

Jason R. Wickham, Ph.D.

Department of Natural Sciences
Northwestern Oklahoma State University
709 Oklahoma Boulevard
Alva, Oklahoma 73717
www.nwosu.edu

Alva, OK, 73717

(580) 327-8560 (office)
jrwickham@nwosu.edu

EDUCATION AND RESEARCH EXPERIENCE

Ph.D. Inorganic Chemistry 2007

Advisor: Professor Charles V. Rice
University of Oklahoma, Norman, OK

Dissertation: *Studies of Molecular Architecture Within Solid Polymer Electrolytes and Teichoic Acid Biopolymers From Solid-State Nuclear Magnetic Resonance Spectroscopy*

Research involves the use of CP-MAS and REDOR solid-state NMR spectroscopy to understand the ion coordination of lithium in solid polymer electrolytes and to characterize the heterogeneous binding abilities of teichoic acid adsorbates. CP-MAS was used assign the crystalline and amorphous NMR signals in PEO and 20:1 PEO:LiTf solid polymer electrolyte. REDOR is used to characterize the crystalline microdomains of a 20:1 PEO:LiTf through comparison of a 3:1 PEO:LiTf with a published crystal structure. Our data clearly demonstrates that the lithium crystalline microdomains in the 20:1 sample are nearly identical to those of the completely crystalline 3:1 sample. CP-MAS and $T_{1\rho}$ experiments were used to evaluate the binding ability of lipoteichoic acid (LTA) to the surface of titanium dioxide. These experiments demonstrate that LTA on the TiO_2 surface has hampered molecular dynamics with two separate chemical environments. CP-MAS and computational model were used to demonstrate that teichoic acids (TA) coordinate with magnesium in a bidentate fashion. CP-MAS and Static Deuterium SSNMR experiments were also used to characterize the antifreeze properties of TA.

B.S. Chemistry 2002

Minor Mathematics

Southwestern Oklahoma State University
Weatherford, OK
Mentor: Professor William Kelly

Research focused on using quantum mechanical techniques to evaluate the prooxidant properties of Carotenoids. Gaussian 98, Titan, and Spartan computational programs were used to calculate the lowest energy geometries of a variety of Carotenoids and Carotenoid radicals. This information was used to evaluate the various Carotenoids as either superoxide Prooxidants or Antioxidants.

PROFESSIONAL EXPERIENCE

Professor of Chemistry, Northwestern Oklahoma State Univ.

August 2018 – Present

Associate Professor of Chemistry, Northwestern Oklahoma State Univ.

August 2013 – Present

Assistant Professor of Chemistry, Northwestern Oklahoma State Univ.

August 2008 - August 2013

Postdoctoral Research Assistant, Washington University of Saint Louis

Jacob Schaefer, Ph. D.

September 2007 – July 2008

Solid State NMR spectroscopy of biological materials

Graduate Research Assistant, University of Oklahoma

Charles V. Rice, Ph. D.

May 2005 – August 2007

May 2003 – August 2004

Solid State NMR spectroscopy of materials

NMR Facility Assistant, University of Oklahoma

Supervisor: Susan Alguindigue, Ph. D. August 2004 – April 2005

Train departmental users, cryogen fills, calibration and maintain NMR spectrometers and operating software

Graduate Teaching Assistant, University of Oklahoma

CHEM 1315 General Chemistry 1 Laboratory and Recitation

Fall 2002 – Spring 2003

Undergraduate Teaching Assistant, Southwestern Oklahoma State University

Organic Chemistry 1 & 2 Laboratory

Summer 2002

Summer 2001

AWARDS

OCAST research and development internship project grant	2017
Oklahoma State Regents for Higher Education Partnership Award	2017
OCAST research and development internship project grant	2014
Scientists in Congregations grant	2011
Kaboom grant (improvements of Hatfield park playground equipment)	2011
OCAST research and development internship project grant	2010
Oklahoma State Regents for Higher Education Partnership Award	2010
Lloyd Swearingen Outstanding Graduate Research Award, University of Oklahoma	2007
Graduate Assistance in Areas of National Need (GAANN) Fellow	2007
Lloyd Swearingen Outstanding Graduate Research Award, University of Oklahoma	2006
J.T. Cronin Scholarship, Southwestern Oklahoma State University	2002

Professional Organizations and Offices

Oklahoma Section of the American Chemical Society Treasure	2011 – present
American Chemical Society	2005 - present

PUBLICATIONS

6. Rice, Charles; Middaugh, Amy; **Wickham, Jason**; Friedline, Anthony; Thomas, Kieth; Scull, Erin; Johnson, Karen; Zachariah, Malcolm; Garimella, Ravindranath, “Bacterial Lipoteichoic Acid Enhances Cryosurvival”. *Extremophiles*, (2015), 19(2), 297 -305
5. **Wickham, Jason R.**; Halye, J.; Rice, C.V. “Magnesium Chelation by Teichoic Acid from Phosphorus Solid-State NMR and Ab Initio Studies”. *Journal of Physical Chemistry B*, (2009) 113(7), 2177–2183
4. **Wickham, Jason R.**; Rice, C.V. “Solid-State NMR Studies of Bacterial Lipoteichoic Acid Adsorption on Different Surfaces”. *Solid State Nuclear Magnetic Resonance*, (2008), 34(3), 154-161.

3. **Wickham, Jason R.**; Mason, Rachel N.; Rice, C.V. “Solid State NMR Studies of Crystalline and Amorphous Domains Within PEO and PEO:LiTf Systems”. *Solid State Nuclear Magnetic Resonance*, (2007), 31(4), 184-192.
2. **Wickham, Jason R.**; York, Shawna S.; Rocher, Natalie M.; Rice, C.V. “Lithium Environment in Dilute Poly(ethylene oxide)/Lithium Triflate Polymer Electrolyte from REDOR NMR Spectroscopy” *Journal of Physical Chemistry B*, (2006), 110(10), 4538-4541.
1. Rice, C.V.; **Wickham, Jason R.** “Heterogeneous Binding of Lipoteichoic Acid to the Surface of Titanium Dioxide as Determined with ³¹P Solid-State NMR Spectroscopy” *Journal of the American Chemical Society* 2005, 127(3), 856-857

ORAL PRESENTATIONS

Wickham, Jason R.; Hoffman, Cori; Anderson, Austin, “Careers, Demonstrations, and Iodine Research”, oral presentation at Alva High School, Alva Middle School, Burlington High School, Freedom high-middle schools, and Waynoka high-middle schools, August 2015

Wickham, Jason R. “Study of the Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma”, Alva Super Club, February 2014

Wickham, Jason R. “Solid State NMR Investigations of PEO Solid Polymer Electrolyte”, oral presentation as key note speaker at the 2012 Southwestern Oklahoma State University Chemistry and Science Education Awards Banquet, Weatherford, Oklahoma, April 2012

Wickham, Jason R.; Pribil, Eric; Drouhard, Katherine, “Careers, Demonstrations, and Research”, oral presentation at Alva, Freedom, Fairview, and Waynoka high schools, December 2011 – January 2012

Wickham, Jason R.; Rice, C.V. “Characterization of the Heterogeneous Binding of Teichoic Acids and Antifreeze Properties of LTA Using Solid State NMR Spectroscopy”, oral presentation at the 52nd Annual Oklahoma ACS Pentasectional Meeting, Ponca, Oklahoma, March 2007

Wickham, Jason R.; York, S. S.; Mason, R. N.; Rice, C.V. “Characterization of Dilute PEO:LiTf Polymer Electrolyte Using CPAMS and REDOR Solid State NMR Spectroscopy”, oral presentation at the 52nd Annual Oklahoma ACS Pentasectional Meeting, Ponca, Oklahoma, March 2007

Wickham, Jason R.; Rice, C.V. “Lithium Environment in Dilute PEO:LiTf Polymer Electrolyte from REDOR NMR Spectroscopy”, oral presentation at the 51st Annual Oklahoma ACS Pentasectional Meeting, Bartlesville, Oklahoma, April 2006

PRESENTATIONS

Wickham, Jason R.; Anderson, A.; Hoffman, C., Edlin, D. “A Study of Iodine Gas Scrubber Efficiency and Iodine Distribution in Northwestern Oklahoma Brine Waters” 2017 American Chemical Society Pentasectional Meeting, Lawton, Ok March 2017

Wickham, Jason R.; Anderson, A.; Hoffman, C., Edlin, D. “A Study of Iodine Gas Scrubber Efficiency and Iodine Distribution in Northwestern Oklahoma Brine Waters” 2017 Oklahoma Research Day, Enid, Ok November 2016

Wickham, Jason R.; Anderson, A.; Hoffman, C., Edlin, D. “A Study of Iodine Gas Scrubber Efficiency and Iodine Distribution in Northwestern Oklahoma Brine Waters” 2016 Annual Ranger Research Day, Alva, Ok November 2016

Wickham, Jason R.; Anderson, A.; Hoffman, C., Edlin, D. “A Study of Iodine Gas Scrubber Efficiency and Iodine Distribution in Northwestern Oklahoma Brine Waters” 2016 American Chemical Society Southwest Regional Meeting, Galveston, TX November 2016

Wickham, Jason R.; Hoffman, C.; Anderson, A., Edlin, D. “Development of an Iodine Plant Efficiency Program and Iodine Distribution in NW Oklahoma Brine Waters” 2016 American Chemical Society Southwest Regional Meeting, Galveston, TX November 2016

Wickham, Jason R.; Anderson, A.; Hoffman, C., Edlin, D. “A Study of Iodine Gas Scrubber Efficiency and Iodine Distribution in Northwestern Oklahoma Brine Waters” 2016 American Chemical Society Pentasectional Meeting, Bartlesville, OK April 2016

Wickham, Jason R.; Hoffman, C.; Anderson, A., Edlin, D. “Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” 2016 American Chemical Society Pentasectional Meeting, Bartlesville, OK April 2016

Wickham, Jason R.; Anderson, A.; Hoffman, C., Edlin, D. “A Study of Iodine Gas Scrubber Efficiency and Iodine Distribution in Northwestern Oklahoma Brine Waters” 2016 Oklahoma Research Day, Tahlequah, Ok March 2016

Wickham, Jason R.; Hoffman, C.; Anderson, A., Edlin, D. “Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” 2016 Oklahoma Research Day, Tahlequah, Ok March 2016

Wickham, Jason R.; Hoffman, C.; Anderson, A., Edlin, D. “Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” 249th American Chemical Society National Meeting & Exposition, Denver, CO March 2015

Wickham, Jason R.; Hoffman, C.; Anderson, A., Edlin, D. “Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” Oklahoma Research Day, Tahlequah, Ok March 2015

Wickham, Jason R.; Pribil, E. C.; Drouhard, K. A., Mason, D. “Study of the Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” 6th Annual Ranger Research Day, Alva, Ok April 2012

Wickham, Jason R.; Pribil, E. C.; Drouhard, K. A., Mason, D. “Study of the Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” 57th Annual Oklahoma Pentasectional Meeting of the American Chemical Society, Lawton, Ok Mar. 2012

Wickham, Jason R.; Pribil, E. C.; Drouhard, K. A., Mason, D. “Study of the Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” Oklahoma Research Day, Lawton, Ok November 2011

Wickham, Jason R.; Pribil, E. C.; Drouhard, K. A., Mason, D. “Study of the Distribution and Quantity of Iodine in the Brine Waters of Northwestern Oklahoma” 46th Midwest / 39th Great Lakes Joint Regional Meeting of the American Chemical Society, St. Louis, MO October 2012

Wickham, Jason R.; Rice, C.V. “Characterization of the Adhesion and Antifreeze Properties of Teichoic Acids Using Solid State NMR Spectroscopy”, poster presentation at the 48th Experimental Nuclear Magnetic Resonance Conference, Daytona Beach, FL April 2007

Wickham, Jason R.; Rice, C.V. “Solid-State NMR Investigation of Teichoic Acids From the Bacterial Cell Wall”, poster presentation at the Great Plains Regional Annual Symposium on Protein NMR, Lawrence, KS October 2006

Wickham, Jason R.; Rice, C.V. “Solid State NMR Studies of the Domains Within PEO and PEO:LiTf Systems”, poster presentation at the 48th Rocky Mountain Conference on Analytical Chemistry, Breckenridge, CO July 2006

Wickham, Jason R.; Rice, C.V. “The Chemical Nature of Ion Coordination in Polymer Electrolytes from Solid-State NMR”, poster presentation at the 230th Annual ACS National Meeting, Washington, D.C. August 2005

Drilling, Holly; **Wickham, Jason R.;** Titus, Amanda; Rice, C.V.. “NMR Studies of RGD Peptide Coatings on Fumed Silica”, poster presentation at the 50th Annual Oklahoma ACS Pentasectional Meeting, Stillwater, OK April 2005

Wickham, Jason R.; Rice C.V. “Lithium Coordination Within Polymer Electrolytes”, poster presentation at the 50th Annual Oklahoma ACS Pentasectional Meeting, Stillwater, Oklahoma April 2005

Rice, C.V.; **Wickham, Jason R.;** Huntley, Jamie L.; Huang, Yongli, Li, Joshua; Cravatt, Earlanna “NMR Studies at the Forefront of Materials Science. Poster presented at the 60th Southwest Regional Meeting of the American Chemical Society, Fort Worth, TX September 2004

Kelly, William J; **Wickham, Jason R.**; “Computational Evaluation of the Prooxidant/Antioxidant Properties of the β -Carotenoids”, poster presentation at 223rd ACS National Meeting, Orlando, FL April 2002

Wickham, Jason R.; Kelly, William J. “A Quantum Mechanical Evaluation of the Prooxidant/Antioxidant Properties of the β -Carotenoids”, poster presentation at the 52nd Combined Regional Meeting of the American Chemical Society, New Orleans, LA December 2000

Wickham, Jason R.; Kelly, William J. “A Quantum Mechanical Evaluation of the Prooxidant/Antioxidant Properties of the β -Carotenoids”, poster presentation at the Research Days for Regional Universities, Edmond, OK October 2000

TECHNICAL EXPERIENCE

- Skilled in the creation, planning, and execution of experimental protocols
- Familiar with the design and construction of experimental equipment
- Proficient in tuning probes, calibrating, and setting up NMR experiments
- Experience in the installation of two 7 T superconducting magnets
- Repair of high resolution magic angle spinning probes
- Installation and software usage of Solaris, VNMR, and VNMRJ
- Experience with glovebox techniques and solid polymer electrolyte preparation
- Experience with silane surface modification reactions
- Experience growing and handling *Staphylococcus aureus* and *Staphylococcus aureus* bacteriophage 52A
- Experience growing and handling *E. coli* and *E. coli* bacteriophage T4
- Performance of routine maintenance and cryogen fills on high field NMR magnets
- Significant contributions to the setup of the research lab and NMR equipment
- Experience using various computational programs (Spartan, Titan, and Gaussian 98)
- Training departmental users of NMR spectrometers for data collection, experimental setup, and data processing
- Mentoring and training undergraduate researchers
- Assisting new graduate students in lab protocols and NMR operations

PROFESSIONAL REFERENCES

Professor Cornelia Mihai
Department of Natural Science
NWOSU
709 Oklahoma BLVD
Alva, OK 73717
Telephone: (580) 327-8559
FAX: (580) 327-8556
E-mail: cmihai@nwosu.edu

Professor Aaron Place
Department of Natural Science
NWOSU
709 Oklahoma BLVD
Alva, OK 73717
Telephone: (580) 327-8673
FAX: (580) 327-8556
E-mail: ajplace@nwosu.edu

Professor Charles V. Rice
Department of Chemistry/Biochemistry
University of Oklahoma
620 Parrington Oval, Rm. 208
Norman, OK 73019
Telephone: (405) 325-5831
FAX: (405) 325-6111
E-mail: rice@ou.edu

Professor Jacob Schaefer
Department of Chemistry
Washington University
Campus Box 1134 One Brookings Drive
St. Louis, MO 63130-4899
Telephone: (314) 935-6844
FAX: (314) 935-4481
E-mail: schaefer@wuchem.wustl.edu

Professor William J. Kelly
Department of Chemistry
Southwestern Oklahoma State University
100 Campus Drive
Weatherford, OK 73096
Telephone: (580) 774-3202
FAX: (580) 774-3795
E-mail: william.kelly@swosu.edu