## Xi ngda Lect ur e

## Prof. Shelley D. Minteer

Departments of Chemistry

The University of Utah, USA

Phone: 801-587-8325

Office: b611 That cher Building

Email: <u>mint eer @chem ut ah. edu</u>

Research Group



Title: Enzymatic bioelectrocatalysis: From metabolic pathways to metabolons

**Abstract:** Oxidor eductase enzymes have been employed for almost 5 decades in biosensors and for energy conversion in the form of biofuel cells. However, most enzymatic bioelectrodes in the literature utilize complex biofuels (e.g. glucose), but only partially oxidize the complex biofuel via the use of a single enzyme (i.e. glucose oxidase or glucose)

dehydrogenase). This presentation will detail the use of enzyme cascades at bioanodes for deep to complete oxidation of substrates to improve performance (current density and power density), but will focus on the importance of forming metabolons for substrate channeling in multi-enzyme cascades. These enzyme cascades will include natural metabolons (i.e. the Kreb's cycle) and artificial metabolons utilizing DNA and peptides as scaffolds. It will discuss the importance of structural orientation of enzymes and enzyme complexation in enzymatic cascades for efficient bioelectrocatalysis.

Short resume: Dr. Shelley Minteer is a USTAR Professor in both the

Departments of Chemistry and Materials Science and Engineering at the University of Utah. She received her PhD in Analytical Chemistry at the University of Iowa in 2000 under the direction of Professor Johna Leddy. After receiving her PhD, she spent 11 years as a faculty in the Department of Chemistry at Saint Louis University before moving to the University of Utah in 2011. She also was a Technical Editor for the Journal of the Electrochemical Society and is now an Associate Editor for the Journal of the American Chemical Society. She has published greater than 250 publications and greater than 350 presentations at national and international conferences and universities. She has won several awards including the Luigi Galvani Prize of the Bioelectrochemical Society, the Missouri Inventor of the Year, International Society of Electrochemistry Tajima Prize, Fellow of the Electrochemical Society, and the Society of Electroanalytical Chemists' Young Investigator Award. Her research research interests are focused on electrocatal ysis and bioanal ytical electrochemistry. She has expertise in biosensors and bioelectronics.

## Sel ect ed Publ i cat i ons

 R.D. Milton, R. Cai, S. Sahin, S. Abdellaoui, B. Alkotaini, D. Leech, <u>The In Vivo Potential - Regulated Protective</u> <u>Protein of Ntrogenase in Azotobacter vinel andii Supports Aerobic</u> <u>Bioelectrochemical Dinitro-gen Reduction In Vitro,</u> the American Chemical Society, 2017, 139, 9044-9052.

• <u>Direct Enzymatic</u> <u>Bioel ectrocatal ysis: Differentiating Between Myth and Reality,</u> Journal of the Royal Society Interface, 2017, 14, 20170253.

 L. Xia, K Nguyen, Y. Holade, H Han, K Dooley, P. Atanassov, S. <u>Improving the Performance of Methanol</u> <u>Biofuel Cells Utilizing an Enzyme Cascade Bioanode with DNA Bridged</u> <u>Substrate Channeling</u>, -1438.

- S. Abdellaoui, M. Snow, I. Matanovic, A. Stephens, P. Atanassov, <u>Hybrid Molecular/Enzymatic Catalytic Cascade</u> <u>for Complete Electro-oxidation of Ciycerol Using a Promiscuous</u> <u>NAD-dependent Formate Dehydrogenase from Candida boidinii,</u> ChemComm, 2017, 53, 5368 - 5371.
- Y. Liu, D.P. Hckey, J.Y. Guo, E. Earl, S. Abdellaoui, R. Milton, Substrate
  <u>Substrate</u>
  <u>Channeling in an Artificial Metabolon: A Molecular Dynamics</u>

<u>Blueprint for an Experimental Peptide Bridge,</u> 7, 2486-93.

- M Grattieri, N.D. Shivel, I. Sifat, M Bestetti, and S.D. Minteer, <u>Sustainable Hypersaline Microbial Fuel Cells: Inexpensive</u> <u>Recyclable Polymer Supports for Carbon Nanotube Conductive Paint</u> <u>Anodes</u>, -2058.
- K Knoche, K Hasan, E Aoyama, and S.D. <u>Role of</u>
- 008871 0 443.32 841.92<u>N tevolgeogeoe0596065etooleo5355</u>n32n8411e932eohewi/insb£11ó/F1Bi12e1Tectrooocat1al1y26.c0</u>2 508.15 Tm0 0 <u>N trogen Fixation by the Cyanobacteria Anabaena variabilis SA-1</u> Mutant Immobilized on Indium Tin Ox[777 539.35 Tm0 g0 O[)]TJ0 O[) TJ)41.92 ro

<u>Pseudocapacitive Dimethyl ferrocene Redox Polymer at the Bioanode</u> Energy Letters, 2016, 1, 380-385.

Direct evidence for met abol on for mation and substrate channeling in recombinant TCA cycl e enzymes - 2853. Effect of Riboflavin Metabolites on Mit ochondrial Electrochemistry Soci et y, 2016, 163(13), H1047-1052. C. Tapia, R.D. MIIton, G. Pankratova, S.D. Minteer, H. Akerlund, D. Leech, Wiring of Photosystem I and Hydrogenase on an Electrode for Photoel ectrochemical H2 Production using Redox Polymers for Relatively Positive Onset Potential ChemEl ect r oChem, 2017, 4, 90-95. Y. Ho Hal i de-Regul at ed Growth of Electrocatalytic Metal Nanoparticles Directly on Carbon Paper rials Chemistry A, 2016, 4, 17154-17162. E ect r odes D. P. Hckey, K.L. Knoche, K. Albertson, C. Castro, R.D. Milton, and S.D. Improving O2 Reduction at an Enzymatic Biocathode: Mimicking - 13302. the Lungs T. Wang, R.D. Milton, S. Adellaoui, D.P. Hckey, and S.D. Minteer, Laccase Inhibition by As<sup>3+</sup>/As<sup>5+</sup>: Determination of Inhibition Mechanism and Preliminary Application to a Self-Powered Biosensor, Chemistry, 2016, 88, 3243-3248. RD. M Tailoring Bi oi nt erfaces for Electrocat al ysis, -2301. I. Wheel don, S.D. Minteer, S. Banta, S. Cal abrese Barton, P. Atanassov, Substrate channeling as an approach to cascade - 309. r eact i ons D.P. Hckey, D. Schiedler, I. Matanovic, P. Doan, P. Atanassov, S.D. Predicting Electrocatalytic Properties: Modeling Structure-Activity Relationships of Ntroxyl Radicals,

Journal of the American Chemical Society, 2015, 137, 16179-16186.