

Erin L. Ratcliff, Ph.D.

EDUCATION

- Postdoctoral Research Fellow 2007-2010
Department of Chemistry and Biochemistry
University of Arizona, Tucson, AZ
Advisor: Neal R. Armstrong
- Iowa State University, Ames, IA 2003-2007
Ph.D. in Physical Chemistry
Dissertation title: "Development of Gradient-Based Surface Methods"
Advisor: Andrew C. Hillier
Honors: *Summa cum laude*
- St. Olaf College, Northfield, MN 1999-2003
B.A. in Chemistry, Mathematics, and Statistics
Research Thesis: "Determination of the pKa of 16-mercaptohexadecanoic acid when tethered to Au(111)
Advisor: Mary Walczak
Honors: *Summa cum laude*

ACADEMIC AND PROFESSIONAL APPOINTMENTS

- Assistant Professor of Materials Science and Engineering 2014-present
University of Arizona, Tucson, AZ
- Research Assistant Professor of Chemistry and Biochemistry 2012-2014
University of Arizona, Tucson, AZ
- Research Scientist 2010-2012
Center for Interface Science: Solar Electric Materials
University of Arizona, Tucson, AZ

PEER-REVIEWED PUBLICATIONS

1. Cowan, S.R.; Li, J.V.; Olson, D.C.; Ratcliff, E.L. "Contact-induced mechanisms in organic photovoltaics: a steady-state and transient study." *Advanced Energy Materials*, *accepted*.
2. Braunecker, W.A.; Oosterhout, S.D.; Owczarczyk, Z.R.; Kopidakis, N; Ratcliff, E.R; Ginley, D.S.; Olson, D.C. "Semi-random vs Well-defined Alternating Donor-acceptor Copolymers." *ACS Macro Letters* 2014, 3(7), 622-627.
3. Cowan, S.R.; Schulz, P.; Giordano, A.J.; MacLeod, B.A.; Garcia, A.; Marder, S.; Kahn, A.; Ginley, D.S.; Ratcliff, E.L.; Olson, D.C. "Chemically-controlled reversible and irreversible extraction barriers in polycarbazole-based organic solar cells." *Advanced Functional Materials*, *accepted*, 10.1002/adfm.201400158.
4. Li, Hong; Ratcliff, E.L.; Sigdel, A.K.; Giordano, A.J.; Marder, S.R.; Berry, J.J.; Bredas, J.L. "Modification of the Gallium-doped Zinc Oxide Surface with Self-Assembled Monolayers

- of Phosphonic Acids: A Joint Theoretical and Experimental Study.” *Advanced Functional Materials*, 2014, 24(23), 3593–3603.
5. Ratcliff, E.L.; Bakus, R.C.; Welch, G.C.; van der Poll, T.; Garcia, A.; Cowan, S.R.; Bazan, G.C.; Olson, D.C. “Formation of interfacial traps upon surface protonation in small molecule solution processed bulk heterojunctions probed by photoelectron spectroscopy.” *Journal of Materials Chemistry, C*, 2013, 1, 6223-6234.
 6. Matz, D.L.; Ratcliff, E.L.; Meyer, J.; Kahn, A.; Pemberton, J. “Deciphering the Metal-C₆₀ Interface in Optoelectronic Devices: Evidence for the C₆₀ Reduction by Vapor Deposited Al.” *ACS Applied Materials and Interfaces*, 5(13), 6001+, 2013.
 7. Steirer, K.X.; MacDonald, G.A.; Olthof, S.; Gantz, J.; Ratcliff, E.L.; Kahn, A.; Armstrong, N.R. “Energy level alignment and morphology of Ag and Au nanoparticle recombination contacts in tandem planar heterojunction solar cells.” *Journal of Physical Chemistry C*, accepted.
 8. Ratcliff, E.L.; Garcia, A.; Paniagua, S.A.; Cowan, S. R.; Girordano, A.J.; Ginley, D.S.; Marder, S.R.; Berry, J.J.; Olson, D.C. “Investigating the influence of interfacial contact properties on open circuit voltages in organic photovoltaic performance: work function versus selectivity.” *Advanced Energy Materials*, 3 (5) 647-656, 2013.
 9. Ndione, Paul F.; Garcia, Andres; Widjonarko, N. Edwin; Sigdel, Ajaya K.; Steirer, K. Xerxes; Olson, Dana C.; Parilla, Philip A.; Ginley, David S.; Armstrong, Neal R.; Richards, Robin E.; Ratcliff, Erin L.; Berry, Joseph J. “Highly-Tunable Nickel Cobalt Oxide as a Low-Temperature p-Type Contact in Organic Photovoltaic Devices.” *Advanced Energy Materials*, 3 (4), 524-531, (2013).
 10. Gliboff, Matthew; Sang, Lingzi; Knesting, Kristina; Schalnat, Matthew; Mudalige, Anoma; Ratcliff, Erin; Li, Hong; Sigdel, Ajaya; Berry, Joseph; Nordlund, Dennis; Giordano, Anthony; Seidler, Gerald; Bredas, Jean-Luc; Marder, Seth; Pemberton, Jeanne; Ginger, David. “Orientation and order of phenyl phosphonic acid self-assembled monolayers on transparent conductive oxides: A combined NEXAFS, PM-IRRAS, and DFT study.” *Langmuir*, 29 (7), 2166-2174, (2013).
 11. MacLeod, Bradley; Horwitz, Noah; Ratcliff, Erin; Jenkins, Judith; Armstrong, Neal; Giordano, Anthony; Hotchkiss, Peter; Marder, Seth; Campbell, Charles; Ginger, David. “Built-in potential in conjugated polymer diodes with changing anode work function: Interfacial states and deviation from the Schottky-Mott Limit.” *Journal of Physical Chemistry Letters*, 3 (9), 1202-1207 (2012).
 12. Garcia, A.; Welch, G.C.; Ratcliff, E.L.; Ginley, D.S.; Bazan, G.C.; Olson, D.C. “Improvement of interfacial contacts for new small molecule bulk heterojunction organic photovoltaics.” *Advanced Materials*, 24, 31, 2012.
 13. Lin, H.C.; Polaske, N.W.; Oquendo, L.E.; Gliboff, M.; Knesting, K.M.; Norlund, D.; Ginger, D.S.; Ratcliff, E.L.; Beam, B.M.; Armstrong, N.R.; McGrath, D.V.; Saavedra, S.S. “Electron transfer processes in monolayer-tethered zinc phthalocyanines: Characterization by waveguide spectroelectrochemistry, voltammetry, and potential-modulated attenuated total reflectance (PM-ATR).” *Journal of Physical Chemistry Letters*, 3 (9), 1154-1158 (2012).
 14. Ratcliff, E.L.; Sigdel, A.K.; Macech, M.R.; Nebesny, K.; Lee, P.A.; Ginley, D.S.; Armstrong, N.R.; Berry, J.J. “Surface composition, work function, and electrochemical characteristics of gallium-doped zinc oxide.” *Thin Solid Films*, 520 (17) 5652-5663, 2012.
 15. Ratcliff, E.L.; Meyer, J.; Steirer, K.X.; Armstrong, N.R.; Olson, D.C.; Kahn, A. “Energy level alignment in PCDTBT:PC₇₀BM solar cells: solution processed NiO_x for improved hole collection and efficiency.” *Organic Electronics*, 13, 744-749 (2012).
 16. Ratcliff, E.L.; Meyer, J.; Steirer, K.X.; Garcia, A.; Berry, J.J.; Ginley, D.S.; Olson, D.C.; Kahn, A.; Armstrong, N.R. “Evidence for near-surface NiOOH species in solution-processed NiO_x selective interlayer materials: impact on energetics and the performance

- of polymer bulk heterojunction photovoltaics." *Chemistry of Materials* 23(22) 4988-5000 (2011).
17. Polaske, N.W.; Lin, H.; Tang, A.; Mayukh, M.; Oquendo, L.E.; Green, J.T.; Ratcliff, E.L.; Armstrong, N.R.; Saavedra, S.S.; McGrath, D.V. "Phosphonic acid functionalized asymmetric phthalocyanines: Synthesis, modification of indium tin oxide (ITO), and charge transfer." *Langmuir*, 27(24) 14900-14909 (2011).
 18. Widjonarko, N.E.; Ratcliff, E.L.; Perkins, C.I.; Sigdel, A.K.; Zakutayev, A.; Ndione, P.F.; Gillaspie, D.T.; Ginley, D.S.; Olson, D.C.; Berry, J.J. "Sputtered nickel oxide thin film for efficient hole transport layer in polymer-fullerene bulk-heterojunction organic solar cell," *Thin Solid Films*, 520(10) 3813-3813, 2012.
 19. Steirer, K.X; Ndione, P.F.; Widjonarko, N.E.; Lloyd, M.T.; Meyer, J.; Ratcliff, E.L.; Kahn, A.; Armstrong, N.R.; Curtis, C.J.; Ginley, D.S.; Berry, J.J.; Olson, D.C. "Enhanced efficiency in plastic solar cells via energy matched solution processed NiO_x interlayers." *Advanced Energy Materials*, 1 (5) 813-820 (2011).
 20. Ratcliff, E.L.; Zacher, B.; Armstrong, N.R. "Selective interlayers and contacts in organic photovoltaic cells." *Journal of Physical Chemistry Letters* 2 (11) 1337-1350. (2011).
 21. Ratcliff, E.L.; Veneman, P.A.; Simmonds, A.; Zacher, B.; Huebner, D.; Saavedra, S.S.; Armstrong, N.R. "A planar, chip-based, dual-beam refractometer using an integrated organic light emitting diode (OLED) light source and organic photovoltaic (OPV) detectors." *Analytical Chemistry* 82 (7) 2734-2742 (2010).
 22. Kim, B.Y.; Ratcliff, E.L.; Armstrong, N.R.; Kowalewski, T.; Pyun, J. "Ferrocene functional polymer brushes on indium tin oxide via surface-initiated atom transfer radical polymerization." *Langmuir*, 26(3) 2083-2092. (2010).
 23. Ratcliff, E.L.; Lee, P.A.; Armstrong, N.R. "Work function control of hole-selective polymer/ITO anode contacts: an electrochemical doping study." *Journal of Materials Chemistry* 20(13) 2672-2679 (2010).
 24. Armstrong, N.R.; Veneman, P.A.; Ratcliff, E.; Placencia, D.; Brumbach, M. "Oxide Contacts in Organic Photovoltaics: Characterization and Control of Near-Surface Composition in Indium-Tin Oxide (ITO)." *Accounts of Chemical Research*, 42 (11) 1748-1757. (2009).
 25. Keng, P.Y.; Kim, B.Y.; Shim, I.; Sahoo, R.; Veneman, P.A.; Armstrong, N.R.; Yoo, H.; Pemberton, J.E.; Bull, M.M; Griebel, J.J; Ratcliff, E.L.; Nebesny, K.W.; Pyun, J. "Colloidal Polymerization of Polymer Coated Ferromagnetic Nanoparticles into Cobalt Oxide Nanowires," *ACS Nano*, 3 (10), 3143-3157, (2009).
 26. Armstrong, N.R.; Wang, W.N.; Alloway, D.M.; Placencia, D.; Ratcliff, E.; Brumbach, M. "Organic/Organic' Heterojunctions: Organic Light Emitting Diodes and Organic Photovoltaic Devices." *Macromolecular Rapid Communications*, 30, 717-731. (2009)
 27. Ratcliff, E.L., Jenkins, J.L.; Nebesny, K.; Armstrong, N.R. "Electrodeposited, "textured" poly(3-hexylthiophene) (e-P3HT) films for photovoltaic applications." *Chemistry of Materials*, 20, 5796-5806. (2008)
 28. Ratcliff E.L. and Hillier, A.C. "Directed electrodeposition of polymer films using spatially controllable electric field gradients." *Langmuir*, 23, 9905-9910 (2007).
 29. Jayaraman, S.; May, E.L. and Hillier, A.C. "Scanning electrochemical mapping of spatially localized electrochemical reactions induced by surface potential gradients," *Langmuir*, 22, 10322-10328 (2006).
 30. May E. L. and Hillier A.C. "Rapid and reversible generation of a microscale pH gradient using surface electric fields," *Analytical Chemistry*, 77, 6487-6493, (2005).