composed of Poly(3-Hexylthiophene), Titanyl Phthalocyanine, and C 60. *J. Phys. Chem. B* **2015**, *119*, 7729–7739.
  - (15) Park, J.; Reid, O. G.; Blackburn, J. L.; Rumbles, G. Photoinduced Spontaneous Free-Carrier Generation in Semiconducting Single-Walled Carbon Nanotubes. *Nat. Comm.* **2015**, *6*, 1–8.
  - (16) OConnor, B. T.; Reid, O. G.; Zhang, X.; Kline, R. J.; Richter, L. J.; Gundlach, D. J.; DeLongchamp, D. M.; Toney, M. F.; Kopidakis, N.; Rumbles, G.

- Morphological Origin of Charge Transport Anisotropy in Aligned Polythiophene Thin Films. *Adv. Funct. Mater.* **2014**, *24*, 3422–3431.
- (17) Marsh, H. S.; Reid, O. G.; Barnes, G.; Heeney, M.; Stingelin, N.; Rumbles, G. Control of Polythiophene Film Microstructure and Charge Carrier Dynamics Through Crystallization Temperature. *J. Polym. Sci. B Polym. Phys.* **2014**, *52*, 700–707.
- (18) Buchaca-Domingo, E.; Ferguson, A. J.; Jameison, F. C.; McCarthy-Ward, T.; Shoaee, S.; Reid, O. G.; Madec, M.-B.; Pfannmüller, M.; Hermerschmidt, F.; Schröder, R. R.; *et al.* Additive-Assisted Supramolecular Manipulation of Polymer:Fullerene Blend Phase Morphologies and Its Influence on Photophysical Processes. *Materials Horizons* **2014**, *1*, 270–279.
- (19) Reid, O. G.; Pensack, R. D.; Song, Y.; Scholes, G. D.; Rumbles, G. Charge Photogeneration in Neat Conjugated Polymers. *Chem. Mater.* **2013**, *26*, 561–575.
- (20) Reid, O. G.; Rumbles, G. Quantitative Transient Absorption Measurements of Polaron Yield and Absorption Coefficient in Neat Conjugated Polymers. *J. Phys. Chem. Lett.* **2013**, *4*, 2348–2355.
- (21) Treat, N. D.; Nekuda Malik, J. A.; Reid, O. G.; Yu, L.; Shuttle, C. G.; Rumbles, G.; Hawker, C. J.; Chabynyc, M. L.; Smith, P.; Stingelin, N. Microstructure Formation in Molecular and Polymer Semiconductors Assisted by Nucleation Agents. *Nat. Mater.* **2013**, *12*, 628–633.
- (22) Ruddy, D. A.; Reid, O. G.; Leonard, B. M.; Pylypenko, S.; Neale, N. R. Non-Aqueous Thermolytic Route to Oxynitride Photomaterials Using Molecular Precursors  $\text{Ti}(\text{OtBu})_4$  and  $\text{NMo}(\text{OtBu})_3$ . *J. Mater. Chem. A* **2013**, *1*, 14066–14070.
- (23) Reid, O. G.; Malik, J. A. N.; Latini, G.; Dayal, S.; Kopidakis, N.; Silva, C.; Stingelin, N.; Rumbles, G. The Influence of Solid-State Microstructure on the Origin and Yield of Long-Lived Photogenerated Charge in Neat Semiconducting Polymers. *J. Polym. Sci. B Polym. Phys.* **2012**, *50*, 27–37.
- (24) Giridharagopal, R.; Rayermann, G. E.; Shao, G.; Moore, D. T.; Reid, O. G.; Tillack, A. F.; Masiello, D. J.; Ginger, D. S. Submicrosecond Time Resolution Atomic Force Microscopy for Probing Nanoscale Dynamics. *Nano Lett.* **2012**, *12*, 893–898.
- (25) Reid, O. G.; Xin, H.; Jenekhe, S. A.; Ginger, D. S. Nanostructure Determines the Intensity-Dependence of Open-Circuit Voltage in Plastic Solar Cells. *J. Appl. Phys.* **2010**, *108*, 084320.
- (26) Reid, O. G.; Rayermann, G. E.; Coffey, D. C.; Ginger, D. S. Imaging Local Trap Formation in Conjugated Polymer Solar Cells: a Comparison of Time-Resolved Electrostatic Force Microscopy and Scanning Kelvin Probe Imaging. *J. Phys. Chem. C* **2010**, *114*, 20672–20677.
- (27) Groves, C.; Reid, O. G.; Ginger, D. S. Heterogeneity in Polymer Solar Cells: Local Morphology and Performance in Organic Photovoltaics Studied with Scanning Probe Microscopy. *Accounts Chem. Res.* **2010**, *43*, 612–620.
- (28) Rodovsky, D. B.; Reid, O. G.; Pingree, L. S. C.; Ginger, D. S. Concerted Emission and Local Potentiometry of Light-Emitting Electrochemical Cells. *ACS Nano* **2010**, *4*, 2673–2680.
- (29) Xin, H.; Reid, O. G.; Ren, G.; Kim, F. S.; Ginger, D. S.; Jenekhe, S. A. Polymer

- Nanowire/Fullerene Bulk Heterojunction Solar Cells: How Nanostructure Determines Photovoltaic Properties. *Acs Nano* **2010**, *4*, 1861–1872.
- (30) Pingree, L. S. C.; Reid, O. G.; Ginger, D. S. Electrical Scanning Probe Microscopy on Active Organic Electronic Devices. *Adv. Mater.* **2009**, *21*, 19–28.
- (31) Pingree, L. S. C.; Reid, O. G.; Ginger, D. S. Imaging the Evolution of Nanoscale Photocurrent Collection and Transport Networks During Annealing of Polythiophene/Fullerene Solar Cells. *Nano Lett.* **2009**, *9*, 2946–2952.
- (32) Reid, O. G.; Munechika, K.; Ginger, D. S. Space Charge Limited Current Measurements on Conjugated Polymer Films Using Conductive Atomic Force Microscopy. *Nano Lett.* **2008**, *8*, 1602–1609.
- (33) Coffey, D. C.; Reid, O. G.; Rodovsky, D. B.; Bartholomew, G. P.; Ginger, D. S. Mapping Local Photocurrents in Polymer/Fullerene Solar Cells with Photoconductive Atomic Force Microscopy. *Nano Lett.* **2007**, *7*, 738–744.

### **Patents and Inventions:**

2017 – Provisional Patent Application: No. 62/476,492, Garten, L.; Moore, D. T.; Reid, O.G.; Gorman, B.; Ginley D. “Hybrid Perovskite Bulk Photovoltaic Effect Devices and Methods of Making the Same” Issue date pending.

2014 – US Patent: US8686358 B2, Ginger, D.; Giridharagopal, R.; Moore, D. T.; Rayermann, G.; Reid, O. G. “Sub-Microscopical-Resolution Probe Microscopy” Issue date: April 1<sup>st</sup>, 2014

### **Lectures and Presentations:**

2017 – Oral – Invited guest lecture, Colorado School of Mines, Golden, CO. “*Balancing Life, or Not...*”

2015 – Oral – Rank Prize Symposium on Exciton Processes in Molecular Materials, Grasmere, UK. “*The Role of Polymer Aggregates on Exciton Dissociation: From Neat Polymers to Dilute Donor/Acceptor Blends*”

2015 – Oral – Chemical and Nanoscience Center Seminar, National Renewable Energy Laboratory, Golden, CO, US. “*Polymer Aggregates and Exciton Dissociation: From Neat Polymers to Dilute Donor/Acceptor Blends*”

2015 – Oral – 12th International Symposium on Functional  $\pi$ -Electron Systems Seattle, WA, US. “*Resonance Energy Transfer Enables Efficient Planar Heterojunction Organic Solar Cells*”

2014 – Poster – Excitonic Photovoltaics (XPV), Telluride, CO, US. “*Toward 15% Efficient Excitonic Photovoltaic Based on Resonance Energy Transfer*”

2013 – Oral – Chemical and Nanoscience Center Seminar, National Renewable Energy Laboratory, Golden, CO, US. “*Photoinduced Charge Generation in Neat Conjugated Polymers*”

2013 – Oral – Materials Research Society (MRS) Spring Meeting, San Francisco, CA, US. “*Quantitative Transient Absorption Measurements of Polaron Yield and Absorption Coefficient in Neat Conjugated Polymers*”

2013 – Oral – Materials Research Society (MRS) Spring Meeting, San Francisco, CA, US. “*The Mechanism of Charge Generation in PPV:C60 Bilayers*”

2012 – Oral – Chemical and Nanoscience Center Seminar, National Renewable Energy Laboratory, Golden, CO, US. “*Quantitative Transient Absorption Measurements of Polaron Yield and Absorption Coefficient in Neat Conjugated Polymers*”

2011 – Oral – International Semiconductor Device Research Symposium College Park, MD, US. “*Detecting Free Carriers in Organic Photovoltaic Systems: Time-Resolved Microwave Conductivity*”

2011 – Oral – Chemical and Nanoscience Center Seminar, National Renewable Energy Laboratory, Golden, CO, US. “*Photogenerated Charges in Neat poly(3-hexylthiophene) Films*”

2011 – Oral – SPIE Optics + Photonics, San Diego, CA, US. “*Photogenerated Charges in Neat Poly(3-hexylthiophene) Films*”

2010 – Oral – Joint 65th Northwest/22nd Rocky Mountain Regional Meeting of the ACS, Pullman, WA, US. “*How Nanostructure Effects the Intensity-Dependence of Open Circuit Voltage in Organic Solar Cells*”

2009 – Poster – Materials Research Society (MRS) Fall Meeting and Exhibit, Boston, MA, US. “*Mapping Local Charge Trapping and Vertical Anisotropy in Nanostructured Organic Solar Cells with trEFM and pcAFM*”

2008 – Oral – Invited guest lecture. Pacific University, Department of Chemistry, Forest Grove, OR, US. “*Scanning Probe Microscopy of Organic Solar Cells*”

2008 – Poster – Gordon Research Conference: Electronic Processes in Organic Materials, South Hadley, MA, US. “*Measuring Local Charge Carrier Mobility in Organic Solar Cell Materials*”

2007 – Poster – Micro Nano Breakthrough Conference, Portland, OR, US. “*Photocurrent and Charge Carrier Mobility in Organic Photovoltaic Blends, Studied via Conductive Atomic Force Microscopy*”

2007 – Poster – NAIMO Summer School, Linköping, Sweden. “*Impact of Morphology on Polymer Solar Cell Performance Studied via Scanning Probe Microscopy*”

2006 – Poster – Gordon Research Conference: Electronic Processes in Organic Materials, South Hadley, MA, US. “*Measuring Local Photocurrents In Polymer Blends Using Conductive-Probe AFM*”

**Honors and Awards:**

2010 – Special Research Merit Award made possible by the Rowland Endowed Fellowship in Chemistry Fund at the University of Washington

2009 – NSF IGERT fellowship in Nanotechnology from the University of Washington Center for Nanotechnology

2007 – “Best Presentation” award for short-format talks at the biannual Student Symposium on Nanotechnology

2007 – NSF IGERT fellowship in Nanotechnology from the University of Washington Center for Nanotechnology