Jodi M. Szarko, Ph.D.

Assistant Professor of Chemistry, Lafayette College Hugel Science Center 232, Easton, PA 18042 Tel:(610)330-5824 Fax: (610)330-5714 Email: <u>szarkoj@lafayette.edu</u>

EDUCATION

University of Colorado at Boulder(Boulder, CO)2005Ph.D., Department of Chemistry and BiochemistryThesis title: Carrier dynamics and spectral analysis of Zinc Oxide nano-
tetrapod lasers

Wesleyan University (Middletown, CT)1998B.A., Department of Chemistry, Departmental Honors1998Thesis title: The Argon-Chlorocyclobutane van der Waals Complex1998

CURRENT POSITION

Assistant Professor of Chemistry	since 2013
<u>Research interests</u> :	
- Molecular interactions in organic semiconducting materials	
- Thin film fabrication	
- Spectroscopic and microscopic methods	
<u>Courses taught:</u>	
CHEM 121 (General Chemistry I)	
CHEM 122 (General Chemistry II)	
CHEM 324 (Physical Chemistry II without lab)	
CHEM 326 (Physical Chemistry II with lab)	
CHEM 426 (Advanced Physical Chemistry)	
Service Activities	
Student Life Committee	2015-2016
Biotechnology/Bioengineering Advisory Committee Institutional Review Board, 1 year appointment	2015-2016 2014-2015

Gender and Sexuality Programs Advisory Committee	2014-2015
Marquis Scholar interviewer	2015-2016
Experience Lafayette	2015-2016
Judge, Multidisciplinary Environmental Poster Session	2013-2015

PREVIOUS TEACHING AND RESEARCH EXPERIENCE

Postdoctoral Research Fellow, Northwestern University (Evanston, IL) 2007-2013

- Facilitated in the construction of a new laser spectroscopy and microscopy laboratory at Northwestern University
- Used this setup along with x-ray diffraction and scattering techniques performed at Argonne National Laboratories to determine the structural and kinetic properties of organic photovoltaic (OPV) polymers to better understand and optimize solar cell efficiencies

Lecturer, Chicago State University (Chicago, IL) 2011-2013 Lecturing General Chemistry and Physical Chemistry courses Instructing Physical Chemistry and General Laboratories Looking for innovative ways to encourage students of diverse ~ backgrounds to enhance their learning experience Research Advisor, TILT (Training in Interdisciplinary Laboratory Techniques) program, Chicago State University (Chicago, IL) July 2012 Constructed a working nanomaterials lab for undergraduate students Advised students on the optimal techniques used to produce and characterize quantum dots Determined the individual strengths of each student to produce a cohesive presentation, which was given collectively by the students Guest lecturer, Northwestern University (Evanston, IL) 2011 - Taught courses in Statistical Thermodynamics and Kinetics when the instructor was unavailable - Created power point presentations, which were uploaded online Assistant Scientist, Helmholtz Zentrum Berlin (Berlin, Germany) 2005-2007

- Utilized and modified a specialized laser system to investigate the dynamics at both inorganic surfaces and inorganic/organic interfaces in vacuum
- Prepared samples and used basic characterization techniques to characterize the samples studied and investigate charge transfer mechanisms

<u>Junior Specialist I</u>, University of California at Berkeley and 2002-2005 Lawrence Berkeley National Laboratories (Berkeley, CA)

- Successfully moved and constructed laboratory for ultrafast spectroscopy and microscopy techniques
- Examined lasing and structural characteristics in ZnO tetrapod microcavities using a unique time-resolved microscopy setup

Open House, Lawrence Berkeley National Laboratories (Berkeley, CA) 2002

- Described laser experiments to younger children
- Used common examples to relate my research to every day life

<u>Chemistry Crew</u>, Biological Science Initiative, University of Colorado 2001-2002 at Boulder (Boulder, CO)

- Instructed high school students in gel electrophoresis analysis
- Constructed a productive laboratory setup with other graduate students using candy dyes to teach chemical concepts

Teaching Assistant, University of Colorado at Boulder (Boulder, CO) 1998-1999

- Oversaw a Chemistry Laboratory section in Honors General Chemistry
- Lead study sessions and review sessions several times a week

Teaching Assistant,	Weslevan	University,	(Middletown,	CT)	1998
	•/	•/ ′	()		

- Held study sessions for a General Chemistry section twice a week
- Graded course exams with the instructor

AWARDS AND FELLOWSHIPS

University Fellowship.University of Colorado at Boulder1998-1999Graduate Teaching Excellence Award.University of Colorado at Boulder1999Bradley Prize.Wesleyan University1998

REFEREED PUBLICATIONS

A. Austin, N. J. Hestand, C. Zhong, X. Zhu, M. Zdilla, F.C. Spano, J.M. Szarko, "Enhanced Davydov Splitting in Crystals of a Perylene Diimide Derivative," *Journal of the American Chemical Society*, **2016**, submitted.

M.T. Weintraub, E. Xhakaj, A. Austin, J.M. Szarko, "The effects of donor:acceptor intermolecular mixing and acceptor crystallization on the composition ratio of blended, spin coated organic thin films," *Journal of Materials Chemistry C*, **2016**, *4*, 2256-7765.

P. Sippel, J.M. Szarko, T. Hannappel, R. Eichberger, "Ultrafast electron scattering from surface to bulk states at the InP(100) surface," *Physical Review B*, **2015**, 115, 115312.

J.M.Szarko, B.S. Rolczynski, S.J. Lou, T. Xu, J. Strzalka, T.J. Marks, L. Yu, L.X. Chen, "Photovoltaic Function and Exciton/Charge Transfer Dynamics in a Highly Efficient Semiconducting Copolymer," *Advanced Functional Materials*, **2014**, 24, 10-26.

B.S. Rolczynski, J.M. Szarko, H.J. Son, L. Yu, L.X. Chen, "Effects of Exciton Polarity in Charge-Transfer Polymer/PCBM Bulk Heterojunction Films," *The Journal* of *Physical Chemistry Letters*, **2014**, 5, 1856-1863.

T. Xu, L. Lu, T. Zheng, J.M. Szarko, A. Schneider, L.X. Chen, L. Yu, "Tuning the Polarizability in Donor Polymers with a Thiophenesaccharin Unit for Organic Photo-voltaic Applications," *Advanced Functional Materials*, **2014**, 24, 3432–3437.

A.K. Blackburn, A.C.H. Sue, A.K Shveyd, D. Cao, A. Tayi, A. Narayanan, B.S.Rolczynski, J.M. Szarko, O.A. Bozdemir, R Wakabayashi, J. Lehrman, B Kahr, L.X. Chen, M.S. Nassar, S.I. Stupp, J.F. Stoddart, "Lock-Arm Supramolecular Ordering: A Molecular Construction Set for Cocrystallizing Organic Charge Transfer Complexes," *Journal of the American Chemical Society*, **2014**, 49, 17224-17235.

A.S. Tayi, A.K. Shveyd, C.H. Sue, J.M. Szarko, B.S. Rolczynski, D. Cao, T.J. Kennedy, A.A. Sarjeant, C.L. Stern, W.F. Paxton, W. Wu, S.K. Dey, A.C. Fahrenbach, J.R. Guest, H. Mohseni, L.X. Chen, K.L. Wang, S.I. Stupp, J.F. Stoddart, "Room-temperature ferroelectricity in supramolecular networks of charge-transfer complexes," *Nature*, **2012**, 488, 485-489.

B. S. Rolczynski, J. M. Szarko, H. J. Son, Y. Liang, L. Yu and L. X. Chen, "Ultrafast Intramolecular Exciton Splitting Dynamics in Isolated Low-Band-Gap Polymers and-Their Implications in Photovoltaic Materials Design," *Journal of the American Chemical Society*, **2012**, 134, 4142-4152.

B. Carsten, J.M. Szarko, L. Lu, H.J. Son, F. He, Y.Y. Botros, L.X. Chen, L. Yu, "Mediating Solar Cell Performance by Controlling the Internal Dipole Change in Organic Photovoltaic Polymers," *Macromolecules*, **2012**, 45, 6390–6395.

S. J. Lou, J. M. Szarko, T. Xu, L. Yu, T. J. Marks, L. X. Chen, "Effects of Additives on the Morphology of Solution Phase Aggregates formed by Active Layer Components of High-Efficiency Organic Solar Cells," *Journal of the American Chemical Society*, **2011**, 133, 20661-20663.

B. Carsten, J. M. Szarko, H. J. Son, W. Wang, L. Lu, F. He, B. S. Rolczynski, S. J. Lou, L. X. Chen, L. Yu, "Examining the Effect of the Dipole Moment on Charge Delocalization in Donor-Acceptor Polymers for Organic Photovoltaic Applications," *Journal of the American Chemical Society*, **2011**, 133, 20468-20475.

I.P. Murray, S.J. Lou, L.J. Cote, S. Loser, C.J. Kadleck, T. Xu, J.M. Szarko, B. S. Rolczynski, J.E. Johns, J. Huang, L. Yu, L.X. Chen, T.J. Marks, M.C. Hersam, "Graphene Oxide Interlayers for Robust, High-Efficiency Organic Photovoltaics," *Journal of Physical Chemistry letters*, **2011**, 2, 3006-3012.

N.A. Gothard, M.W. Mara, J. Huang, J.M. Szarko, B.S. Rolczynski, L.X. Chen, "Strong Steric Hindrance Effect on Excited State Structural Dynamics of Cu(I) Diimine Complexes," *Journal of Physical Chemistry A*, **2012**, 116, 1984-1992.

J.M. Szarko, J.C. Guo, B.S. Rolczynski, L.X. Chen, "Nanoscale structure, dynamics and power conversion efficiency correlations in small molecule and oligomer-based photovoltaic devices," *Nano Reviews*, **2011**, *2*, 1-17.

J.M. Szarko, J.C. Guo, B.S. Rolczynski, L.X. Chen, "Current Trends in the Optimization of Low Bandgap Polymers in Bulk Heterojunction Photovoltaic Devices," *Journal of Materials Chemistry*, **2011**, 21, 7849-7857.

A. Neubauer, J. Szarko, A. Bartelt, R. Eichberger, T. Hannappel, "A Photophysical Study of Perylene/TiO₂ and Perylene/ZnO Varying Interfacial Couplings and the Chemical Environment," *Journal of Physical Chemistry C*, **2011**, 115, 5683-5691.

B.S. Rolczynski, J.M. Szarko, B. Lee, J. Strzalka, J.C. Guo, Y.Y. Liang, L.P. Yu, L.X. Chen, "Length-Dependent Self-Assembly of Oligothiophene Derivatives in Thin Films: Implications in Photovoltaic Material Fabrications," *Journal of Materials Research*, **2011**, 26, 296-305.

J.M. Szarko, J.C. Guo, Y.Y. Liang, B. Lee, B.S. Rolczynski, J. Strzalka, T. Xu, S. Loser, T.J. Marks, L.P. Yu, L.X. Chen, "When Function Follows Form: Effects of Donor Copolymer Side-Chains on Film Morphology and BHJ Solar Cell Performance," *Advanced Materials*, **2010**, 22, 5468-5472.

J.M. Szarko, B.S. Rolczynski, J.C. Guo, Y.Y. Liang, M.W. Mara, L.P. Yu, L.X. Chen, "Electronic Processes in Conjugated Diblock Oligomers Mimicking Low Band-gap Polymers: Experimental and Theoretical Spectral Analysis," *Journal of Physical Chemistry B*, **2010**, 114, 14505-14513.

S. Banerjee, J.M. Szarko, B.D. Yuhas, C.D. Malliakas, L.X. Chen, M.G. Kanatzidis, "Room Temperature Light Emission from the Low-Dimensional Semiconductors AZrPS₆ (A = K, Rb, Cs)," *JACS Communications*, **2010**, 132, 5349-5350.

R.A. Jensen, H. van Ryswyk, C.X. She, J.M. Szarko, L.X. Chen, J.T. Hupp, "Dye-Sensitized Solar Cells: Sensitizer-Dependent Injection into ZnO Nanotobe Electrodes," *Langmuir*, **2010**, 26, 1401-1404.

J.C. Guo, Y.Y. Liang, J.M. Szarko, B. Lee, H.J. Son, B. Rolczynski , L.P. Yu, L.X. Chen, "Structure, Dynamics and Power Conversion Efficiency Correlations in a New Low Bandgap Polymer:PCBM Solar Cell," *Journal of Physical Chemistry B*, **2010**, 114, 742-748.

Y.Y. Liang, D.Q. Feng, J.C. Guo, J.M. Szarko, C. Ray, L.X. Chen, and L.P. Yu, "Regioregular Oligomer and Polymer Containing Thieno[3,4-b]thiophene Moiety for Efficient Organic Solar Cells," *Macromolecules*, **2009**, 42, 1091-1098.

J.C. Guo, Y.Y. Liang, S.Q. Xiao, J.M. Szarko, M. Sprung, M.K. Mukhopadhyay, J. Wang, L.P. Yu, and L.X. Chen, "Structure and dynamics correlations of photoinduced charge separation in rigid conjugated linear donor-acceptor dyads towards photovoltaic applications," *New Journal of Chemistry*, **2009**, 33, 1497-1507.

J. Tornow, K. Ellmer, J. Szarko, and K. Schwarzburg, "Voltage bias dependency of the space charge capacitance of wet chemically grown ZnO nanorods employed in a dye sensitized photovoltaic cell," *Thin Solid Films*, **2008**, 516, 7139-7143.

J.M. Szarko, A. Neubauer, A. Bartelt, L. Socaciu-Siebert, F. Birkner, K. Schwarzburg, T. Hannappel, and R. Eichberger, "The ultrafast temporal and spectral characterization of electron injection from perylene derivatives into ZnO and TiO₂ films," *Journal of Physical Chemistry C*, **2008**, 112, 10542-10552.

J.K. Song, U. Willer, J.M. Szarko, S.R. Leone, S. Li, and Y. Zhao, "Ultrafast upconversion probing of lasing in single ZnO nanowire lasers," *Journal of Physical Chemistry C*, **2008**, 112, 1679-1684.

L. Gundlach, J. Szarko, L. Socaciu-Siebert, A. Neubauer, R. Ernstorfer, and F. Willig, "Different orientations of large rigid organic chromophores at the rutile TiO₂ surface controlled by different binding geometries of specific anchor groups," *Physical Review B*, **2007**, 75,125320.

C.W. Blackledge, J.M. Szarko, A. Dupont, G.H. Chan, E.L. Read, and S.R. Leone, "Zinc oxide nanorod growth on gold islands prepared by microsphere lighography on silicon and quartz," *Journal of Nanoscience and Technology*, **2007**, *7*, 3336-3339.

J.K. Song, J.M. Szarko, S.R. Leone, S. Li, and Y. Zhao, "Ultrafast carrier dynamics and wavelength-dependent lasing dynamics in single nanotetrapod and nanowire lasers," *Journal of Physical Chemistry B*, **2005**, 109, 15749-15753.

R. Subramanian, J.M. Szarko, W.C. Pringle, S.E. Novick, "Rotational spectrum, nuclear quadrupole coupling constants, and structure of six isotopomers of the Argonchlorocyclobutane van der Waals complex," *Journal of Molecular Structure*, **2005**, 742, 165-172.

J.M. Szarko, J.K. Song, C.W. Blackledge, I. Swart, S.R. Leone, S. Li, and Y. Zhao, "Optical injection probing of single ZnO tetrapod lasers," *Chemical Physics Letters*, **2005**, 404, 171-176.

B. Dragnea, J.M. Szarko, S. Kowarik, T. Weimann, J. Feldmann, and S.R. Leone, "Near-field surface plasmon excitation on structured gold films," *Nano Letters*, **2003**, *3*(1), *3-7* (cover).

B. Dragnea, J. Preusser, J. M. Szarko, L. A. McDonough, S. R. Leone, W. D. Hinsberg, "Chemical Mapping of Patterned Polymer Photoresists by Near-field Infrared Microscopy," *Applied Surface Science*, **2001**, 175-176, 783-789.

B. Dragnea, J. Preusser, J.M. Szarko, S.R. Leone, and W.D. Hinsberg, "Pattern characterization of deep-ultraviolet photoresists by near-field infrared microscopy," *Journal of Vacuum Science and Technology B*, **2001**, 19(1), 142-152.

CONFERENCE PROCEEDINGS

M.T. Weintraub, A. Austin, J.M. Szarko,"Effects of molecular weight and crystallization on the donor-acceptor composition ratio of spin-coated, blended, organic semiconductor films,"*Abstracts of Papers of the American Chemical Society*, **2016**, 251, 3-ENFL.

N.A. Gothard, M.W. Mara, J. Huang, J.M. Szarko, B.S. Rolczynski, L.X. Chen, "Steric and electronic tuning of Cu(I) phenanthroline complexes for solar energy conversion," *Abstracts of Papers of the American Chemical Society*, **2011**, 241, 202-INOR.

L.X. Chen, J. Guo, J.M. Szarko, Y. Liang, B. Rolczynski, B. Lee, H.J. Son, L. Yu, "Structure, dynamics and power conversion efficiency correlations in new low bandgap polymer: PCBM solar cells," *Abstracts of Papers of the American Chemical Society*, **2010**, 240, 426-COLL.

J. Szarko, A. Neubauer, L. Socaciu-Siebert, A. Bartelt, F. Birkner, K. Schwarzburg, R. Eichberger, "Electron Injection Dynamics of Perylene Derivatives into ZnO and TiO2 Particle Films," Ultrafast Phenomena XVI, 2009, 92, 640.

J. Szarko, J. Guo, Y. Liang, B. Rolczynski, L. Yu, L.X. Chen, "The electron and energy transfer between oligothiophenes and thieno [3,4-b] thiophene units," SPIE Proceedings, 2008, 7034,703403.

J. Szarko, L. Socaciu-Siebert, A. Neubauer, T. Hannappel, R. Eichberger, "Electron relaxation dynamics at the In-rich (100) surface of InP," SPIE proceedings, 2008, 6892, 28921M.

CONFERENCE RESPONSIBILITIES AND INVITED LECTURES

"PMSE: Oligomers & Polymers with Precisely Designed Microstruc-	
tures: Synthesis, Properties & Applications," <u>Session Presider</u> , 252nd	August 2016
American Chemistry Society Conference, Philadelphia, PA	
"Effects of alkyl side chain oligomers on the microcrystallite growth	
in perylene diimide derivatives," oral presentation, 252nd American	August 2016
Chemistry Society Conference, Philadelphia, PA	
"Solvent effects on the crystal structure formation of perylene diimide	<u>}</u>
derivatives," oral presentation, 44th ACS Middle Atlantic Regional	June 2016
Meeting, Riverdale, NY	
"Investigation of spin coated and drop cast pristine and blended or- ganic semiconductor films containing perylene diimides: The role of molecular structure and crystal formation in blended film composi- tion," poster, 25th Inter-American Photochemical Society Meeting, Santiage Chilo	May 2016
"Effects of molecular weight and crystallization on the donor-acceptor	
composition ratio of spin-coated, blended, organic semiconductor films."	
oral presentation, 251st American Chemistry Society Conference, San Diego, CA	March 2016
"Correlating spectral shifts, polarization, and molecular orientation in con- jugated organic thin films and microstructures," oral presentation, 251st American Chemistry Society Conference, San Diego, CA	March 2016
"The spectroscopic and microscopic analysis of aggregation effects in N-alkylated perylene diimides," poster, 249th American Chemistry	March 2015

Society Conference, Denver, CO

"Spectroscopic, dynamic, and structural investigations in conducting polymers utilized in high efficiency organic solar cells." Invited lec- ture, Rutgers University at Newark	September 2013
Current progress in organic photovoltaic research, Argonne North- western Solar Energy Research Center monthly conference series.	August 2009- 2013
"Film Morphology Optimization in Copolymer and Co-oligomer Or- ganic Photovoltaics," invited lecture, Advanced Photon Source/ Elec- tron Microscopy Center Users Meeting at Argonne National Labora- tory, Argonne, IL.	May 2012
"When function follows form: plastic solar cells," Department of En- ergy Highlight for the Argonne Northwestern Solar Energy Research Center.	March 2011
"Structural, kinetic, and electronic effects in organic photovoltaic polymers used in high efficiency organic solar cells," Industrial Asso- ciates Meeting, Evanston, IL	May 2010
"Transient absorption Studies of a new, highly photoconductive polymer," Department of Energy Review of the Center for Nanaoma- terials, Argonne National Laboratory, Argonne, IL	May 2010
"Substituent effects on the morphology, kinetics, and electronics in organic photovoltaic polymers used in high efficiency organic solar cells," 2010 Advanced Photon Source/ Electron Microscopy Center Users Meeting at Argonne National Laboratory, Argonne, IL	May 2010
"Investigations of charge separation, charge recombination, and mor- phology in photovoltaic precursors," lecture, Argonne Northwestern Solar Energy Research Center.	March 2010
"Time-resolved Luminescence Spectroscopy: Fluorescence Upcon- version and Time-Correlated Single Photon Counting methods," in- vited lecture, Ultrafast Spectroscopy Workshop, Sarasota, FL	January 2010

"Investigations of charge separation, charge recombination, and morphology in photovoltaic precursors," invited lecture, Wesleyan Uni- February 2009 versity, Middletown, CT

"Structural and temporal characterization of conjugated oligomers as OPV precursors," lecture, Conference on Physical Chemistry of In- August 2008 terfaces and Nanomaterials VII, San Diego, CA

"Effects of Intermolecular Charge Transfer on the Exciton Migration and Structural Relaxation Dynamics in Conjugated Diblock July 2009 Oligomers," poster, Gordon Research Conference: Photochemistry.

"The temporal and spectral characterization of electron injection from molecular dyes into ZnO and TiO₂ surfaces using visible transient absorption techniques," poster, Femtochemistry and Femtobiology 8, July 2007 Oxford, UK

"The temporal and spectral characterization of electron injection from molecular dyes into ZnO and TiO₂ surfaces using visible transient absorption techniques," poster, Femtochemistry and Femtobiology 8, March 2006 Oxford, UK

"Carrier dynamics in ZnO and Lasing in ZnO tetrapods," poster,	January 2004
Western Spectroscopy Conference, Monterey, CA	January 2004

"ZnO nanostructures and troscopy Conference 50 th	optical prop Anniversary	perties," poster, , Monterey, CA	Western Spec-	January 2003
"The study of the GaAsP	Photodiode :	and the charact	terization of	

plasmons on etched metal surfaces on a silicon p-i-n photodiode," October 2001 CPAD seminar, JILA, Boulder, CO

"Confocal Scanning Optical Microscopy of the GaAs_{0.6}P_{0.4} photodiode," poster, Rocky Mountain Symposium on Photons and Chemistry, Estes Park, CO 1999

STUDENT PRESENTATIONS AND LECTURES

"Spectroscopic characterization of the molecular aggregation of N- alkylated perylene diimides," <u>Ashli Austin</u> , poster, 251st American Chemistry Society Conference, San Diego, CA	March 2016
"Quantifying the Ratio of Acceptor to Donor Molecules in Solution Versus Thin Film," <u>Matthew Weintraub</u> , poster, 2015 Summer Re- search Symposium, Lafayette College	September 2015
"Spectroscopic and microscopic analysis of aggregation effects in N- alkylated perylene diimides," <u>Ashli Austin</u> , poster, 249th American Chemistry Society Conference, Denver, CO	March 2015
"Quantifying the ratios of the donor and the acceptor in blended films," <u>Enia Xhakaj</u> , poster, 2014 Summer Research Symposium, La- fayette College	September 2014