

Nicholas M. Bedford, Ph.D.

M: +1 720 879 9250
nicholas.bedford@mines.edu
n.bedford@unsw.edu.au

Formal Education and Appointments

Department of Chemistry, Colorado School of Mines
Research Associate Professor (2024-current)

School of Chemical Engineering, University of New South Wales
Senior Lecturer (2020-current, reduced capacity in 2024)

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

US 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.

The University of Cincinnati, Cincinnati, OH
Ph.D. in Materials Science and Engineering (2007- 2012)
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

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

Current Funding:

1. "Development of Biomass Waste Electrocatalysts for Localized Green H₂ Generation and Sustainable Hydrocarbon Chemistry", Lead PI with Prof Alan Sellinger (Colorado School of Mines), Drs Jack Ferrell and Susan Habas (National Renewable Energy Laboratory), Source: Nexus, 2023, \$10,000 USD.

2. "Peptide-Directed High Entropy Nanomaterials Established via Structure/Function Relationships", Single PI, Source: Air Force Office of Scientific Research, 2023-2026, \$310,000 AUD.
3. "Thermomechanical Analysis Equipment for Advanced Polymer Derived Ceramic Materials", Lead PI with 4 academics at UNSW, Source: UNSW Research Infrastructure Scheme, 2023-2024, \$174,850 AUD
4. "Comprehensive and Versatile In-house X-ray Absorption Spectroscopy Facility", Lead PIs: Prof Christopher Ling and Dr Nicholas Bedford with 13 PIs across 4 Australian universities (UNSW/University of Sydney co-lead institutions), Source: Australian Research Council, 2023-2024, \$549,859 AUD
5. "Metal-on-Metal Single Atom Catalysts", Lead PI: Prof Richard Tilley, with Dr Martina Lessio and Prof Wolfgang Schuhmann (UNSW lead organization), Source: Australian Research Council, 2023-2026, \$441,000 AUD
6. "ARC Centre of Excellence for Carbon Science and Innovation", Lead PI: Prof Liming Dai, with 18 PIs from 8 Australian universities (UNSW lead organization), Source: Australian Research Council, 2023-2030, \$35,000,000 AUD
7. "Removing the Guesswork in Compositionally Complex Ceramics through Atomic-Scale Structural Characterization and Modelling", Single PI, Source: Air Force Office of Scientific Research, 2022-2025, \$450,000 AUD.
8. "Morphology Controlled Fabrication of Rare Earth Magnetic Materials Using Engineered Biosystems", Lead PI with Prof Richard Tilley and Dominic Glover (UNSW), Prof Yu Heng Lau (University of Sydney), and Prof Valeri Petkov (Central Michigan University) Source: Defense Advanced Research Projects Agency, 2022-2024, \$1,426,578 AUD.
9. "Functionalized Metal-Organic Frameworks for the Selective Capture and Photodegradation of Organophosphates", Lead PI with Prof Alejandro Fracaroli (Universidad Nacional Cordoba), Source: Army Research Office, 2021-2024, \$314,000 AUD
10. "Molecular Alignment at Functional Biotic/Abiotic Interfaces for Biosensing", Single PI, Source: Air Force Office of Scientific Research, 2020-2024, \$175,000 AUD
11. "Understanding Atomic-Scale Structure of Preceramic Polymers, Intermediate Phases, and Final Ceramics: Toward Tailorable SiC-based Composites for Extreme Environments", Single PI, Source: Asian Office of Aerospace Engineering, 2020-2024, \$140,000 AUD

Publications

Peer-Reviewed Papers (*denotes corresponding author), current H-index of 40 (Google Scholar)

1. Y. Yuwei, J. A. Yuwono, T. Whittaker, M. Manyé Ibáñez, B. Wang, C. Kim, A. Y. Borisevich, S. Chua, J. Pena Prada, X. Wang, P.-O. Autran, R. R. Unonic, L. Dai, A. Holewinski, N. M. Bedford* "Double Hydroxide Nanocatalysts for Urea Electrooxidation Engineered toward Environmentally Benign Products", *Adv. Mater.* **2024** DOI: 10.1002/adma.202403187
2. M. Zubair, P. M. Usov, H. Ohtsu, J. A. Yuwono, C. S. Gerke, G. D. Y. Foley, H. Hackbarth, R. F. Webster, Y. Yuwei, W. Hadinata Lie, Z. Ma, L. Thomsen, M. Kawano, N. M. Bedford* "Vacancy Mediated Electrooxidation of 5-Hydroxymethyl Furfuryl Using Defect Engineered Layered Double Hydroxide Electrocatalysts", *Adv. Ener. Mater.* **2024** DOI: 10.1002/aenm.202400676 (**Feature on the Inside Front Cover**)

3. Y. Yuwei, N. M. Bedford* “Two-Dimensional Layered Hydroxide Materials for Nucleophile Oxidation”, *ChemElectroChem* **2024** DOI: 10.1002/celec.202400101
4. V. A. Bobrin,* H. G. Hackbarth, J. O. Bonsu, Y. Yao, N. M. Bedford, D. Kunda, J. Zhang,* N. Corrigan,* C. Boyer* “Microphase Separation 3D Printing of Binary Inorganic Polymer Precursors to Prepare Nanostructured Carbon-Ceramic Multimaterials”, *Adv. Mater. Technol.* **2024** DOI: 10.1002/admt.202400337
5. L. Sun, J. A. Yuwono, S. Zhang,* B. Chen, G. Li, H. Jin, B. Johannessen, J. Mao, C. Zhang,* M. Zubair, N. M. Bedford, Z. Guo* “High Entropy Alloys Enable Durable and Efficient Lithium-Mediated CO₂ Redox Reactions”, *Adv. Mater.* **2024** DOI: 10.1002/adma.202401288
6. Q. Zhu, B. Gong, S. Huang, Y. Jin, S. Liu, S. Shao, Y. Yang, T. Cataldo, N. M. Bedford, J. C.-H. Lam “Rhombohedral ZnIn₂S₄-catalysed anodic direct electrochemical oxidative cleavage of C–O bond in α-O-4 linkages in ambient conditions”, *Green Chem.* **2024** 26, 4135. DOI: 10.1039/D4GC00338A
7. V. A. Bobrin,* H. G. Hackbarth, Y. Yao, D. Kundu, N. M. Bedford, R. P. Kuchel, J. Zhang,* N. Corrigan,* C. Boyer* “Design and 3D Printing of Polyacrylonitrile-Derived Nanostructured Carbon Architectures”, *Small Sci.* **2024** 202300275 DOI: 10.1002/smsc.202300275
8. J. Jiang, J. Peña, W. Hadinata Lie, Y. Yang, G. Thong, J. Wright, L. Thomsen, L. C. Gallington, J. A. Scott,* N. M. Bedford,* “Modulating Ce³⁺ Sites in Ce-Zr Oxide Nanocatalysts through Protamine Biomineralization for Organophosphate Dephosphorylation”, *ChemCatChem* **2024** e202300965 DOI: 10.1002/cctc.202300965
9. A. R. Poerwoprajitno, Q. Li, S. Cheong, L. Gloag, Y. Yang, B. Subhash, N. M. Bedford, J. Watt, D. L. Huber, J. J. Gooding,* W. Schuhmann,* R. D. Tilley* “Tuning the Pt–Ru Atomic Neighbors for Active and Stable Methanol Oxidation Electrocatalysis”, *Chem. Mater.* **2023**, 35, 10724. DOI: 10.1021/acs.chemmater.3c02956
10. C. S. Gerke, Y. Xu, Y. Yang, G. D. Foley, B. Zhang, E. Shi, N. M. Bedford, F. Che,* V. S. Thoi* “Electrochemical C–N Bond Formation within Boron Imidazolate Cages Featuring Single Copper Sites”, *J. Amer. Chem. Soc.* **2023**, 145, 26144. DOI: 10.1021/jacs.3c08359
11. H. G. Hackbarth, T. S. Key, B. J. Ackley, G. Opletal, A. Rawal, L. Gallington, Y. Yang, L. Thomsen, M. B. Dickerson,* T. L. Pruyn,* N. M. Bedford* “Uncovering atomic-scale polymer-to-ceramic transformations in SiC polymer derived ceramics from polycarbosilanes”, *J. Eur. Ceram. Soc.* **2024**, 44, 1932. DOI: 10.1016/j.jeurceramsoc.2023.11.014
12. B. Subhash, R. R. Unocic, W. Hadinata Lie, L. C. Gallington, J. Wright, S. Cheong, R. D. Tilley, N. M. Bedford* “Resolving Atomic-Scale Structure and Chemical Coordination in High-Entropy Alloy Electrocatalysts for Structure–Function Relationship Elucidation”, *ACS Nano* **2023**, 17, 22299 DOI: 10.1021/acsnano.3c03884
13. Q. Shen, L. Shen, L. Chen, L. Qin, Y. Liu, N. M. Bedford, F. Ciucci,* Z. Tang* “Heterointerface of all-alkynyl-protected Au₂₈ nanoclusters anchored on NiFe-LDHs boosts oxygen evolution reaction: a case to unravel ligand effect”, *Rare Met.* **2023**, 42, 4209 DOI: 10.1007/s12598-023-02438-2
14. Y. Yang, W. Hadinata Lie, R. U. Unocic, J. A. Yuwono, M. Klingenhof, T. Merzdorf, P. Wolfgang Bucheister, M. Kroschel, A. Walker, L. C. Gallington, L. Thomsen, P. V. Kumar, P. Strasser, J. A. Scott, N. M. Bedford* “Defect-Promoted Ni-Based Layer Double Hydroxides with Enhanced Deprotonation Capability for Efficient Biomass Electrooxidation”, *Adv. Mater.* **2023**, 35, 2305573 DOI: 10.1002/adma.202305573. **Featured on the Back Cover**
15. X. Li, W. Huang, A. Krajnc, Y. Yang, A. Shukla, J. Lee, M. Ghasemi, I. Martens, B. Chan, D. Appadoo, P. Chen, X. Weng, J. A. Steele, H. Hackbarth, Q. Sun, G. Mali, R. Lin, N. M. Bedford, V.

- Chen, A. K. Cheetham, L. H. G. Tizei, S. M. Collins, L. Wang, J. Hou* "Interfacial alloying between lead halide perovskite crystals and hybrid glasses", *Nat. Comm.* **2023**, *14*, 7612 DOI: 10.1038/s41467-023-43247-6
16. V. A. Bobrin, H. G. Hackbarth, Y. Yao, N. M. Bedford, J. Zhang,* N. Corrigan,* C. Boyer* "Customized Nanostructured Ceramics via Microphase Separation 3D Printing", *Adv. Sci.* **2023**, *10*, 2304734 DOI: 10.1002/advs.202304734
17. Z. Chen, N. K. Zimmerli, M. Zubair, A. V. Yakimov, S. Björgvinsdóttir, N. Alaniva, E. Willinger, A. B. Barnes, N. M. Bedford, C. Copéret, P. Florian,* P. M. Abdala,* A. Fedorov,* C. R. Müller* "Nature of GaO_x Shells Grown on Silica by Atomic Layer Deposition", *Chem. Mater.* **2023**, *35*, 7475 DOI: 10.1021/acs.chemmater.3c00923
18. N. J. LiBretto, S. A. Tacey, M. Zubair, T. V. Bui, K. A. Unocic, F. G. Baddour, M. B. Griffin, J. A. Schaidle, C. A. Farberow,* D. A. Ruddy,* N. M. Bedford,* S. E. Habas* "Compositional dependence of hydrodeoxygenation pathway selectivity for Ni_{2-x}Rh_xP nanoparticle catalysts", *J. Mater. Chem. A* **2023**, *11*, 16788 DOI: 10.1039/D3TA02071A
19. M. Zubair, H. Ou, Y. Yang, D. Oldfield, L. Thomsen, B. Subhash, J. Hamilton, J. Wright N. M. Bedford,* J. Veliscek Carolan* "Enhanced Uranium Extraction Selectivity from Seawater Using Dopant Engineered Layered Double Hydroxides", *Ener. Adv.* **2023**, *2*, 1134 DOI: 10.1039/D3YA00154G
20. M. Zubair, P. Kumar, M. Klingenhof, B. Subhash, J. A. Yuwono, S. Cheong, Y. Yao, L. Thomsen, P. Strasser, R. D. Tilley, N. M. Bedford* "Vacancy Promotion in Layered Double Hydroxide Electrocatalysts for Improved Oxygen Evolution Reaction Performance", *ACS Catal.* **2023**, *13*, 4799. DOI: 10.1021/acscatal.2c05863
21. M. S. Salman, M. Zubair, Y. Yang, N. M. Bedford, K.-F. Aguey-Zinsou* "Doping and Structure-Promoted Destabilization of NaBH₄ Nanocubes for Hydrogen Storage", *ACS Appl. Nano Mater.* **2023**, *6*, 4178. DOI: 10.1021/acsanm.2c05209
22. W. H. Lie, Y. Yang, J. A. Yuwono, C. Tsounis, M. Zubair, J. Wright, L. Thomsen, P. Kumar N. M. Bedford* "Identification of catalytic activity descriptors for selective 5-hydroxymethyl furfural electrooxidation to 2,5-furandicarboxylic acid", *J. Mater. Chem. A* **2023**, *11*, 5527. DOI: 10.1039/D2TA08306J **Featured on the Front Cover**
23. D. Sim, Z. Kuang, G. Sant'Anna, R. M. Krabacher, M. C. Brothers, J. L. Chavez, J. A. Martin, A. E. Islam, B. Maruyama, R. R. Naik, N. M. Bedford, S. S. Kim* "Rational Design of Peptide Biorecognition Elements on Carbon Nanotubes for Sensing Volatile Organic Compound", *Adv. Mater. Interface* **2022**, *10*, 2201707 DOI: 10.1002/admi.202201707
24. S. Banerjee, X. Han, M. A. Siegler, E. M. Miller, N. M. Bedford, B. C. Bukowski, V. S. Thoi* "Flexible 2D Boron Imidazolate Framework for Polysulfide Adsorption in Lithium–Sulfur Batteries", *Chem. Mater.* **2022**, *34*, 10451. DOI: 10.1021/acs.chemmater.2c02324
25. K. O. Sulaiman, M. Zubair, G. King, N. M. Bedford, R. W. J. Scott* "Taking a different road: following Ag₂₅ and Au₂₅ cluster activation via in situ differential pair distribution function analysis", *Phys. Chem. Chem. Phys.* **2022**, *24*, 24834 DOI: 10.1039/D2CP02682A
26. E. des Ligneris, A. Merenda, X. Chen, J. Wang, B. Johannessen, N. M. Bedford, D. L. Callahan, L. F. Dumeé, L. Kong* "In Situ Growth of Cu/CuO/Cu₂O Nanocrystals within Hybrid Nanofibers for Adsorptive Arsenic Removal", *ACS Appl Nano Mater.* **2022**, *5*, 14437. DOI: 10.1021/acsanm.2c02776
27. Y. Zou, S. A. Kazemi, G. Shi, J. Liu, Y. Yang, N. M. Bedford, K. Fan, Y. Xu, H. Fu, M. Dong, M. Al-Mamun, Y. L. Zhong, H. Yin,* Y. Wang, P. Liu,* H. Zhao* "Ruthenium single-atom modulated Ti₃C₂T_x

MXene for efficient alkaline electrocatalytic hydrogen production”, *EcoMat* **2022**, e12274 DOI: 10.1002/eom.2.12274

28. S. Banerjee, J. M. Gorham, P. Beccar-Varela, H. G. Hackbarth, M. A. Siegler, N. Drichko, J. T. Wright, N. M. Bedford,* V. S. Thoi* “Atomically Dispersed CuN_x Sites from Thermal Activation of Boron Imidazolate Cages for Electrocatalytic Methane Generation”, *ACS Appl. Ener. Mater.* **2023**, *6*, 18, 9044. DOI: 10.1021/acsaem.2c01174
29. J. Jiang, B. Huang, R. Daiyan, B. Subhash, C. Tsounis, Z. Ma, C. Han, Y. Zhao, L. H. Effendi, L. C. Gallington, J. M. Hart, J. A. Scott,* N. M. Bedford* “Defective Sn-Zn perovskites through bio-directed routes for modulating CO₂RR”, *Nano Ener.* **2022**, *101*, 107593 DOI: 10.1016/j.nanoen.2022.107593
30. C. Tsounis, B. Subhash, P. V. Kumar, N. M. Bedford, Y. Zhao, J. Shenoy, Z. Ma, D. Zhang, C. Y. Toe, S. Cheong, R. D. Tilley, X. Lu, L. Dai, Z. Han,* R. Amal* “Pt Single Atom Electrocatalysts at Graphene Edges for Efficient Alkaline Hydrogen Evolution”, *Adv. Funct. Mater.* **2022**, *32*, 2203067 DOI: 10.1002/adfm.202203067
31. M. S. Salman, Y. Yang, M. Zubair N. M. Bedford, K.-F. Auguey-Zinsou* “Core-shell NaBH₄@Ni Nanoarchitectures: A Platform for Tunable Hydrogen Storage”, *ChemSusChem* **2022**, *15*, e202200664 DOI: 10.1002/cssc.202200664
32. H. Fu, J. Liu, N. M. Bedford, Y. Wang, J. W. Sun, Y. Zou, M. Dong, J. Wright, H. Diao, P. Liu,* H. G. Yang, H. Zhao* “Synergistic Cr₂O₃@Ag Heterostructure Enhanced Electrocatalytic CO₂ Reduction to CO”, *Adv. Mater.* **2022**, *34*, 2202854 DOI: 10.1002/adma.202202854
33. H. Fu, J. Liu, N. M. Bedford, Y. Wang, J. Wright, P. F. Liu, Ch. F. Wen, L. Wang, H. Yin, D. Qi, P. Liu,* H. G. Yang, H. Zhao* “Operando Converting BiOCl into Bi₂O₂(CO₃)_xCl_y for Efficient Electrocatalytic Reduction of Carbon Dioxide to Formate”, *Nano-Micro Lett.* **2022**, *14*, 121 DOI: 10.1007/s40820-022-00862-0
34. L. Zong, F. Lu, W. Zhang, K. Fan, X. Chen, B. Johannessen, D. Qi, N. M. Bedford, M. Warren, C. U. Segre, P. Liu,* L. Wang,* H. Zhao* “Atomically-dispersed Mn-(N-C₂)₂(O-C₂)₂ sites on carbon for efficient oxygen reduction reaction”, *Ener. Storage Mater.* **2022**, *49*, 209 DOI: 10.1016/j.ensm.2022.04.016
35. Z. Ma, C. Tsounis, C. Y. Toe, P. V. Kumar, B. Subhash, S. Xi, H. Y. Yang, S. Zhou, Z. Lin, K.-H. Wu, R. J. Wong, L. Thomsen, N. M. Bedford, X. Lu, Y. H. Ng, Z. Han,* R. Amal* “Reconstructing Cu Nanoparticle Supported on Vertical Graphene Surfaces via Electrochemical Treatment to Tune the Selectivity of CO₂ Reduction toward Valuable Products”, *ACS Catal.* **2022**, *12*, 4792. DOI: 10.1021/acscatal.1c05431
36. A. R. Poerwoprajitno, L. Gloag, J. Watt, S. Cheong, X. Tan, H. Lei, H. A. Tahini, A. Henson, B. Subhash, N. M. Bedford, B. K. Miller, P. B. O’Mara, T. M. Benedetti, D. L. Huber, W. Zhang, S. C. Smith,* J. J. Gooding,* W. Schuhmann,* R. Tilley* “A single-Pt-atom-on-Ru-nanoparticle electrocatalyst for CO-resilient methanol oxidation”, *Nat. Catal.* **2022**, *5*, 231. DOI: 10.1038/s41929-022-00756-9
37. I. Kuschnerus, K. Giri, J. Ruan, Y. Huang, N. M. Bedford, A. Garcia-Bennett* “On the growth of the soft and hard protein corona of mesoporous silica particles with varying morphology”, *J. Colloid Interface Sci* **2022**, *612*, 467. DOI: 10.1016/j.jcis.2021.12.161
38. E. C. Lovell,* J. Scott,* N. M. Bedford, T. H. Tan, P. J. Cullen, K. K. Ostrikov R. Amal “Two Steps Back, One Leap Forward: Synergistic Energy Conversion in Plasmonic and Plasma Catalysis”, *ACS Ener. Lett* **2022**, *7*, 300 DOI: 10.1021/acsenerylett.1c02387

39. D. Zhang, C. Tsounis, Z. Ma, D. Djaidiguna, N. M. Bedford, L. Thomsen, X. Lu, D. Chu, R. Amal, Z. Han* “Highly Selective Metal-Free Electrochemical Production of Hydrogen Peroxide on Functionalized Vertical Graphene Edges”, *Small* **2021**, *18*, 2105082 DOI: 10.1002/sml.202105082
40. Y. Cui, J. C. Rushing, S. Seifert, N. M. Bedford, D. G. Kuroda* “Structural and dynamical changes observed when transitioning from an ionic liquid to a deep eutectic solvent”, *J. Chem. Phys.* **2021**, *155*, 054507 DOI: 10.1063/5.0053448
41. J. Jiang, C. Tsounis, L. C. Gallington, Y. Hu, R. W. J. Scott, J. A. Scott,* N. M. Bedford,* “Disordered TiO_x-SiO_x Nanocatalysts using Bioinspired Synthetic Routes”, *ACS Appl. Ener. Mater.* **2021**, *4*, 7691. DOI: 10.1021/acsaem.1c01025 **Supplemental Cover Article**
42. P. Ellersdorfer, T. C. Peterson,* G. Opletal,* N. M. Bedford,* “Extracting nanoscale structures from experimental and synthetic data with reverse Monte Carlo”, *Nano Futures* **2021**, *5*, 022502. DOI: 10.1088/2399-1984/ac087b
43. W. H. Lie, C. Deng, Y. Yang, C. Tsounis, K.-H. Wu, M. V. Chandra-Hioe, N. M. Bedford,* D. Wang,* “High yield electrooxidation of 5-Hydroxymethyl furfural catalysed by unsaturated metal sites in CoFe Prussian Blue Analogue Films”, *Green Chem.* **2021**, *23*, 4333. DOI: 10.1039/D1GC01208H
44. K. Wang, J. Liu, Z. Tang,* L. Li, M. Zubair, F. Ciucci,* L. Thomsen, J. Wright, N. M. Bedford,* “Establishing Structure/Property Relationships in Atomically Dispersed Co-Fe Dual Sites M-N_x Catalysts on Microporous Carbon for Oxygen Reduction Reaction”, *J. Mater. Chem. A* **2021**, *9*, 13044 DOI: 10.1039/D1TA02925H (Part of HOT Papers collection)
45. Q. Zhang, P. Kumar, X. Zhu, R. Daiyan, N. M. Bedford, K.-H. Wu, Z. Han, T. Zhang, R. Amal,* X. Lu* “Electronically Modified Atomic Sites Within a Multicomponent Co/Cu Composite for Efficient Oxygen Electroreduction”, *Adv. Ener. Mater.* **2021**, *11*, 2100303 DOI: 10.1002/aenm.202100303 **Featured on the back cover.**
46. M. H. Griep, M. S. Sellers, B. Subhash, A. M. Fakner, A L. West, N. M. Bedford,* “Towards the identification of the gold binding region within trypsin stabilized nanoclusters using microwave synthesis routes”, *Nanoscale* **2021**, *13*, 1061 DOI: 10.1039/D0NR07068H (Part of a Special Collection on Nanoscale Emerging Investigators 2021 & Editor’s Choice: Single-atom and nanocluster catalysis).
47. H. Iranmanesh, B. Subhash, D. J. Glover,* N. M. Bedford,* “Proteins and peptides for functional nanomaterials: Current efforts and new opportunities”, *MRS Bulletin* **2020**, *45*, 1005. DOI: 10.1557/mrs.2020.299
48. T. Zurrer, K. Wong, J. Horlyck, E. C. Lovell, J. Wright, N. M. Bedford, Z. Han, K. Liang, J. Scott,* R. Amal* “Mixed-Metal MOF-74 Templated Catalysts for Efficient Carbon Dioxide Capture and Methanation”, *Adv. Funct. Mater.* **2021**, *31*, 2007624. DOI: 10.1002/adfm.202007624
49. T. H Tan, B. Xie, Y. H. Ng, S. F. Binti Abdullah, H. Y. M. Tang, N. M. Bedford, R. A. Taylor, K.-F. Aguey-Zinsou, R. Amal, J. Scott* “Unlocking the Potential of the Formate Pathway in the Photo-assisted Sabatier Reaction”, *Nat. Catal.* **2020**, *3*, 1034. DOI: 10.1038/s41929-020-00544-3
50. Y. Cui, X. Tan, K. Xiao, S. Zhao, N. M. Bedford, Y. Liu, Z. Wang, K.-H. Wu, J. Pan, W. H. Saputera, S. Cheong, R. D. Tilley, S. C. Smith, J. Yun, L. Dai, R. Amal,* D.-W. Wang* “Tungsten Oxide/Carbide Surface Heterojunction Catalyst with High Hydrogen Evolution Activity”, *ACS Ener. Lett.* **2020**, *5*, 3560. DOI: 10.1021/acseenergylett.0c01858
51. X. Han, C. S. Gerke, S. Banerjee, M. Zubair, J. Jiang, N. M. Bedford, E. M. Miller, V. S. Thoi* “Strategic Design of MoO₂ Nanoparticles Supported by Carbon Nanowires for Enhanced

- Electrocatalytic Nitrogen Reduction”, *ACS Ener. Lett.* **2020**, *5*, 3237. DOI: 10.1021/acsenerylett.0c01857
52. J. J. Bowen, L. M. Rueschhoff, K. L. Matrin, D. P. Street, T. A. Patel, M. J. S. Parvulescu, N. M. Bedford, H. Koerner, S. Seifert, M. B. Dickerson* “Tailorable Micelle Morphology in Self-Assembling Block Copolymer Gels for Templating Nanoporous Ceramics”, *Macromolecules* **2020**, *53*, 7528. DOI: 10.1021/acs.macromol.0c01137
53. Q. Zhang, X. Tan, N. M. Bedford, Z. Han, L. Thomsen, S. Smith, R. Amal,* X. Lu* “Direct insights into the role of epoxy groups on cobalt sites for acidic H₂O₂ production”, *Nat. Comm.* **2020**, *11*, 4181. DOI: s41467-020-17782-5
54. C. Tsounis, X. Lu, N. M. Bedford,* B. Subhash, L. Thomsen, Q. Zhang, Z. Ma, K. Ostrikov, A. Bendavid, J. A. Scott, R. Amal, Z. Han* “Valence Alignment of Mixed Ni–Fe Hydroxide Electrocatalysts through Preferential Templating on Graphene Edges for Enhanced Oxygen Evolution”, *ACS Nano* **2020**, *14*, 11327. DOI: 10.1021/acsnano.0c03380
55. 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**, *10*, 2001381. DOI: 10.1002/aenm.202001381
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Textbooks

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

Previous Funding:

1. Development of Electrocatalytic Nanoparticles for Simultaneous Biomass Upgrading and Clean Energy Production”, Scientia PhD Scholarship Scheme, Single PI, Source: UNSW, 2019-2023, \$200,000 AUD
2. Academic Start-up Funding Scheme, Single PI, Source: UNSW: 2018-2023, \$180,000 AUD
3. “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

Presentations:

Invited Conference Presentations

1. “Biomass Electro-Conversion Reactions using Engineered Nanocatalysts”, ACS National Spring Meeting, New Orleans, LA in March of 2024
2. “Revealing Structure-Function Relationships in High Entropy Alloy Electrocatalysts”, ACS National Spring Meeting, New Orleans, LA in March of 2024
3. “Developing Advanced Ceramic Materials via Pre-ceramic Polymer Chemistry and an Enhanced Understanding of Structure-Property Relationships”, ACS National Spring Meeting, New Orleans, LA in March of 2024
4. “Developing Advanced Ceramic Materials via Pre-ceramic Polymer Chemistry and an Enhanced Understanding of Structure-Property Relationships”, 2023 International Materials Research Congress, Cancun, Mexico in August of 2023
5. “Rational Design of Nanoscale Materials for Electrocatalysis”, International Organization for Chemical Sciences in Development North/South Collaborative Workshop on Energy, Cancun, Mexico in August of 2023
6. “Understanding Processing-Structure-Property Relationships for Polymer Derived Ceramics Using Advanced Synchrotron Characterization and Modeling Techniques”, PIRE PDC MatCom-ComMat Workshop 2023, Hirschegg, Austria in June of 2023
7. “Prussian blue analogue derived metal oxides for biomass electrooxidation reactions”, ACS National Meeting Spring 2023, Indianapolis, IN, in March of 2023
8. “Probing Structure-Function Relationships in High Entropy Nanomaterials”, 2022 International Materials Research Congress, Cancun, Mexico in August of 2022
9. “Probing Structural Changes and Active Site Formation using in-situ Electrochemical XAS”, XAFS 2022, Sydney, Australia in July of 2022.
10. “Designing Functional Nanomaterials for Infield Energy Generation from a Wide Array of Water Sources”, 2021 International Materials Research Congress, Cancun, Mexico in August of 2021, symposium held virtually in August of 2021
11. “Making Sense of Atomically-Complex Nanoscale Materials by Stochastic Modeling of Pair Distribution Functions”, Denver X-ray Conference, held virtually in August of 2021
12. “Engineering Inorganic Nanoparticles with Proteins: New Possibilities for SynBio?”, CSIRO Synthetic Biology for Bio-Based Materials Symposium, held virtually in June of 2021

13. "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
14. "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
15. "Leveraging Biological Molecules for Functional Inorganic Nanomaterials Development via Atomic-Scale Structural Characterization", 2018 International Materials Research Congress, Cancun, Mexico in August of 2018
16. "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
17. "Predictive Materials Properties through the Establishment of Bio-Inspired Rational Design Rules," US-Australia Enabling Technologies Meeting, Sydney, NSW, Australia in May 2016
18. "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. "Development of Biomass Waste Electrocatalysts for Localized Green H₂ Generation and Sustainable Hydrocarbon Chemistry" Nexus Center, Colorado School of Mines, Golden, Colorado in February of 2024 (held virtually).
2. "Developing Functional Nanoscale Materials through Synchrotron Enabled Structure-Property Relationships" Institut Català de Nanociència i Nanotecnologia, Barcelona, Spain in December of 2023.
3. "Developing Functional Nanoscale Materials through the Gained Fundamental Insights from In-situ Synchrotron Characterization Methods" École Nationale Supérieure de Chimie de Montpellier, Montpellier, France in December of 2023.
4. "Catalyst Design Strategies for Biomass Electroprocessing for Sustainable Chemistries and Energy" Department of Mechanical and Process Engineering, ETH Zurich, Zurich, Switzerland in December of 2023.
5. "Establishing Design Strategies for Electrocatalytic Materials Implemented in Biomass Electrooxidation Reactions" School of Chemical Engineering, University of Adelaide, Adelaide, South Australia, Australia in September of 2023.
6. "Establishing Design Strategies for Nanoscale Materials Implemented in Biomass Electrocatalysis" Scion Research, Rotorua, New Zealand in September of 2023.
7. "Engineered Nanomaterials for Hydrocarbon Electrocatalysis: Toward Versatile Platforms for Waste-Fuel Conversion" Adelphi Laboratory Center, Army Research Laboratory, Adelphi, Maryland in August of 2023.
8. "Probing the Fundamental Processes Occurring within MOFs for the Detection and Degradation of Organophosphates" DEVCOM Chemical Biological Center, US Army Aberdeen Proving Grounds, Maryland in August of 2023.

9. "Using Advanced Synchrotron Characterization and Modeling Techniques to Understand Structure-Property Relationships of Functional Nanomaterials" Departamento de Química Orgánica, Universidad Nacional de Córdoba, Córdoba, Argentina in August of 2023.
10. "Establishing Design Strategies for Electrocatalytic Materials Implemented in Biomass Electrooxidation Reactions" Center for Nanophase Materials Science, Oak Ridge National Laboratory, Oak Ridge, Tennessee in June of 2023.
11. "Understanding Synthesis-Structure-Property Relationships for Functional Nanomaterials through Advanced Synchrotron Characterization and Modeling" Department of Chemical and Biological Engineering, University of Colorado at Boulder, Boulder, Colorado in June of 2023.
12. "Uncovering Structure/Function Relationships for Electrocatalytic Nanomaterials Implemented in Hydrocarbon Transformation Reactions Using Synchrotron Radiation Characterization Techniques" Department of Chemistry, Colorado School of Mines, Golden, Colorado in February of 2023.
13. "Understanding Structure/Function Relationships for Electrocatalytic Nanomaterials", Departamento De Óptica, Centro de Investigación Científica y de Educación Superior de Ensenada, Ensenada, Baja, Mexico in November of 2022.
14. "Understanding Structure/Function Relationships for Electrocatalytic Nanomaterials for Implementation in Biomass Reactions", ChemCatBio Consortium, National Renewable Energy Laboratory, Golden, CO in November of 2022.
15. "Understanding Structure/Function Relationships for Functional Nanomaterials using Synchrotron Radiation Characterization Methods", School of Molecular and Life Sciences, Curtin University, Perth, WA in July of 2022 (held virtually).
16. "Developing Functional Nanomaterials through Atomic-Scale Structural Elucidation", School of Materials Science and Engineering, Nanyang Technical University, Singapore in May of 2022.
17. "Elucidation of Structure/Property Relationships for Electrocatalysis Using In-situ Synchrotron Methodologies", Sensors and Electron Devices Directorate, Army Research Laboratory, Maryland, USA in May of 2022.
18. "Efforts in Rational Material Design through Synchrotron Characterization", Department of Mechanical and Process Engineering, ETH Zurich, Zurich, Switzerland, in March of 2022.
19. "Solving the "Structure/Function Relationship" Problem for Nanoscale Materials using Synchrotron Characterization Methods", Department of Mechanical and Materials Engineering, University of Cincinnati, Cincinnati, OH in February of 2022 (held virtually).
20. "Elucidating Atomic Scale Structure for Functional Nanomaterials: Toward Rational Design through Fundamental Science", School of Chemical Engineering, University of Queensland, Brisbane, QLD in April of 2021 (held virtually).
21. "Understanding Structure/Function Relationships for Catalytic Systems using In-Situ Synchrotron Techniques", Department of Biomedical, Biological, and Chemical Engineering, University of Missouri, Columbia, MO in November of 2020 (held virtually).
22. "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

23. "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
24. "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
25. "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
26. "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
27. "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
28. "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
29. "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
30. "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
31. "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
32. "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
33. "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
34. "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
35. "Rational Design of Nanoscale Materials Using Synchrotron Characterization Techniques", Department of Chemistry, US Naval Academy, Annapolis, MD, USA in September of 2016
36. "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

37. "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
38. "Atomic-Scale Structure Elucidation of Nanoscale Materials Using Synchrotron Irradiation Techniques", School of Chemistry, University of Sydney, Sydney, NSW, Australia in May of 2016
39. "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
40. "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
41. "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
42. "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
43. "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
44. "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.
45. "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.
46. "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.
47. "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. "Revealing Atomic Scale Structure in Chemically Complex Ceramics", Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications VI, Giardini Naxos, Messina Sicily, Italy in April of 2024
2. "Unlocking the vacancy mediated electrocatalytic mechanism for improved HMF conversion to FDCA using defects enriched layered double hydroxides", ACS National Meeting Spring 2023, Indianapolis, IN, in March of 2023
3. "Defect Engineered 2D Layered Double Hydroxides for Biomass Electrooxidation Reactions," Materials Research Society Spring Meeting, Honolulu, HI, USA in May 2022.

4. "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.
5. "In-situ Atomic Scale Structure Elucidation of Nanocatalyst under Electrochemical Conditions using XAS and PDF Analysis," European Materials Research Society Spring Meeting, Nice, France in May 2019.
6. "Leveraging Biology for Functional Inorganic Nanomaterials Development," American Institute of Chemical Engineers Annual Meeting, Pittsburgh, PA, USA in October 2018.
7. "Development of Sequence-Dependent Structure/Function Relationships for Peptide-Enabled Nanomaterials," American Chemical National Society Meeting, New Orleans, LA, USA in March 2018.
8. "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
9. "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
10. "Manipulation of Bimetallic Nanoparticle Surfaces through Peptide-Enabled Synthetic Strategies," Materials Research Society Fall Meeting, Boston, MA, USA in November/December 2017
11. "Elucidation of Sequence-Dependent Structure/Function Relationships for Bio-Enabled Nanoparticles," Denver X-Ray Conference, Westminster, CO, USA in August 2015
12. "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
13. "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
14. "Non-Platinum Group Metal Bimetallic Electrocatalyst for Alternative Fuel Oxidation and Ammonia Production," American Chemical Society National Meeting, Denver, CO, USA in March 2015
15. "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.
16. "Pd Nanomaterials Templated by R5-PAMAM Dendrimer Conjugates," American Chemical Society National Meeting, New Orleans, LA, USA in April of 2013.
17. "Photocatalytic Textile Fibers by Coaxial Electrospinning," Materials Research Society Fall Meeting, Boston, MA, USA in December of 2009.
18. "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

- *Colorado School of Mines*
 - Instructor, Introduction to Nanoscience (CHGN311), 2024
- *University of New South Wales*
 - Lecturer & Course Coordinator, Engineering PGCW Research Skills (GSOE9011), 2021-current
 - Lecturer & Course Coordinator, Advanced Thermodynamics and Separations (CEIC 3001), 2019-2023
 - Course Coordinator, Industrial Chemistry for Chemical Engineering (CEIC 2004), 2019
 - Lecturer, Chemical Reaction Engineering (CEIC 2005), 2018-2022
 - Laboratory Supervisor, Chemical Engineering Lab A (CEIC 2007), 2018-2023
- *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)
 - Current – 2 postdocs, 6 current PhD candidates at UNSW
 - 5 PhD successfully completed, 2 postdoctoral appointments completed
 - 2 current undergraduate honors thesis students
 - 12 undergraduate honors student theses successfully completed
 - 10 undergraduate students on Vertically Aligned Program from Chemical Engineering, Civil Engineering, Materials Science, and Chemistry
- Supervisor – NIST Summer 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

Committees and Editorial Boards

- Member of the Australian Synchrotron Program Advisory Committee for the SXR beamline (2023-present)
- Editorial Board for Scientific Reports (2023-present)

Proposal Reviewer

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

Journal Reviewer (selected journals):

- *Advanced Materials*
- *Advanced Functional Materials*
- *Angewandte Chemie International Edition*
- *ACS Nano*
- *Journal of the American Chemical Society*
- *Chemistry of Materials*
- *ACS Energy Letters*

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

- Rajesh R. Naik, Ph.D.
Chief Scientist (Retired)
711th Human Performance Wing, Air Force Research Laboratory, Wright-Patterson AFB, OH 45433
rajeshnaik.phd@gmail.com
- Richard A. Vaia, Ph.D.
Chief Scientist
Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright-Patterson AFB, OH, 45433
(937) 255-9209; richard.vaia@us.af.mil
- Valeri G. Petkov, Ph.D.
Professor
Central Michigan University, Department of Physics, 1200 S. Franklin Street, Mount Pleasant, MI, 48859
(989) 774-3395; petko1vg@cmich.edu