



American Chemical Society Susquehanna Valley Section

FEBRUARY 2015 NEWSLETTER

The four hundred and twenty-first meeting of the American Chemical Society Susquehanna Valley Section will be held on Wednesday, February 11, 2015 in Burke Auditorium in the McGowan School of Business on the campus of King's College. The meeting will begin at 7:00 PM and will be preceded by dinner at 5:30 PM. The speaker will be Bryan Eigenbrodt, Ph. D. of Villanova University.

"High Temperature, In Situ X-Ray Absorption Study of Sr₂MgMoO₆ Solid Oxide Fuel Cell Anode Materials"

Dr. Bryan C. Eigenbrodt
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Currently, nickel-based solid oxide fuel cell (SOFC) anode materials do not support the use of complex hydrocarbon fuels (high molecular weight, with H₂S contaminants) that can lead to eventual device failure brought upon by unwanted graphitic and metal sulfide formations. These limitations have spurred the investigation of new mixed ionic and electronic conducting (MIEC) anode materials that are effective at blocking these detrimental formations. The MIEC anode material used in this study was the double perovskite, Sr₂MgMoO₆ (SMMO). The redox chemistry of this material was explored using X-ray absorption spectroscopy (XAS) in conjunction with a unique, custom built electrochemical assembly to allow for the non-invasive exploration of these materials during device operation at 800°C. This work was completed at the 10-ID Beamline located at the Advance Photon Source at Argonne National Laboratory. Data exhibited that the XAS spectra for the molybdenum K-edge of this material showed drastic changes for the reduced and oxidized samples as evident by a shift in the molybdenum 1s electron binding energy and an increase in the formation of oxide vacancies when the sample was exposed to a reducing atmosphere. *In situ* electrochemical measurements, taken at 800°C of a working single chamber SOFC revealed that the molybdenum oxidation state in SMMO remained unchanged under various cell polarizations. The findings, of this study, demonstrated that SMMO would be an acceptable SOFC anode material by providing adequate electron conduction through multivalent molybdenum oxidation states, the formation of oxide vacancies to offer acceptable sulfur and carbon tolerance, and its stability under various cell potentials.

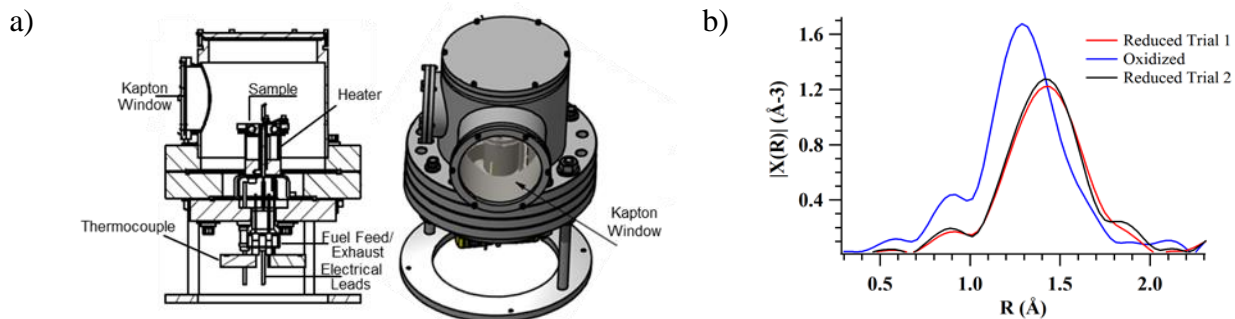


Figure. a) Custom built attachment for the X-ray absorption spectrometer located at the 10-ID beam line at the Advanced Photon Source located at Argonne National Laboratory. This attachment allows for the non-invasive investigation of SOFC materials under operational conditions. **b)** Extended X-ray absorption fine structure (EXAFS) spectra of $\text{Sr}_2\text{MgMoO}_6$ taken under reducing and oxidizing environments at 800°C . The peak at $1.0\text{-}1.7\text{\AA}$ represents the Mo-O interactions. The decrease in this peak's intensity, when the sample was exposed to hydrogen at 800°C , exhibits the depletion of oxygen near the molybdenum atom. This finding suggests that molybdenum plays a large role in the formation of oxygen vacancy formation for this material which lends to its high fuel tolerance in complex hydrocarbon environments.

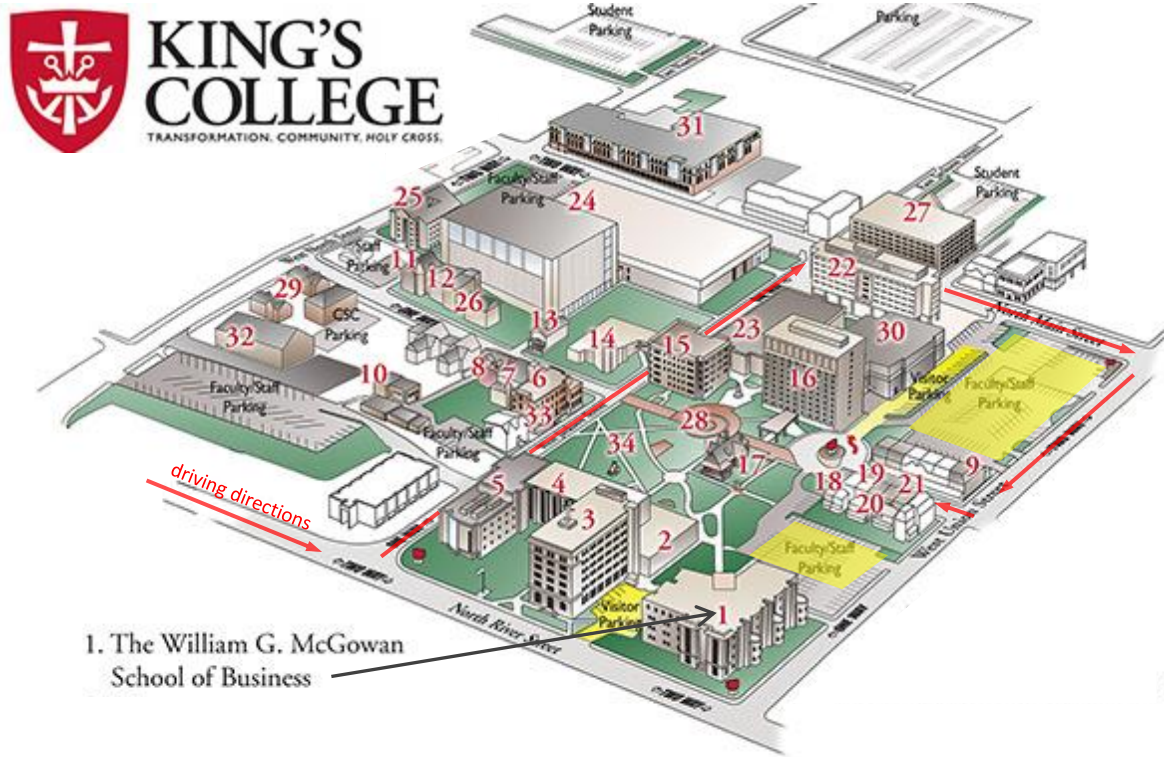
Dr. Bryan Eigenbrodt began his appointment in the Department of Chemistry at Villanova University in August of 2013. He obtained his Ph.D. in Chemistry from the University of Maryland in 2011. His graduate work was conducted under the supervision of Professor Robert Walker and his Ph.D. thesis was entitled "Correlating Electrochemical Performance with In Situ Optical Spectroscopy in Solid Oxide Fuel Cells". Upon obtaining his Ph.D., Dr. Eigenbrodt was awarded a National Academies of Science Post-Doctoral Fellowship that allowed him to conduct alternative energy research in the Aerospace Systems Directorate at the Air Force Research Laboratory, located at the Wright-Patterson Air Force Base in Dayton, Ohio. Dr. Eigenbrodt's current research interests focus on studying the chemistry of alternative power generation devices and renewable biofuels.

DINNER: 5:30 PM at the Postupack Conference room in the McGowan School of Business. Please call or email reservations to Ron Supkowski (ronaldsupkowski@kings.edu) or 570-208-5900 x 5733 or) by Thursday, February 5.

DIRECTIONS TO KING'S COLLEGE:

- From Route I-81, take Exit 170B which will put you on Route 309 North.
- Follow Route 309 and take exit 3 (Wilkes-Barre/Plains).
- Turn left off the exit ramp onto North River Street. Proceed about 1.5 miles, and you will see the Luzerne County Courthouse on your right. Continue through the light at the courthouse.
- Turn left at the next street, West Jackson Street. There is no traffic light at West Jackson Street, so do not go as far as the next light.
- Go through the stop sign, and at the first traffic light turn right onto North Main Street.
- Turn right at the next light onto West Union Street.
- Proceed to the next light and turn right onto North Franklin Street.

- The Visitors Lot is located to your right off the cul-de-sac.
- The lots colored yellow also have limited parking available.



For additional directions, visit <http://www.kings.edu/aboutkings/resources/directions>

2014 LOCAL SECTION ELECTIONS:

Congratulations to our elected 2015 officers:

Chair:	James Swan	Bucknell University
Chair-Elect:	Anne Szklarski	King's College
Counselor:	Dee Casteel	Bucknell University
Alt.-Counselor:	Deborah Hokien	Marywood University
Treasurer:	Holly Bendorf	Lycoming College
Secretary:	Ronald Supkowski	King's College

Susquehanna Valley Section Web Page: <http://departments.kings.edu/SusquehannaValleyACS>

Please send any comments about the monthly newsletter to Ron Supkowski, Section Secretary
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