

Nicholas M. Bedford, Ph.D.

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Formal Education and Appointments

School of Chemical Engineering, University of New South Wales
Senior Lecturer (2020-current)

School of Chemical Engineering, University of New South Wales
Lecturer (2018-2020)

Air Force Research Laboratory
Materials Research Engineer (2016-2018)

National Institute of Standards and Technology
Professional Research Experience Program Postdoctoral Associate (2014-2016)
Advisor: Timothy P. Quinn, Ph.D.

Air Force Research Laboratory/University of Miami
National Research Council Postdoctoral Associate (2012-2014)
Advisors: Rajesh R. Naik, Ph.D., Marc R. Knecht, Ph.D.

The University of Cincinnati, Cincinnati, OH
Ph.D. in Materials Science and Engineering (2007- 2011)
Dissertation Title: "Electrospun fibers for Energy, Electrical and Environmental Applications"
Advisor: Andrew J. Steckl, Ph.D. and Donglu Shi, Ph.D.

Central Michigan University, Mt. Pleasant, MI
B.S. in Chemistry, B.S. in Physics, Mathematics minor (2002-2007)
Undergraduate Research Project (Physics): "X-Ray Diffraction of Nano-Scale Materials"
Advisor: Valeri Petkov, Ph.D.
Undergraduate Research Project (Chemistry): "Solvent Effect on Hydrodynamic Radii of PPI Dendrimers"
Advisor: Minghui Chai, Ph.D.

Research Interests

- Structure/function relationship analysis of functional nanomaterials
- Synchrotron X-ray characterization techniques/modeling
- Bio-enabled nanotechnology for emergent materials
- Catalysis and electrocatalysis
- Nanostructured materials for clean energy and sustainability

Publications

Peer-Reviewed Papers (* denotes corresponding author), current H-index of 20 (Google Scholar)

1. R. Daiyan, E. C. Lovell, B. Huang, M. Zubair, J. Leverett, Q. Zhang, S. Lim, J. Horlyck, J. Tang, X. Lu, K. Kalantar-Zadeh, J. N. Hart, N. M. Bedford,* R. Amal,* "Uncovering

Atomic-Scale Stability and Reactivity in Engineered Zinc Oxide Electrocatalysts for Controllable Syngas Production”, *Adv. Ener. Mater.* **2020** DOI:10.1002/aenm.202001381

- Z. Ma, C. Tsounis, P. V. Kumar, Z. Han, R. J. Wong, C. Y. Toe, S. Zhou, N. M. Bedford, L. Thomsen, Y. H. Ng, R. Amal,* “Enhanced Electrochemical CO₂ Reduction of Cu@Cu_xO Nanoparticles Decorated on 3D Vertical Graphene with Intrinsic sp³-type Defect”, *Adv. Funct. Mater.* **2020**, 30, 1910118.
- M. Griep, N. M. Bedford,* “Amino-acid conjugated protein-Au nanoclusters with tuneable fluorescence properties”, *J. Phys. Mater.* **2020**, DOI: 10.1088/2515-7639/ab8d90 (Part of a Special Issue on Emerging Leaders 2020)
- M. J. Young,* N. M. Bedford, A. Yanguas-Gil, S. Letourneau, M. Colie, D. J. Mandia, B. Aoun, A. S. Covanagh, S. M. George, J. W. Elam,* “Probing the Atomic-Scale Structure of Amorphous Aluminum Oxide Grown by Atomic Layer Deposition”, *ACS Appl. Mater. Interfaces* **2020**, 12, 22804.
- J. Veliscek-Carolan,* A. Rawal, D. T. Oldfield, G. J. Thorogood, N. M. Bedford, “Nanoporous Zirconium Phosphonate Materials with Enhanced Chemical and Thermal Stability for Sorbent Applications”, *ACS Appl. Nano Mater.* **2020**, 3, 3717.
- C. Hu, L. Gong, Y. Xiao, Y. Yuan, N. M. Bedford, Z. Xia, L. Ma, T. Wu, J. Lu, Y. Lin, J. W. Connell, L. Dai,* “High-Performance, Long-Life Rechargeable Li-CO₂ Batteries based on a 3D Holey Graphene Cathode Implanted with Iron Single Atoms”, *Adv. Mater.* **2020**, 32, 1907436.
- I. Kuschnerus, M. Lau, K. Giri, N. M. Bedford, J. Biazik-Richmond, J. Ruan, A. Garcia-Bennett,* “Effect of a Soft Protein Corona on the Fibrinogen Induced Cellular Oxidative Stress of Gold Nanoparticles”, *Nanoscale*, **2020**, 12, 5898.
- R. Daiyan, R. Chen, P. Kumar, N. M. Bedford, J. Qu, J. Cairney, X. Lu, R. Amal,* “Tuneable Syngas Production through CO₂ Electroreduction on Cobalt-Carbon Composite Electrocatalyst”, *ACS Appl. Mater. Interfaces*, **2020**, 12, 9307
- H-S. Chen, T. M. Benedetti, V. R. Goncales, N. M. Bedford, R. W. J. Scott, R. F. Webster, S. Cheong, J. J. Gooding,* R. D. Tilley,* “Preserving the Exposed Facets of Pt₃Sn Intermetallic Nanocubes During an Order to Disorder Transition Allows the Elucidation of the Effect of the Degree of Alloy Ordering on Electrocatalysis”, *J. Amer. Chem. Soc.* **2020**, 142, 3231.
- F. G. Baddour,* E. J. Roberts, A. To, L. Wang, S. E. Habas, D. A. Ruddy, N. M. Bedford, J. Wright, C. P. Nash, J. A. Schaidle, R. L. Brutchey,* N. Malmstadt,* “An Exceptionally Mild and Scalable Solution-Phase Synthesis of Molybdenum Carbide Nanoparticles for Thermocatalytic CO₂ Hydrogenation”, *J. Amer. Chem. Soc.* **2020**, 142, 1010.
- K. I. Hunter,* N. M. Bedford, K. Schramke, U. R. Kortshagen,* “Structural Characterization of Doped Silicon Nanocrystals by Reverse Monte Carlo Simulations”, *Nano Lett.* **2020**, 20, 852.
- J. M. Slocik, P. B. Dennis, A. O. Govorov, N. M. Bedford, Y. Ren, R. R. Naik* “Chiral Restructuring of Peptide Enantiomers on Gold Nanomaterials”, *ACS Biomater. Sci Eng.* **2019**, DOI:10.1021/acsbiomaterials.9b00933
- A. Walker,* M. Vratsanos, S. Kozawa, T. Askew, K. Hemmendinger, B. McGrail, N. M. Bedford, G. Wnek “Enhanced elasticity in poly (acrylic acid) gels via synthesis in the presence of high concentrations of select salts”, *Soft Matt.* **2019**, 15, 7596.

14. L. Torres Jr., J. L. Daristotle, O. B. Ayyub, B. M. Bellato-Meinhardt, H. Garimella, A. Margaronis, S. Seifert, N. M. Bedford, T. J. Woehl, P. Kofinas,* “Structurally Colored Protease Responsive Nanoparticle Hydrogels with Degradation-Directed Assembly”, *Nanoscale* **2019**, *11*, 17904.
15. J. Horlyck, A. Nashira, E. Lovell, R. Daiyan, N. M. Bedford, Y. Wei, R. Amal, J. Scott,* “Plasma treating mixed metal oxides to improve oxidative performance via defect generation”, *Materials* **2019**, *12*, 2756.
16. Y. Cui, K. Xiao, N. M. Bedford, X. Lu, J. Yun, R. Amal, D.-W. Wang,* “Refilling Nitrogen to Oxygen Vacancies in Ultrafine Tungsten Oxide Clusters for Superior Lithium Storage”, *Adv. Ener. Mater.* **2019**, *9*, 1902148.
17. J. Horlyck, S. Pokhrel, E. Lovell, N. M. Bedford, L. Mädler,* R. Amal, J. Scott,* “Unifying Double Flame Spray Pyrolysis with Lanthanum Doping to Restrict Cobalt-Aluminate Formation in Co/Al₂O₃ Catalysts for the Dry Reforming of Methane”, *Catal. Sci. Techn.* **2019**, *9*, 4970.
18. Q. Zhang, N. M. Bedford, J. Pan, X. Lu,* R. Amal,* “A Fully Reversible Water Electrolyzer Cell Made Up from FeCoNi (Oxy)hydroxide Atomic Layers”, *Adv. Ener. Mater.* **2019**, *9*, 1901312.
19. R. Daiyan, E. C. Lovell, N. M. Bedford, W. H. Saputera, K.-S. Wu, S. Lim, J. Horlyck, Y. H. Ng, X. Lu,* R. Amal,* “Modulating Activity through Defect Engineering of Tin Oxides for Electrochemical CO₂ Reduction”, *Adv. Sci.* **2019**, *6*, 1900678.
20. X. Li, H. Almkhelfe, N. M. Bedford, T. C. Back, K. L. Hohn, P. B. Amama,* “Characterization and Catalytic Behavior of Fischer-Tropsch Catalysts Derived from Different Cobalt Precursors”, *Catal. Today* **2019**, *338*, 40.
21. Y. Cui, J. C. Rushing, S. Seifert, N. M. Bedford, D. G. Kuroda,* “The Molecularly Heterogeneous Structure of a Non-Ionic Deep Eutectic Solvent Composed of N-Methylacetamide and Lauric Acid”, *J. Phys. Chem B* **2019**, *123*, 3984.
22. J. Liu, Z. Li, X. Zhang, K. Otake, L. Zhang, A. W. Peters, M. J. Young, N. M. Bedford, S. P. Letourneau, D. J. Mandia, J. W. Elam, O. K. Farha,* J. T. Hupp,* “Introducing Nonstructural Ligands to Zirconia-like MOF Nodes to Tune the Activity of Node-Supported Nickel Catalysts for Ethylene Hydrogenation”, *ACS Catal.* **2019**, *9*, 3198.
23. W. H. Saputera, H. A. Tahini, M. Sabsabi, T. H. Tan, N. M. Bedford, E. Lovell, Y. Cui, J. N. Hart, D. Friedmann, S. C. Smith, R. Amal,* J. Scott,* “Light Induced Synergistic Defects on TiO₂/SiO₂ Composites for Oxygen Activation”, *ACS Catal.* **2019**, *9*, 2674.
24. M. J. Young,* ,T. Kiryutina, N. M. Bedford,* T. J. Woehl, C. S. Segre, “Discovery of Anion Insertion Electrochemistry in Layered Hydroxide Nanomaterials”, *Sci. Reports* **2019**, *9*, 2462.
25. K. Wang, W. Wu, Z. Tang,* L. Li, S. Chen, N. M. Bedford,* “Hierarchically Structured Co(OH)₂/CoPt/N-CN Air Cathodes for Rechargeable Zinc-Air Batteries”, *ACS Appl. Mater. Interfaces* **2019**, *11*, 4983.
26. X. Han, M. Wang, M. L. Le, N. M. Bedford, T. J. Woehl, V. S. Thoi,* “Effects of Substrate Porosity in Carbon Aerogel Supported Copper for Electrocatalytic Carbon Dioxide Reduction”, *Electrochim. Acta* **2019**, *297*, 545.
27. L. M. Rueschhoff, L. A. Baldwin, R. Wheeler, M. J. Dalton, H. Koerner, J. D. Berrigan, N. M. Bedford, S. Seifert, M. K. Cinibulk, M. B. Dickerson,* “Fabricating Ceramic Nanostructures

with Ductile-Like Compression Behavior via Rapid Self-Assembly of Block Copolymer and Pre ceramic Polymer Blends”, *ACS Appl. Nano Mater.* **2019**, *2*, 250.

28. M. K. Gupta, K. A. Becknell, M. G. Crosby, N. M. Bedford, J. Wright, P. B. Dennis,* R. R. Naik,* “Programmable Mechanical Properties from a Worm Jaw-Derived Biopolymer through Hierarchical Ion Exposure”, *ACS Appl. Mater. Interfaces* **2018**, *10*, 31928.
29. S. Letourneau, M. J. Young, N. M. Bedford, Y. Ren, A. Yanguas-Gil, A. U. Mane, J. W. Elam, E. Graugnard,* “Structural evolution of molybdenum disulfide prepared by atomic layer deposition for realization of large scale films”, *ACS Appl. Nano Mater.* **2018**, *1*, 4028.
30. A. Baumann, G. Aversa, A. Roy, N. M. Bedford, M. Falk, V. S. Thoi,* “Probing Sulfur Interactions in Cu-based Metal Organic Frameworks for Lithium Sulfur Batteries”, *J. Mater. Chem. A* **2018**, *6*, 4811.
31. A. E. Garcia-Bennett,* M. Lau, N. M. Bedford, “Probing the amorphous state of pharmaceutical compounds within mesoporous material”, *J. Pharma. Sci.* **2018**, *107*, 2216.
32. H. Ramezani-Dakhel, N. M. Bedford, T. J. Woehl, M. Knecht, R. R. Naik, H. Heinz,* “Nature of peptide wrapping onto metal nanoparticle catalysts and driving forces for size control”, *Nanoscale* **2017**, *9*, 8401.
33. M. J. Young,* N. M. Bedford,* N. Jiang, D. Lin, L. Dai, “In-situ Electrochemical High-Energy X-Ray Diffraction Using a Capillary Working Electrode Cell Geometry”, *J. Synchrotron Rad.* **2017**, *24*, 787.
34. H. Zhang, R. Zhang, K. S. Schramke, N. M. Bedford, K. Hunter, U. R. Kortshagen, P. Nordlander,* “Doped Silicon Nanocrystal Plasmonics”, *ACS Photonics* **2017**, *4*, 963.
35. N. A. Merrill, T. T. Nitka, E. M. McKee, K. C. Merino, L. F. Drummy, S. Lee, B. Reinhart, Y. Ren, C. J. Munro, S. Pylypenko, A. I. Frenkel, N. M. Bedford,* M. R. Knecht,* “Effects of Metal Composition and Ratio on Peptide-Templated Multimetallic PdPt Nanomaterials”, *ACS Appl. Mater. Interfaces* **2017**, *9*, 8030.
36. S. L. Candelaria, N. M. Bedford, T. J. Woehl, N. S. Rentz, A. R. Showalter, S. Pylypenko, B. A. Bunker, S. Lee, B. Reinhart, Y. Ren, S. P. Ertem, E. B. Coughlin, N. A. Sather, J. L. Horan, A. M. Herring, L. F. Greenlee,* “Multi-Component Fe-Ni Hydroxide Nanocatalyst for Oxygen Evolution and Methanol Oxidation Reactions under Alkaline Conditions” *ACS Catal.* **2017**, *7*, 365.
37. B. D. Briggs, J. P. Palafox-Hernandez, Y. Li, K. L. M. Drew, T. J. Woehl, N.M. Bedford, S. Seifert, M. T. Swihart, T. R. Walsh,* M. R. Knecht,* “Toward a Modular Multimaterial Nanoparticle Synthesis and Assembly Strategy via Bionanocombinatorics: Effects of Bifunctional Peptides for Au and Ag Materials” *Phys. Chem. Chem. Phys.* **2016**, *18*, 30845.
38. O. Yehezkeli, N. M. Bedford, E. Park, K. Ma, J. N. Cha,* “Semiconductor based Solar Drive Photochemical Cells for Fuel Generation from CO₂ in Aqueous Solutions”, *ChemSusChem* **2016**, *9*, 3188.
39. N. M. Bedford,* A. R. Showalter, T. J. Woehl, Z. E. Hughes, S. Lee, B. Reinhart, Y. Ren, T. R. Walsh, B. A. Bunker, “Peptide-Directed Bimetallic Nanoparticle Phase Separation: Toward Controlled Bimetallic Architecture Design for Enhanced Catalytic Materials” *ACS Nano* **2016**, *10*, 8645.
40. N.M. Bedford, C. J. Munro, M. R. Knecht,* “Peptide-Binding for Bio-Based Nanomaterials”, *Methods in Enzymology*, **2016**, *580*, 581.

41. N. M. Bedford,* Z. Hughes, Z. Tang, B. D. Briggs, Y. Ren, A. V. G. Petkov, R. R. Naik,* M. R. Knecht,* T. R. Walsh,* “Probing the Sequence-Dependent Structure/Function Relationships of Catalytic Peptide-Enabled Au Nanoparticles”, *J. Amer. Chem. Soc.* **2016**, *138*, 540
42. N. A. Merrill, E. M. McKee, K. C. Merino, L. F. Drummy, S. Lee, B. Reinhart, Y. Ren, A. I. Frenkel, R. R. Naik, N. M. Bedford,* M. R. Knecht* “Identifying the Effects of Metal Composition on the Structure and Catalytic Activity of Peptide-Templated Materials”, *ACS Nano*, **2015**, *9*, 11968.
43. B. D. Briggs†, N. M. Bedford†, S. Seifert, H. Koerner, H. Ramezani-Dakhel, H. Heinz, A. I. Frenkel, R. R. Naik,* M. R. Knecht,* “C-C Coupling of Peptide-Capped Pd Nanoparticle Progresses Through an Atom Leeching Mechanism”, *Chem. Sci* **2015**, *6*, 6413. †**Equal author contribution**
44. M. A. Nguyen, N. M. Bedford, Y. Ren, E. M. Zahran, R. C. Goodwin, F. F. Chagani, L. G. Bachas, M. R. Knecht,* “Direct Synthetic Control Over the Size, Shape, Composition, and Photocatalytic Activity of Copper Oxide Materials”, *ACS Appl. Mater. Interfaces* **2015**, *7*, 13238.
45. N. M. Bedford,* H. Ramezani-Dakhel, J. M. Slocik, B. D. Briggs, Y. Ren, A. I. Frenkel, V. G. Petkov, H. Heinz,* R. R. Naik,* M. R. Knecht,* “Elucidation of Biologically Programmed Atomic-Scale Structure of Nanoparticle Interfaces that Modulates Catalytic Activity”, *ACS Nano* **2015**, *9*, 5082. **Featured on the front cover**
46. J. D. Torrey, J. P. Killgore, N. M. Bedford, L. F. Greenlee,* “Oxidation Behavior of Zero-Valent Iron Nanoparticles in Mixed Matrix Water Purification Membranes”, *Environ. Sci. Water Res. Technol.* **2015**, *1*, 146. **Featured on the inside front cover**
47. N. M. Bedford, R. Bhandari, J. M. Slocik, S. Seifert, R. R. Naik, M. R. Knecht,* “Peptide-Modified Dendrimers as Templates for the Production of Highly Reactive Catalytic Nanomaterials”, *Chem. Mater.* **2014**, *26*, 4082.
48. E. M. Zahran, N. M. Bedford, M. A. Nguyen, Y.-J. Chang, B. S. Guiton, R. R. Naik, L. G. Bachas, M. R. Knecht,* “Light Driven Tandem Catalysis Driven by Multicomponent Nanomaterials”, *J. Amer. Chem. Soc.* **2013**, *136*, 32.
49. M. B. Dickerson, A. A. Sierra, N. M. Bedford, W. Lyon, W. E. Gruner, P. A. Mirau, R. R. Naik,* “Keratin-Based Antimicrobial Textiles, Films, and Nanofibers”, *J. Mater. Chem. B* **2013**, *1* 5505.
50. R. Bhandari, D. B. Pacardo, N. M. Bedford, R. R. Naik, M. R. Knecht,* “Peptide Templated Metallic Nanoparticles for Catalytic Allyl Alcohol Hydrogenation”, *J. Phys. Chem. C*, **2013**, *117*, 18053.
51. R. Coppage, J. M. Slocik, H. Ramezani-Dakhel, N. M. Bedford, R. R. Naik, M. R. Knecht,* “Exploiting Localized Surface Binding Effects to Enhance the Catalytic Reactivity of Peptide-Capped Nanoparticles”, *J. Amer. Chem. Soc.* **2013**, *135*, 11048.
52. N. M. Bedford, M. Pelaez, C. Han, D. D. Dionysiou, A. J. Steckl,* “Photocatalytic cellulosic electrospun fibers for the degradation of potent cyanobacteria toxin microcystin-LR”, *J. Mater. Chem.* **2012**, *22*, 12666. **Published as HOT Article by RSC**
53. N. M. Bedford, M. B. Dickerson, L. F. Drummy, H. Koerner, K. M. Singh, M. C. Vasudev, M. F. Durstock, R. R. Naik,* A. J. Steckl,* “Nanofiber-Based Bulk-Heterojunction Organic Solar Cells Using Coaxial Electrospinning”, *Adv. Ener. Mater.* **2012**, *2*, 1136.

54. D. Shi,* N. M. Bedford, H. S. Cho, "Engineered Multifunctional Nanocarriers for Cancer Diagnosis and Therapeutics", *Small* **2011**, 7, 2549.
55. N. M. Bedford, G. D. Winget, S. Punnamaraju, A. J. Steckl,* "Immobilization of Stable Thylakoid Vesicles in Conductive Nanofibers by Electrospinning", *Biomacromolecules* **2011** 12, 778.
56. N. M. Bedford, A. J. Steckl,* "Photocatalytic Self Cleaning Textile Fibers by Coaxial Electrospinning", *ACS Appl. Mater. & Interfaces* **2010**, 2, 2448.
57. N. M. Bedford,* "Analysis of 3D structures of platinum nanoparticles by high energy X-ray diffraction and reverse Monte Carlo simulations", *Solid State Comm.* **2010**, 150, 1505.
58. V. Petkov,* N. Bedford, M. R. Knecht, M. G. Weir, R. M. Crooks, W. Tang, G. Henkelman, and A. Frenkel, "Periodicity and Atomic Ordering in Nanosized Particles of Crystals", *J. Phys. Chem. C* **2008**, 122, 8907.
59. N. Bedford, C. Dablemont, G. Viau, P. Chupas, and V. Petkov,* "3D Structure of Nanosize Catalysts by High-Energy XRD and RMC Simulations: Study of Ru", *J. of Phys. Chem. C* **2007**, 111, 18214.

Textbooks

1. D. Shi, Z. Gui, N. Bedford, "Nanomaterials and Devices" Elsevier Publishing (Oxford) **2015**.

Funding:

1. "Single Atom Catalysts and Nanoclusters Supported on Nanoscale Silicon Carbide/Nitrides for the Partial Oxidation of Methane using Tuneable Pre-ceramic Polymer Templates", Lead PI with Prof Jason Scott (UNSW), Source: ACS Petroleum Research Fund, 2020-2023, \$160,000 AUD
2. "Understanding Atomic-Scale Structure of Pre-ceramic Polymers, Intermediate Phases, and Final Ceramics: Toward Tailorable SiC-based Composites for Extreme Environments", Single PI, Source: Asian Office of Aerospace Engineering, 2020-2023, \$140,000 AUD
3. "Development of Electrocatalytic Nanoparticles for Simultaneous Biomass Upgrading and Clean Energy Production", Scientia PhD Scholarship Scheme, Single PI, Source: UNSW, 2019-2022, \$200,000 AUD
4. "A Zero-Emission All Solar-driven Tandem Biomass-to-Hydrogen Technology", Co-PI (lead PIs Profs J. Scott & Dr. D. Wang, UNSW), Source: Australian Renewable Energy Agency, 2018-2021, \$1,623,000 AUD
5. Academic Start-up Funding Scheme, Single PI, Source: UNSW: 2018-2023, \$180,000 AUD

Presentations:

Invited Conference Presentations

1. "Using Synchrotron Radiation Characterization Methods to Undercover Structural Phenomena in Reactive Nanomaterials and Interfaces", 2019 International Materials Research Congress, Cancun, Mexico in August of 2019

2. "Understanding Structure at the Biotic/Abiotic Interface: Issues in Current Characterization Methods and Future Opportunities using Soft X-ray Characterization Methods", Advanced Light Source 2018 User Meeting, Berkeley, CA, USA in October of 2018
3. "Leveraging Biological Molecules for Functional Inorganic Nanomaterials Development via Atomic-Scale Structural Characterization", 2018 International Materials Research Congress, Cancun, Mexico in August of 2018
4. "Optimization of Human-Performance Biosensors: Opportunities in RSoXS and NEXAFS to Elucidate Biomolecular Structure/Function Relationships for Future Sensor Design", 2017 NSLS-II & CFN Users' Meeting, Brookhaven National Laboratory, Upton, NY, USA in May of 2017
5. "Predictive Materials Properties through the Establishment of Bio-Inspired Rational Design Rules," United States-Australia Enabling Technologies Meeting, Sydney, NSW, Australia in May 2016
6. "Predictive Materials Properties through the Establishment of Bio-Enabled Rational Design Rules," US-Australia Enabling Technologies Meetings, Arlington, VA, USA in May 2015

Invited Seminars

1. "Discovery of Atomic-Scale Structure/Function Relationships in Nanoscale Materials using Synchrotron Radiation Characterization Methods", Department of Chemistry, Technical University of Berlin, Berlin, Germany in May of 2019
2. "Discovery of Atomic-Scale Structure/Function Relationships in Nanoscale Materials using Synchrotron Radiation Characterization Methods", Centre for Clean Environment and Energy, Griffith University, Gold Coast, QLD, Australia in May of 2019
3. "Using Synchrotron Radiation Characterization Methods to Undercover Structural Phenomena in Reactive Nanomaterials and Interfaces", Edgewood Chemical and Biological Center, US Army, Edgewood, MD, USA in March of 2019
4. "Identification of Atomic-Scale Structural Motifs Responsible for Materials Properties using Synchrotron Radiation Characterization Methods", Department of Materials Science and Engineering, Boise State University, Boise, ID, USA in November of 2018
5. "Identification of Important Atomic-Scale Structural Motifs Responsible for Materials Properties using Synchrotron Radiation Characterization Methods", Institute for Superconducting and Electronic Materials, University of Wollongong, Wollongong, NSW, Australia, in June of 2018
6. "Nanomaterials Development using Structure/Function Relationship Established by Synchrotron Radiation Characterization Techniques", Department of Chemistry and Biological Science, Macquarie University, Sydney, NSW, Australia in May of 2018
7. "Development of Structure/Function Relationships for Catalytic Nanomaterials using Atomic-Scale Synchrotron Radiation Characterization Methods", Department of Chemical Engineering, University of Toledo, Toledo, OH, USA in November of 2017
8. "Understanding Structure/Function Relationships of Nanomaterials using Atomic-Scale Synchrotron Radiation Characterization Methods", School of Mathematical and Physics Sciences, University of Technology Sydney, Sydney, NSW, Australia in October of 2017

9. "Biotic/Abiotic Interface Manipulation of Functional Nanomaterials: Toward Rational Engineering of Enhanced Materials Using Structure/Function Relationship Development", School of Chemical Engineering, University of New South Wales, Sydney, NSW Australia in August of 2017
10. "Nanocatalyst Design Using Peptide-Enabled Synthetic Routes & Atomic-Scale Structure Characterization Methods", Department of Chemical Engineering, Auburn University, Auburn, AL, USA in February of 2017
11. "Nanocatalyst Design Using Peptide-Enabled Synthetic Routes & Atomic-Scale Structure Characterization Methods", Department of Materials Science and Engineering, Boise State University, Boise, ID, USA in January of 2017
12. "Research Activities at the Materials and Manufacturing Directorate and Future Collaborative Possibilities at NSLS-II", National Synchrotron Light Source, Brookhaven National Laboratory, Upton, NY, USA in December of 2016
13. "Complete Atomic-Scale Structure Elucidation of Nanoscale Materials: Toward Rational Materials Design", Department of Materials Engineering, Auburn University, Auburn, AL, USA in December of 2016
14. "Rational Design of Nanoscale Materials Using Synchrotron Characterization Techniques", Department of Chemistry, US Naval Academy, Annapolis, MD, USA in September of 2016
15. "Atomic-Scale Structure Elucidation of Nanoscale Materials Using Synchrotron Irradiation Techniques", Institute of Frontier Materials, Deakin University, Waurn Ponds, VIC, Australia in May of 2016
16. "Atomic-Scale Structure Elucidation of Nanoscale Materials Using Synchrotron Irradiation Techniques", Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW, Australia in May of 2016
17. "Atomic-Scale Structure Elucidation of Nanoscale Materials Using Synchrotron Irradiation Techniques", Department of Chemistry, University of Sydney, Sydney, NSW, Australia in May of 2016
18. "Complete Atomic-Scale Structure Elucidation of Nanoscale Materials Using Synchrotron Radiation Characterization Methods: Toward Rational Materials Design", Department of Chemistry, University of New Orleans, New Orleans, LA, USA in April of 2016
19. "Complete Atomic-Scale Structure Elucidation of Nanoscale Materials Using Synchrotron Radiation Characterization Methods: Toward Rational Materials Design", Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland, OH, USA in March of 2016
20. "Using Advanced Atomic-Scale Structural Characterization Methods with Bio-Inspired Synthesis Routes for the Generation of Highly Active Nanocatalysts", Department of Chemistry, Johns Hopkins University, Baltimore, MD, USA in January of 2016
21. "Understanding Atomic-Scale Structure/Function Relationships of Peptide-Enabled Nanomaterials: Toward Bio-Inspired Optimization of Materials Properties", NIST Center for Neutron Research, Gaithersburg, MD, USA in January of 2016
22. "Peptide-Enabled Nanomaterials with Optimized Properties via Atomic-Scale Structural Characterization of the Biotic/Abiotic Interface", Advanced Photon Source User Seminar, Argonne National Laboratory, IL, USA in August of 2015

23. "Peptide-Enabled Nanomaterials with Optimized Properties via Atomic-Scale Structural Characterization of the Biotic/Abiotic Interface," Department of Chemical Engineering, University of Arkansas, AR, USA in June of 2015.
24. "Using High-Energy Synchrotron-Based Methods to Uncover Tunable Properties of Peptide-Enabled Nanomaterials," Department of Chemical Engineering, Kansas State University, Manhattan, KS, USA in April of 2015.
25. "Using Bio-Inspired Synthesis Methods to Understand Structure/Function Relationships for Catalytic Nanoparticles," Department of Chemistry, Central Michigan University, Mount Pleasant, MI, USA in February of 2015.
26. "Exploiting Biology to Achieve Rationally-Designed Nanomaterials with Optimized/User Defined Properties," Applied Chemical and Materials Division, National Institute of Standards and Technology, Boulder, CO, USA in December of 2014.

Scientific Conferences

1. "Using in-situ Synchrotron Characterization Methods to Understand Structure/Function Relationships for Catalytic Nanomaterials," American Institute of Chemical Engineers Annual Meeting, Orlando, FL, USA in November 2019.
2. "In-situ Atomic Scale Structure Elucidation of Nanocatalyst under Electrochemical Conditions using XAS and PDF Analysis," European Materials Research Society Spring Meeting, Nice, USA in May 2019.
3. "Leveraging Biology for Functional Inorganic Nanomaterials Development," American Institute of Chemical Engineers Annual Meeting, Pittsburgh, PA, USA in October 2018.
4. "Development of Sequence-Dependent Structure/Function Relationships for Peptide-Enabled Nanomaterials," American Chemical National Society Meeting, New Orleans, LA, USA in March 2018.
5. "Elucidating Morphology and Orientation of Biomolecules on 2D Nanomaterials for Real-Time Flexible FET Biosensors," Materials Research Society Fall Meeting, Boston, MA, USA in November/December 2017
6. "Disordered Mixed Metal Oxide Nanocatalysts for the Oxygen Evolution Reaction Using Bio-enabled Synthetic Routes," Materials Research Society Fall Meeting, Boston, MA, USA in November/December 2017
7. "Manipulation of Bimetallic Nanoparticle Surfaces through Peptide-Enabled Synthetic Strategies," Materials Research Society Fall Meeting, Boston, MA, USA in November/December 2017
8. "Elucidation of Sequence-Dependent Structure/Function Relationships for Bio-Enabled Nanoparticles," Denver X-Ray Conference, Westminster, CO, USA in August 2015
9. "Sequence-Dependent Structure/Function Elucidation of Peptide-Enabled Nanoparticles Using a Combined Experimental/Computational Approach," Materials Research Society Spring Meeting, San Francisco, CA, USA in April 2015
10. "Sequence-Dependent Structure/Function Elucidation of Peptide-Enabled Nanoparticles Using a Combined Experimental/Computational Approach," American Chemical Society National Meeting, Denver, CO, USA in March 2015

11. "Non-Platinum Group Metal Bimetallic Electrocatalyst for Alternative Fuel Oxidation and Ammonia Production," American Chemical Society National Meeting, Denver, CO, USA in March 2015
12. "Structure/Function Analysis of Peptide-Capped Pd Nanoparticles Using High-Energy X-Ray Characterization Techniques," Materials Research Society Fall Meeting, Boston, MA, USA in December of 2013.
13. "Pd Nanomaterials Templated by R5-PAMAM Dendrimer Conjugates," American Chemical Society National Meeting, New Orleans, LA, USA in April of 2013.
14. "Photocatalytic Textile Fibers by Coaxial Electrospinning," Materials Research Society Fall Meeting, Boston, MA, USA in December of 2009.
15. "Electrospun Biopolymer-Based Micro/Nanofibers," University Government Industry Micro/Nano Symposium, Louisville, KY, USA in July of 2008.

Poster Presentations

1. "Elucidation of Atomic-Scale Structure/Function Relationships: Toward Predictive and Rational Design of Nanoscale Materials," AIChE Annual Meeting, San Francisco, CA, USA in November 2016
2. "Elucidation of Sequence-Dependent Structure/Function Relationships for Monometallic and Bimetallic Nanoparticles: Toward the Establishment of Bio-Inspired Rational Design Rules," NIST Chapter of Sigma XI, 23rd Annual Postdoc Poster Forum, Gaithersburg, MD, USA in February 2016 (**BEST POSTER, MATERIALS CATEGORY**)
3. "In-situ Structural Determination of Monometallic and Bimetallic Nanoparticles During Electrocatalysis Using High-Energy X-Ray Diffraction, Pair Distribution Function Analysis, and X-Ray Adsorption Spectroscopy," Materials Research Society Spring Meeting, San Francisco, CA, USA in April 2015
4. "Structure/Function Elucidation of Aqueous-Based Monometallic and Bimetallic Nanocatalysts," Gordon Research Conference: Nanomaterials for Applications in Energy Technologies, Ventura, CA, USA in February 2015
5. "Structure/Function Analysis of Peptide-Capped Pd Nanoparticles Using High-Energy X-Ray Characterization Techniques," International Conference on Frontiers of Polymers and Advanced Materials, Auckland, New Zealand in December of 2013.
6. "Peptide-Modified Dendrimers as Templates for the Production of Highly Reactive Catalytic Nanomaterials," Materials Research Society Fall Meeting, Boston, MA, USA in December of 2013.
7. "Detection of Microcystin-LR Using Peptide Functionalized Au Nanoparticles," Materials Research Society Spring Meeting, San Francisco, CA, USA in April of 2012.
8. "Toward Colorimetric Chemical and Biological Sensing Using Bio-Functionalized Polydiacetylenes," Chemical and Biological Defense Science and Technology Meeting, Las Vegas, NV, USA in November of 2011.
9. "Degradation of Potent Cyanobacteria Toxin Microcystin-LR Using Photocatalytic Cellulosic Electrospun Fibers," IGERT Regional Symposium, Cincinnati, OH, USA in September 2011.

10. "Fiber-Based Bulk-Heterojunction Solar Cells Using Coaxial Electrospinning," University Clean Energy Alliance of Ohio 5th Annual Conference, Columbus, OH, USA in April 2011.
11. "Toward Colorimetric Chemical and Biological Sensing Using Bio-Functionalized Polydiacetylenes," Chemical and Biological Defense Science and Technology Meeting, Orlando, FL, USA in November of 2010.
12. "Photocatalytic Cellulosic Micro/Nano-Fibers by Electrospinning," Nanofibers for the 3rd Millennium, Raleigh, NC, USA in August of 2010 (**3rd Prize overall**).
13. "Fiber-Based Bulk-Heterojunction Solar Cells Using Coaxial Electrospinning," Central Region Meeting of the American Chemical Society, Dayton, OH, USA in June of 2010.
14. "Electrospun P3HT/PCBM Fiber-Based Bulk-Heterojunction Solar Cells," Materials Research Society Spring Meeting, San Francisco, CA, USA in April of 2010.
15. "Applications of Electrospun Nano/Micro Fibers for Textiles, Optoelectronics & Biotechnology," Materials Research Society Fall Meeting, Boston, MA, USA in December of 2009 (**1st Prize, Symposium WW**).
16. "Core/Sheath Micro/Nanofibers by Coaxial Electrospinning," Ohio Innovation Summit, Dayton, OH, USA in April of 2009.
17. "Core/Sheath Micro/Nanofibers by Coaxial Electrospinning," 5th Annual Science & Engineering Expo, Cincinnati, OH, USA in March of 2009 (**Invited Poster**).
18. "Core/Sheath Micro/Nanofibers by Coaxial Electrospinning," University of Cincinnati Graduate School Poster Forum, Cincinnati, OH, USA in March of 2009 (**Best Poster Award**).
19. "3-Dimensional Structure of Metallic Nanoparticles Using High Energy X-Ray Diffraction and Reverse Monte Carlo Simulations," Materials Research Society Spring Meeting, San Francisco, CA, USA in March of 2008.
20. "3D Structure of Nanoparticles by Reverse Monte Carlo Simulation," Student Research & Creative Endeavors Exhibition, Mt. Pleasant, MI, USA in April of 2007.
21. "3D Structure of Nanoparticles by Reverse Monte Carlo Simulation," Central Michigan University's Posters at the Capitol, Lansing, MI, USA in April of 2007.
22. "Hydrodynamic Radii of PPI Dendrimers in Various Solvents," Student Research & Creative Endeavors Exhibition, Mt. Pleasant, MI, USA in April of 2006.
23. "Diffusion NMR Study of Dendrimer Encapsulation," International Dendrimer Symposium, Mt. Pleasant, MI, USA in May of 2005.

Teaching Experience

- *University of New South Wales*
 - Lecturer & Course Coordinator, Industrial Chemistry for Chemical Engineering, 2019
 - Lecturer, Advanced Thermodynamics and Separations (CEIC 3001), 2019-current
 - Lecturer, Chemical Reaction Engineering (CEIC 2005), 2018-current
 - Laboratory Supervisor, Chemical Engineering Lab A (CEIC 2007), 2018-current
- *University of Miami*
 - Instructor, Principles of Chemistry I (CHM 111), Summer Semester 2014
 - Guest lecturer, Introduction to Nanotechnology (taught by Dr. Marc Knecht), Spring Semester 2014

- *University of Cincinnati*
 - Teaching assistant, Advanced Microfabrication of Compound Semiconductor Devices (taught by Dr. Andrew Steckl), Winter Quarter 2011
 - Teaching assistant, Microfabrication of Semiconductor Devices (taught by Dr. Andrew Steckl), Fall Quarter 2010
 - Teaching assistant, Basic Heat Transfer (taught by Dr. Paul Phillips), Spring Quarter 2008
 - Teaching assistant, Soft Matter (taught by Dr. Dale Schaefer), Spring Quarter 2008
 - Teaching assistant, Intro Thermodynamics (taught by Dr. Dale Schaefer), Spring Quarter 2008
 - Teaching assistant, Diffusion and Kinetics (taught by Dr. Jainagesh Sekhar), Winter Quarter 2008
 - Head teaching assistant, Intro to Metals (taught by Dr. Donglu Shi), Fall Quarter 2007
 - Teaching assistant, Intro to Chemical Engineering Lab (taught by Dr. Vesselin Shanov), Fall Quarter 2007
- *Central Michigan University*
 - Undergraduate Laboratory Assistant, Organic Chemistry and General Chemistry, 2005-2007.

Mentorship & Management

- Supervisor – UNSW School of Chemical Engineering (2018 – current)
 - 5 current PhD candidates
 - 2 undergraduate researchers on scholarship
 - 3 current undergraduate honors thesis students
- Supervisor – NIST Sumer High School Intern Program (SHIP), 2015
- Supervisor – NIST Summer Undergraduate Research Fellowship (SURF), 2015
- Mentor – Science Research Seminar, Monarch High School (Louisville, CO), 2015-16

Professional Activities

Proposal Reviewer

- Moderator for the UNSW Scientia PhD Scheme
- Ad-hoc reviewer for Stanford Synchrotron Radiation Lightsource (SSRL) beam time proposals
- Ad-hoc reviewer for Australian Synchrotron beam time proposals
- Ad-hoc reviewer for the American Chemical Society Petroleum Research Fund (ACS PRF)
- Ad-hoc reviewer for the US Department of Energy Basic Energy Sciences (DOE-BES)
- Panel reviewer for the Catalysis and Biocatalysis program of the CBET Division at NSF (2016, 2017)

Journal Reviewer:

- *ACS Nano*
- *Journal of the American Chemical Society*
- *Chemistry of Materials*
- *ACS Energy Letters*
- *Small*
- *ACS Applied Materials and Interfaces*
- *Journal of Materials Chemistry B*
- *ChemSusChem*
- *Journal of Physical Chemistry C*

Memberships:

- American Institute of Chemical Engineers, 2017-present
- American Chemical Society, 2010-present
- Materials Research Society, 2008-present
- Vice President, Graduate Student Governance Associated (Materials Engineering Chapter), University of Cincinnati, 2008-2011
- Secretary, Graduate Student Governance Associated (Materials Engineering Chapter), University of Cincinnati, 2007-2008
- Sigma Phi Sigma (Physics Honors Society), Central Michigan University Chapter, 2007
- Treasurer, Central Michigan University Society of Physics Students, 2004-2006

Awards and Honors

- National Research Council Research Associateship, 2012-2014
- The Dayton Area Graduate Studies Institute Fellowship Award, 2009-2011
- Best Poster, Materials Category, NIST 23rd Annual Postdoc Poster Forum
- 3rd Prize Poster Award, Nanofibers for the 3rd Millennium, 2010
- 1st Prize Poster Award, Symposium WW, MRS Fall Meeting 2009
- Best in Show Award, 2009 University of Cincinnati Graduate School Poster Forum
- University Graduate Scholarship, University of Cincinnati, 2007-2008
- College of Science and Technology Summer Scholarship Award, 2006

References

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