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Aaron K. Vannucci, Ph.D.

EXPERIENCE

Assistant Professor (Aug. 2014 – Present) University of South Carolina

Postdoctoral Research Associate (Sept. 2010 – Aug. 2014) UNC Chapel Hill under Thomas J. Meyer

Research/Teaching Assistant/Associate (Aug. 2004 – Sept. 2010) The University of Arizona

EDUCATION

The University of Arizona Tucson, Arizona

- Ph.D. in chemistry May 2009.
- Advisor: Dennis L. Lichtenberger
- Dissertation Title: Computational, Spectroscopic, and Electrochemical Studies of Molybdoenzyme and Hydrogenase Active Site Inspired Complexes

The College of Wooster Wooster, Ohio

- B.A. in chemistry May 2004
- American Chemical Society certified degree

AWARDS

- Ada B. Thomas Outstanding Advisor Award (given to only one faculty member a year), University of South Carolina (2020)
- ACS Green Chemistry Institute Ignition Award (2019)
- Postdoc Research Excellence Award, UNC Chapel Hill (2013)

FUNDING

- New Hybrid Catalysts for Sustainable Cross-Coupling Reactions: Using Atomic Layer Deposition to Immobilize and Enhance Molecular Catalysts (PI) – NSF Grant No. 1954850 – 7/20 - 6/23 – \$308,669.
- A New Approach to Catalyst Immobilization Research: Designing Molecular Catalysts for Heterogeneous Catalysis (PI) – ACS Green Chemistry Institute – 9/19 - 3/20 – \$25,000
- Industrial Funding (PI) – PBI Performance Products Inc. – 5/19 - 5/21 – \$120,000
- Development of Electrolysis Processes to Electrochemically Reduce Lignin Samples to Produce a Color Stable Lignin Product (PI) – Ingevity Corp. – 1/17 - 6/17 – \$10,000
- Catalytic Carbon-Carbon Cross Coupling from a Heterogeneous Catalytic System Based on a Homogeneous Molecular Catalyst (PI) – NSF Industry/University CRC Grant No. 1464630 – 6/16 - 5/17 – \$54,000
- Development of a Photocatalytic System for the Renewable Production of Hydrogen Fuel (PI) – University of South Carolina Office of the VP of Research – 8/16 – 8/17 - \$15,000
- Catalysis for Renewables: Applications, Fundamentals and Technologies (CRAFT) (co-PI) – NSF EPSCoR RII Track-2 Grant No. 1539105 – 8/15 - 8/19 – \$4,000,000 total.

PUBLICATIONS

During Independent Career at the University of South Carolina

Bobo, M. V.; Paul, A.; Reed, J.; Ngo, T.; Arcidiacono, A. M.; Smith, M. D.; Hanson, K.; Vannucci, A. K.
“Synthesis and Characterization of bis-Cyclometalated Iridium Complexes Containing (4,4’-bis(phosphonomethyl)-2,2’-bipyridine) Ligands” *Inorg. Chem.* **2019**, 59, 6351-6358. DOI:

10.1021/acs/inorgchem.0c00456

- Yao, W.; Das, S.; DeLucia, N. A.; Boudreaux, C. M.; Qu, F.; Vannucci, A. K.; Papish, E. T. "Determining the Catalyst Properties that Lead to High Activity and Selectivity for Catalytic Hydrodeoxygenation with Ruthenium Pincer Complexes" *Organometallics*, **2020**, 39, 662-669. DOI: 10.1021/acs.organomet.9b00816
- Leith, G. A.; Rice, A. M.; Yarbrough, B. J.; Berseneva, A. A.; Ly, R. T.; Buck III, C. N.; Chusov, D.; Brandt, A. J.; Chen, D. A.; Lamm, B. W.; Stefik, M.; Stephenson, K. S.; Smith, M. D.; Vannucci, A. K.; Pellechia, P. J.; Garashchuk, S.; Shustova, N. B. "A Dual Threat: Redox Activity and Electronic Structures of Well-Defined Donor-Acceptor Fulleretic Covalent-Organic Materials" *Angew. Chem. Int. Ed.* **2020**, 59, 2-9. DOI: 10.1002/anie.201914233
- Zhu, T.; Sha, Y.; Firouzjaie, H. A.; Peng, X.; Cha, Y.; Dissanayake, D. M. M. M.; Smith, M. D.; Vannucci, A. K.; Mustain, W. E.; Tang, C. "Rational Synthesis of Metallo-Cations Toward Redox- and Alkaline-Stable Metallo-Polyelectrolytes" *J. Am. Chem. Soc.* **2020**, 142, 1083-1089 DOI: 10.1021/jacs.9b12051
- Sindt, Ammon J.; DeHaven, B. A.; Goodlett, D. W.; Hartel, J. O.; Ayare, P. J.; Du, Y.; Smith, M. D.; Mehta, A. K.; Brugh, A. M.; Forbes, M. D. E.; Bowers, C. R.; Vannucci, A. K.; Shimizu, L. S. "Guest Inclusion Modulates Concentration and Persistence of Photogenerated Radicals in Assembled Triphenylamine Macrocycles" *J. Am. Chem. Soc.* **2020**, 142, 502-511. DOI: 10.1021/jacs.9b1151
- DeLucia, N. A.; Jystad, A.; Vander Laan, K.; Tengco, J. M. M.; Caricato, M.; Vannucci, A. K. "Silica Supported Molecular Palladium Catalyst for Selective Hydrodeoxygenation of Aromatic Compounds under Mild Conditions" *ACS Catal.* **2019**, 9, 9060-9071. DOI: 10.1021/acscatal.9b02460
- Dissanayake, D. M. M. M.; Melville, A. D.; Vannucci, A. K. "Electrochemical Anion Pool Synthesis of Amides with Concurrent Benzyl Ester Synthesis" *Green Chem.* **2019**, 21, 3165-3171 DOI: 10.1039/C9GC00707E
- Key, R. J.; Smith, M. D.; Vannucci, A. K. "A Molecular/Heterogeneous Nickel Catalyst for Suzuki-Miyaura Coupling" *Organometallics*, **2019**, 35, 2007-2014. DOI: 10.1021/acs.organomet.9b00082
- Dissanayake, D. M. M. M.; Vannucci, A. K. "Selective N1-Acylation of Indazoles with Acid Anhydrides using and Electrochemical Approach" *Org. Lett.* **2019**, 21, 457-460. DOI: 10.1021/acs.orglett.8b03683
- Sindt, A. J.; DeHaven, B. A.; McEachern Jr., D. F.; Dissanayake, D. M. M. M.; Smith, M. D.; Vannucci, A. K.; Shimizu, L. S. "UV-irradiation of self-assembled triphenylamines affords persistent and regenerable radicals" *Chem. Sci.* **2019**, 10, 2670-2677. DOI: 10.1039/C8SC04607G
- Key, R. J.; Vannucci, A. K. "Nickel Dual Photoredox Catalysis for the Synthesis of Aryl Amines" *Organometallics*, **2018**, 37, 1468-1472. DOI: 10.1021/acs.organomet.8b00121
- DeLucia, N. A.; Das, N.; Vannucci, A. K. "Mild Synthesis of Silyl Ethers via Potassium Carbonate Catalyzed Reactions between Alcohols and Hydrosilanes" *Org. Biomol. Chem.* **2018**, 16, 3415-3418. DOI: 10.1039/C8OB00464A.
- DeLucia, N. A.; Das, N.; Overa, S.; Paul, A.; Vannucci, A. K. "Low temperature selective hydrodeoxygenation of model lignin monomers from a homogeneous palladium catalyst" *Catal. Today* **2018**, 302, 146-150. DOI: 10.1016/j.cattod.2017.05.050
- Dissanayake, D. M. M. M.; Vannucci, A. K. "Transition-Metal-Free and Base-Free Electrosynthesis of 1H-Substituted Benzimidazoles" *ACS Sustainable Chem. Eng.* **2017**, 6, 690-695. DOI: 10.1021/acssuschemeng.7b03029
- Paul, A.; Smith, M. D.; Vannucci, A. K. "Photoredox-Assisted Reductive Cross-Coupling: Mechanistic Insight into Catalytic Aryl-Alkyl Cross-Coupling" *J. Org. Chem.* **2017**, 82, 1996-2003. DOI: 10.1021/acs.joc.6b02830
- Rice, A. M.; Fellows, W. B.; Dolgoplova, E. A.; Greytak, A. B.; Vannucci, A. K.; Smith, M. D.; Karakalos, S. G.; Krause, J. A.; Avdoshenko, S. M.; Popov, A. A.; Shustova, N. B. "Hierarchical Corannulene- Based Materials: Energy Transfer and Solid-State Photophysics" *Angew. Chem. Int. Ed.* **2017**, 56, 4525.
- Salapage, S. R.; Paul, A.; Banerjee, T.; Hanson, K.; Smith, M. D.; Vannucci, A. K.; Shimizu, L. S. "Structure, Electrochemistry and Photophysical Properties of an Exocyclic Di-Ruthenium Complex and its Application as a Photosensitizer" *Dalton Trans.* **2016**, 45, 9601.
- Fellows, W. B.; Rice, A. M.; Williams, D. E.; Dolgoplova, E. A.; Vannucci, A. K.; Pellechia, P. J.; Smith, M. D.; Krause, J. A.; Shustova, N. B. "Redox-Active Corannulene Buckybowls in a Crystalline Hybrid Scaffold" *Angew. Chem. Int. Ed.* **2015**, 55, 2195.

Previous to independent career

- Hyde, J. T.; Hanson, K.; Vannucci, A. K.; Lapides, A. M.; Alibabaei, L.; Norris, M. R.; Meyer, T. J.; Harrison, D. P. "Electrochemical Instability of Phosphonate-Derivatized Ru(II) Polypyridyl Complexes on Metal Oxide Surfaces" *ACS Appl. Mater. Interfaces* **2015**, 7, 9554.
- Ashford, D. L.; Gish, M. K.; Vannucci, A. K.; Brennaman, M. K.; Templeton, J. L.; Papanikolas, J. M.; Meyer, T. J. "Molecular Chromophore-Catalyst Assemblies for Solar Fuel Applications" *Chem. Rev.* **2015**, 115, 9554.
- Song, N.; Concepcion, J. J.; Binstead, R. A.; Rudd, J.; Vannucci, A. K.; Dares, C. J.; Coggins, M. K.; Meyer, T. J. "Base-enhanced water oxidation by a carboxylate-bipyridine Ru(II) complex" *Proc. Natl. Acad. Sci.* **2015** 112, 4935-4940.
- Song, W.; Vannucci, A. K.; Farnum, B. H.; Brennaman, M. K.; Lapides, A. M.; Kalanyan, B.; Alibabaei, L.; Concepcion, J. J.; Losego, M. D.; Parsons, G. N.; Meyer, T. J. "Visible Light Driven Benzyl Alcohol Dehydrogenation in a Dye-Sensitized Photoelectrosynthesis Cell" *J. Am. Chem. Soc.* **2014**, 136, 9773.
- Tamaki, Y.; Vannucci, A. K.; Dares, C. J.; Binstead, R. A.; Meyer, T. J. "One-electron Activation of Water Oxidation Catalysis" *J. Am. Chem. Soc.* **2014**, 136, 6854.
- Ashford, D. L.; Lapides, A. M.; Vannucci, A. K.; Hanson, K.; Torelli, D. A.; Harrison, D. P.; Templeton, J. L.; Meyer, T. J. "Water Oxidation by an Electropolymerized Catalyst on Derivatized Mesoporous Metal Oxide Electrodes" *J. Am. Chem. Soc.* **2014**, 136, 6578.
- Coggins, M. K.; Zhang, M. T.; Vannucci, A. K.; Dares, C. J.; Meyer, T. J. "Electrocatalytic Water Oxidation by a Monomeric Amidate-Ligated Fe(III)-Aqua Complex" *J. Am. Chem. Soc.* **2014**, 136, 5531.
- de la Cruz Cruz, J. I.; Juarez-Saavedra, P.; Paz-Michel, B.; Leyva-Ramirez, M. A.; Rajapakshe, A.; Vannucci, A. K.; Lichtenberger, D. L.; Paz-Sandoval, M. A. "Phosphine-substituted η^5 -Pentadienyl- Manganese-Carbonyl Complexes: Geometric Structures, Electronic Structures, and Energetic Properties of the Associative Substitution Mechanism, Including Isolation of the Slipped η^3 - Pentadienyl Associative Intermediate" *Organometallics* **2014**, 33, 278
- Vannucci, A. K.; Alibabaei, L.; Losego, M. D.; Concepcion, J. J.; Kalanyan, B.; Parsons, G. N.; Meyer, T. J. "Crossing the Divide between Homogeneous and Heterogeneous Catalysis" *Proc. Natl. Acad. Sci.* **2013**, 110, 20918.
- Hanson, K.; Torelli, D. A.; Vannucci, A. K.; Brennaman, M. K.; Luo, H.; Alibabaei, L.; Song, W.; Ashford, D. L.; Norris, M. R.; Glasson, C. R. K.; Concepcion, J. J.; Meyer, T. J. "Self-assembled Bilayer Films of Ru(II) Polypyridyl Complexes by Layer-by-Layer Deposition on High-Surface Area Metal Oxides" *Angew. Chem. Int. Ed.* **2012**, 124, 12954
- Glasson, C. R. K.; Song, W.; Ashford, D. L.; Vannucci, A. K.; Chen, Z.; Concepcion, J. J.; Holland, P. L.; Meyer, T. J. "Self-Assembled Bilayers on ITO (SAB-ITO) Electrodes: A Design for Chromophore- Catalyst Photoanodes" *Inorg. Chem.* **2012**, 51, 8637
- Vannucci, A. K.; Chen, Z.; Concepcion, J. J.; Meyer, T. J. "Nonaqueous Electrocatalytic Oxidation of the Alkylaromatic Ethylbenzene by a Surface Bound Ru^V(O) Catalyst" *ACS Catal.* **2012**, 2, 716.
- Gagliardi, C. J.; Vannucci, A. K.; Concepcion, J. J.; Chen, Z.; Meyer, T. J. "The Role of Proton Coupled Electron Transfer in Water Oxidation" *Energy Environ. Sci.* **2012**, 5, 7704.
- Vannucci, A. K.; Hull, J. F.; Chen, Z.; Binstead, R. A.; Concepcion, J. J.; Meyer, T. J. "Water Oxidation Intermediates Applied to Catalysis: Benzyl Alcohol Oxidation" *J. Am. Chem. Soc.* **2012**, 134, 3972.
- Chen, Z.; Vannucci, A. K.; Concepcion, J. J.; Jurss, J. W.; Meyer, T. J. "Proton-coupled Electron Transfer at Modified Electrodes by Multiple Pathways" *Proc. Natl. Acad. Sci. USA* **2011**, 108, E1461.
- Estes, D. P.; Vannucci, A. K.; Hall, A. R.; Lichtenberger, D. L.; Norton, J. R. "Thermodynamics of the Metal-Hydrogen Bonds in $(\eta^5\text{-C}_5\text{H}_5)\text{M}(\text{CO})_2\text{H}$ (M = Re, Ru, Os)" *Organometallics*, **2011**, 30, 3444.
- Chen, J.; Vannucci, A. K.; Mebi, C. A.; Okumura, N.; Borowski, S. C.; Lockett, L. T.; Lichtenberger, D. L.; Evans, D. H.; Glass, R. S. "Synthesis of Diron Hydrogenase Mimics Bearing Hydroquinone and Related Ligands. Electrochemical and Computational Studies of the Mechanism of Hydrogen Production and the Role of O-H...S Hydrogen Bonding" *Organometallics*, **2010**, 29, 5330.
- Vannucci, A. K.; Wang, S.; Nichol, G. S.; Lichtenberger, D. L.; Evans, D. H.; Glass, R. S. "Electronic and Geometric Effects of Phosphatriazaadamantane Ligands on the Catalytic Activity of an [FeFe] Hydrogenase

Inspired Complex" *Dalton Trans.* **2010**, 39, 2671.

Vannucci, A. K.; Snyder, R. A.; Gruhn, N. E.; Lichtenberger, D. L.; Enemark, J. H. "New Insights into Solvolysis and Reorganization Energy from Gas-Phase, Electrochemical, and Theoretical Studies of Oxo-Tp*Mo(V) Molecules" *Inorg. Chem.* **2009**, 48, 8856.

Felton, G. A. N.; Mebi, C. A.; Petro, B. J.; Vannucci, A. K.; Evans, D. H.; Glass, R. S.; Lichtenberger, D. L. "Review of Electrochemical Studies of Complexes containing the Fe₂S₂ core characteristic of [FeFe]-Hydrogenases Including Catalysis by these Complexes of the Reduction of Acids to Form Dihydrogen" *J. Organomet. Chem.* **2009**, 694, 2681.

Felton, G. A. N.; Vannucci, A. K.; Okumura, N.; Lockett, L. T.; Evans, D. H.; Glass, R. S.; Lichtenberger, D. L. "Hydrogen Generation from Weak Acids: Electrochemical, Computational, and Photoelectron- Spectroscopy Studies in the [(η⁵-C₅H₅)Fe(CO)₂]₂ System" *Organometallics* **2008**, 27, 4671.

Petro, B. J.; Vannucci, A. K.; Lockett, L. T.; Mebi, C.; Kottani, R.; Gruhn, N. E.; Nichol, G. S.; Evans, D. H.; Glass, R. S.; Lichtenberger, D. L. "Photoelectron Spectroscopy of Dithiolatodiiironhexacarbonyl Models for the Active Site of [Fe-Fe] Hydrogenases: Insight into the Reorganization Energy of the "Rotated" Structure in the Enzyme" *J. Mol. Struct.* **2008**, 890, 281.

Felton, G. A. N.; Vannucci, A. K.; Chen, J.; Lockett, L. T.; Okumura, N.; Petro, B. J.; Zakai, U. I.; Evans, D. H.; Glass, R. S.; Lichtenberger, D. L. "Hydrogen Generation from Weak Acids: Electrochemical and Computational Studies of a Diiron Hydrogenase Mimic" *J. Am. Chem. Soc.* **2007**, 129, 12521.

COMMITTEES

- Department of Chemistry and Biochemistry Recruiting Committee (2019 – present)
- Heterogeneous High Performance Computing Committee University of South Carolina (2017 – present)
- NMR Facilities Committee University of South Carolina (2017 – present)
- Curriculum Committee University of South Carolina (2016 – present)
- Bouknight Scholarship Committee University of South Carolina (2014 – present)

SELECTED INVITED SEMINAR PRESENTATIONS (20 invited seminars given)

Vannucci, A. K. "Molecular/Heterogeneous Catalysts for the Selective Hydrodeoxygenation of Aromatics Related to Lignin Biomass" presented on October 20th, 2019 at the Southeastern Regional Meeting of the American Chemical Society in Savannah, GA as an invited seminar.

Vannucci, A. K. "Photo- and Electro-Catalytic Cross-Coupling Reactions" presented on March 30th, 2018 at the University of Virginia as an invited departmental seminar.

Vannucci, A. K. "Catalytic Photoredox C-C and C-N Cross-Couplings" presented on November 10th, 2017 at the Southeastern Regional Meeting of the American Chemical Society in Charlotte, NC as an invited seminar.

Vannucci, A. K. "Photoelectrochemical Production of H₂ from Weak Acids" presented on November 8th, 2017 at the Southeastern Regional Meeting of the American Chemical Society in Charlotte, NC as an invited seminar.

Vannucci, A. K. "Catalytic Photoredox C-C and C-N Cross-Couplings" presented on July 11th, 2017 at the Organometallic Chemistry Gordon Research Conference in Newport, RI as an invited seminar.

Vannucci, A. K. "A Heterogeneous Catalytic Cross-Coupling System Based on Homogeneous Molecular Catalysts" presented on March 21st, 2017 at Boehringer Ingelheim Pharmaceutical Company in Ridgefield, CT as an invited seminar.

Vannucci, A. K. "Photoredox-Assisted Reductive Cross-Coupling (PARC)" presented on August 21st, 2016 at the 252nd American Chemical Society National Meeting & Exposition in Philadelphia, PA as an invited seminar to honor Thomas J. Meyer on his 75th birthday.