

Robert Lee Johnson, Ph.D.

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Professional Summary

- Broad technical background: biology, chemical engineering, materials science, chemistry (phys./org.).
- >10 years of experience in the renewable energy/chemical space.
- Innovative mindset ideal for applied interdisciplinary projects.
- Team oriented self-starter experienced in detail oriented and broad context analysis and assessment.
- Excellent written and oral communication skills for informing both technical and broader audiences.
- Expert in numerous chemical and materials characterization techniques.
- Entrepreneurial problem solver (NSF icorps program) STTR phase I awardee.
- Experience in leadership of people and projects, on time and within budget.

Key Skills

- **Heterogeneous Chemical Catalysis/Extraction:** Expert in construction of lab scale reactors/extractors (gas/liquid/SCCO₂) that operate at elevated pressure and temperatures.
- **Plant Chemical Characterization:** Characterization cellulosic materials and secondary metabolites.
- **Materials Engineering:** Investigation of chemical fouling and development of fouling-resistant nanocomposite materials and coatings.
- **Analytical Technique Development:** Developed hybrid solid-state Nuclear Magnetic Resonance Spectroscopy (NMR) technique to probe nm scale chemical solid-liquid interfaces.
- **Porous Materials Characterization:** Surface area and pore size distribution with chemisorption and physisorption techniques.
- **Solid State NMR Technique Development:** Develop unique spectrally edited pulse sequences (rf) for structural determination of complex organic materials.
- **Carbon Nanocomposite Material Synthesis:** Expert in pyrolysis chemistry for formation of functionalized carbon materials, and superparamagnetic composites.
- **Standard Analytical Techniques:** Gas/liquid chromatography, TGA/DSC, UV/VIS spectroscopy, IR spectroscopy, CHNS elemental analysis, ICP.
- **Micro/Molecular Biology:** Competent with aseptic technique, microbial culture (bacteria, fungi, algae) and propagation and molecular biology techniques.

Professional Experience

University of Hawaii, Manoa

Research Associate *Hawaii Natural Energy Institute*

Sept. 2018-present

- Recommissioned POST 30 for chemical research (Equipment set up, SOP's, JSA's, QRA's).
- Ensure that all safety and chemical hygiene practices are being followed to HIOSH standards.
- Manage laboratory equipment, chemical inventory, waste disposal, and purchasing.
- Supervise student's and conduct research for funded projects:
 - ✓ PHA bioplastics from biomass (*Bio-on*)
 - ✓ Liquid fuels from synthesis gas (DOD Navy)

King Fahd University of Petroleum and Minerals

Assistant Professor *Department of Chemistry*

Sept. 2017-Sept. 2018

Successful proposals:

- "Solid State NMR Studies for Characterization of Heterogeneous Catalysis."

- “Green Plasticizers from Low Cost Petrochemicals for Saudi Arabia's Emerging Polymer Industry: Replacements for Phthalate Plasticizers.”
- “Selective Oxidation of Para-Xylene Using Metal Nanoparticle Heterogeneous Catalyst.” (Saudi Aramco)
- “A Novel Synergistic Coating Technology Using Nano Particle Insecticide Delivery System for Red Palm Weevil Eradication.”
- “Polymeric Materials for Removal of Sulfur and Mercury from Petroleum Feeds.” (Saudi Aramco)

SusTerea Biorenewables LLC

www.susterea.com

Senior Scientist

Aug. 2016-Aug. 2017

Project Manager & Principal Investigator NSF STTR phase I research grant (\$225,000)

- Conducted market analysis to identify potential target capabilities to exploit market opportunities.
- Coordinated resources and people towards research relevant to develop useful technology, construct detailed process flow diagrams and carry out techno-economic modeling to assess economic viability.
- Developed strategic network to aid commercialization and mitigate gaps in technical capabilities.
- Compiled, analyzed, and prepared final project report providing long and short term economic assessment of the company's technology and assess viability of commercialization options.

Iowa State University, Department of Chemical and Biological Engineering

Post Doctorate Research Fellow

Jan. 2014-Aug. 2016

- Developed new NMR based analytical capabilities to study catalyst fouling in aqueous systems.
- Invented materials synthesis protocol to produce fouling resistant hydrothermal catalyst materials.
- Constructed and operated flow reactors to study catalyst stability, reaction kinetics and selectivity.

Iowa State University, Department of Chemistry (Ames Lab DOE)

Graduate Research Assistant

Jun. 2010-Jan. 2014

- Utilized Advanced solid state NMR techniques to characterize functionalized carbon materials.
- Invented a scalable synthesis platform to produce functionalized carbon materials.
- Characterized noble metal catalyst poisoning from biogenic impurities.
- Developed robust quantitative ^{13}C NMR cross-polarization pulse sequence. (137 citations)

Washington State University, Department of Biological Systems Engineering

Graduate Research Assistant

Aug. 2007-May 2009

- Investigated hydrothermal biomass pretreatment
- Used pyrolysis GC-MS to characterization of biomass pyrolysis products

University of Oregon Summer Program for Undergraduate Research (SPUR)

Undergraduate Research Assistant (REU)

Jun. 2006-Aug. 2006

- Constructed reporter plasmids for *s.cerevisiae* signal transduction research
- Created and analyzed mutant library for strains deficient in HOG pathway regulation

Minnesota State University, Mankato, Department of Biology

Undergraduate research assistant

Dec. 2003-May 2006

- Constructed plasmid reporter fusion protein constructs to investigate mycobacteria cell entry protein
- Learned various microbiological and molecular biological techniques

Education

Institution	Credits	GPA	Major	Degree
Iowa State University Ames, Iowa 50010	86	3.54	Chemistry	Ph.D. Dec 2014
Washington State University Pullman, Washington 99164	75	3.46	Bioprocessing and Bioproducts Engineering	MS. Aug 2009
Minnesota State University, Mankato, Minnesota 56001	115	3.71	Biochemistry and Biotechnology	BS. May 2007
Bemidji State University Bemidji, Minnesota 56601	60	3.83	General Education	Gen. Ed.

Patent Applications/Invention Disclosures

1. **Johnson, R.L.**, Garcia-Perez, M., Liaw, S., Systems and Processes for Producing Bio-fuels from lignocellulosic materials. (2008) AP 27158-8026US00, Patent Pending.
2. **Johnson, R.L.**, Anderson, J.A., Shanks, B., Schmidt-Rohr, K., FUNCTIONALIZED CARBON MATRIX MATERIALS. Preliminary Patent; submitted 2-25-2014. SLW 900.278US1, ISURF #04178.
3. **Johnson, R.L.**, Levin, E., Alston, Z., Shanks, B., Lawrinenko, M., Saraeian, A., Cheng, Y., Jensen, B., Synthesis of templated carbon-metal carbide nano-composite catalyst supports for applications in condensed phase heterogeneous catalysis. Invention Disclosure Filed August 2017, ISURF #04689

Publications

1. **Johnson, R.L.**, Perras, F., Hannarahan, M.P., Mellmer, M.A., Garrison, T.F., Kobayashi, T., Dumesic, J., Pruski, M., Rossinni, A., and Shanks, B.H. Condensed Phase Deactivation of Solid Bronsted Acids for Dehydration of Fructose to Hydroxymethylfurfural Via Fouling. Accepted *ACS Catalysis*. Oct. 2019
2. Mellmer, M.A., **Johnson, R.L.**, Ma, K., Shanks, B.H., Dumesic, J.A., Effects of Chloride Ions in Acid-Catalyzed Biomass Conversion Reactions in Polar Aprotic Solvents. *Nature Communications*. 10, 2019, 1132
3. Cheng, Y., Pham, H.N., Huo, J., **Johnson, R.L.** ; Datye, A.K., Shanks, B.H. High Activity Pd-Fe Bimetallic Catalysts for Aqueous Phase Hydrogenations. *Molecular Catalysis*. 477 2019
4. Pfennig, T. Chemburkar, A., **Johnson, R.L.**, Ryan, M. Rossini, A.J., Neurock, M., Shanks, B.H. Modulating Reactivity and Selectivity of 2-Pyrone-Derived Bicyclic Lactones through Choice of Catalyst and Solvent. *ACS Catalysis*. 8 (3), 2018, 2450-2463
5. Huo, J., **Johnson, R.L.**, Duan, P., Pham, H., Mendivelso-Perez, D., Smith, E., Datye, A., Schmidt-Rohr, K., Shanks, B., Stability of Pd Nanoparticles on Carbon-Coated Supports under Hydrothermal Conditions. *Catalysis Science and Technology*. 8, 2018, 1151-1160
6. Pfennig, T. **Johnson, R.L.**, Shanks, B., The Formation of *p*-Toluic Acid From Coumalic Acid: A Reaction Network Analysis. *Green Chemistry*. 19, 2017, 3263-3271
7. **Johnson, R.L.**, Hanrahan, M., Mellmer, M., Dumesic, J., Rossini, A., Shanks, B.. The Solvent-Solid Interface of Acid Catalysts Studied by High Resolution MAS NMR. *Journal of Physical Chemistry C*. 121 (32), 2017, 17226–17234
8. Perras, F., Padmos, D.J., **Johnson, R.L.**, Wang, L., Schwartz, T., Kobayashi, T., Horton, H.J., Dumesic, J., Shanks, B., Johnson, D., Pruski, M., Characterizing Substrate-Surface Interactions on Alumina-

Supported Metal Catalysts by DNP-Enhanced Double-Resonance NMR Spectroscopy. *Journal of the American Chemical Society*. 139, 2017, 2702-2709

9. Pfennig, T., Carraher, J.M., Chemburkar, A., **Johnson, R.L.**, Tessonier, J.P., Neurock, M., Shanks, B.H. A New Selective Route Towards Benzoic Acid and Derivatives From Biomass-Derived Coumalic Acid. *Green Chemistry*. 19, 2017, 4879-4888
10. Lawrinenko, M.L., **Johnson, R.L.**, Jing, D., Laird, D., Accelerated Aging of Biochars; Impact On Anion Exchange Capacity. *Carbon*. 103, 2016, 217-227
11. Gardner, D.G., Huo, J., Hoff, T.C., **Johnson, R.L.**, Shanks, B.H., Tessonier, J.P. Insights Into The Hydrothermal Stability of ZSM-5 Under Relevant Biomass Conversion Reaction Conditions. *ACS Catalysis*. 2015, 5, 4418-4422.
12. Pham, H.N., Anderson, A.E., **Johnson, R.L.**, Schwartz, T. J., O'Neill, B. J., Duan, P., Dumesic, J. A., Schmidt-Rohr, K., Datye, A.K. Carbon Overcoating of Supported Metal Catalysts for Improved Hydrothermal Stability. *ACS Catalysis*. 2015, 5, pp 4546-4555.
13. **Johnson, R.L.**, Schwartz, T., Dumesic, J., Schmidt-Rohr, K., Methionine Bound to Pd/ γ -Al₂O₃ Catalysts Studied by Solid-State ¹³C NMR. *Solid State Nuclear Magnetic Resonance*. 72, 2015, 64-72.
14. **Johnson, R.L.**, Perras, A.F., Kobayashi, T., Schwartz, T., Dumesic, J., Shanks, B., Pruski, M. Identifying Low-Coverage Surface Species on Noble Metal Nanoparticles by DNP-NMR. *Chemical Communications*. 52, 2015, 1859-1862.
15. **Johnson, R.L.**, Schmidt-Rohr, K., Quantitative Solid-State ¹³C NMR with Signal Enhancement by Multiple Cross Polarization. *Journal of Magnetic Resonance*. 239, 2014, 44-49.
16. Anderson, J., **Johnson, R.L.**, Schmidt-Rohr, K., Shanks, B., Solid State NMR of Chemical Structure and Hydrothermal Deactivation of Moderate-Temperature Carbon Materials with Acidic SO₃H Sites. *Carbon*. 74, 2014, 333-345.
17. Anderson, J.A., **Johnson, R.L.**, Schmidt-Rohr, K., Shanks, B., Hydrothermal Degradation of Model Sulfonic Acid Compounds: Probing the Relative Sulfur-Carbon Bond Strength in Water. *Catalysis Communications*. 51, 2014, 33-36.
18. **Johnson, R.L.**, Anderson, J.A., Shanks, B., Schmidt-Rohr, K., A simple one-step synthesis of aromatic materials with high concentrations of stable catalytic sites, validated by NMR. *Chemistry of Materials*. 26, 2014, 5523-5532.
19. Schwartz, T., **Johnson, R.L.**, Cardenas, J., Okerlund, A., Da Silva, N., Schmidt-Rohr, K., Dumesic, J., Engineering Catalyst Microenvironments for Metal Catalyzed Hydrogenation of Biologically Derived Platform. *Angewandte Chemie*. 53, 2014, 12718-12722.
20. **Johnson, R.L.**, Anderson, J.A., Shanks, B., Fang, X., Hong, M., Schmidt-Rohr, K. Spectrally Edited 2D ¹³C-¹³C NMR Spectra Without Diagonal Ridge for Characterizing ¹³C-Enriched Low-Temperature Carbon Materials. *Journal of Magnetic Resonance*. 234, 2013, 112-124.
21. Mao, J-D., **Johnson, R. L.**, Lehmann, J., Olk, D. C., Neves, E. G., Thompson, M. L., Schmidt-Rohr, K., Abundant and Stable Char Residues in Soils: Implications for Soil Fertility and Carbon Sequestration. *Environmental Science and Technology*. 46, 2012, 9571-9576.
22. Pham, H. Anderson, A.E., **Johnson, R.L.**, Schmidt-Rohr, K., Datye, A. K. Improved Hydrothermal Stability of Mesoporous Oxides For Aqueous Phase Reactions. *Angewandte Chemie*. 51, 2012, 13163-13167.
23. **Johnson R.L.**, Liaw, S., Ha, S., Lin, S., Garcia-Perez, M., Chen, S. Py-GCMS Studies to Evaluate Hydro-Thermal Pretreatment as a Way to Enhance The Production of Sugars From the Fast Pyrolysis of Wheat Straw. *Energy & Fuels*. 23, 2009, 6242-6252.
24. U. Zaher, Khachatryan, H., Ewing, T., **Johnson, R.L.**, Chen, S., Stockle, C.O. Biomass Assessment for Potential Bio-Fuels Production: Simple Methodology and Case Study. *Journal of Solid Waste Technology and Management*. 36, 2010, 182-192.

Presentations

1. **Johnson, R.L.**, Anderson, J.A., Shanks, B., Schmidt-Rohr, K. "Improvement of Sulfonated Carbon Catalyst Hydrothermal Stability Guided by Advanced Solid State NMR" North American Catalyst Conference, June 2015, Pittsburgh Pennsylvania.
2. **Invited talk** "Use of Solid-State NMR for Condensed Phase Catalyst Applications: Hydrothermal Stability and Solid Liquid Interfaces" 254th ACS National Meeting in Washington, DC August 20-24, 2017.
3. **Johnson, R.L.**, Pfennig, T., Hanrahan, M.P., Ryan, M.J., Shanks, B.H., Rossini, A.J., "Magic Angle Spinning Solid-State NMR of Impregnated Heterogeneous Catalysts." ACS meeting March 2018

Teaching Experience

Assistant Professor, King Fahd University of Petroleum and Minerals. Department of Chemistry:

- Sept 2017-Sept 2018: General chemistry course instructor

Post Doctorate Researcher, Iowa State University, Department of Chemical and Biological Engineering:

- Mentored undergraduate research assistants (1.5 years total)
- REU mentor summer 2017
- RET mentor summer 2017

Graduate Teaching Assistant, Iowa State University. Department of Chemistry:

- General Chemistry 2010-2011 & 2014

Undergraduate Teaching Assistant. Minnesota State University, Mankato. Department of Chemistry:

- Fall 2004-Spring 2006, General and Organic Chemistry.
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