

LOUIS A. MADSEN

Curriculum Vitae

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FACULTY EMPLOYMENT

Virginia Polytechnic Institute and State University, Department of Chemistry

Assistant Professor, August 2006 – July 2012
Associate Professor, August 2012 – July 2019
Professor – August 2019 - present

Deakin University, Melbourne, Australia

Visiting Fellow with Professor Maria Forsyth, *Institute for Frontier Materials*, September 2013 – May 2014

POSTDOCTORAL EXPERIENCE

University of North Carolina at Chapel Hill, Department of Chemistry

Postdoctoral Research Fellow with Professor Edward T. Samulski, March 2002 – July 2006.

Victoria University of Wellington, New Zealand, Department of Physics

Visiting Scientist with Professor Sir Paul T. Callaghan, December 2004 – May 2005.

EDUCATION

California Institute of Technology - Ph.D. in Chemistry with Professor Daniel P. Weitekamp, March 2002.

Thesis: "Force-Detected NMR in a Homogeneous Field: Experiment Design, Apparatus, and Observations."

Grinnell College - BA with Honors in Chemistry. Also completed courses for Physics major. June 1994.

RESEARCH EXPERIENCE AND CURRENT EXPLORATIONS

Professor – *Virginia Tech*

- Understanding and controlling ion-conducting polymer membranes from molecular to macroscopic scales.
- Probing fundamental aspects of ion associations and conduction in ion-dense electrolytes.
- Determining transport/complexation behaviors of polymer-based drug delivery and medical imaging agents.
- Discovery and understanding of a new class of electrolyte materials "molecular ionic composites."

Visiting Scientist – *Victoria University of Wellington*

- Carried out Couette-cell rheological NMR spectroscopy and microimaging of wormlike micelles, and made first observations of shear-induced alignment in a non-ionic block-copolymer micelle solution.

Postdoctoral Research Associate - *University of North Carolina*

- Probed phase order of oxadiazole-core, boomerang-shaped liquid crystals using ^2H NMR. Confirmed that these rigid-core molecules exhibit the previously predicted but unobserved biaxial nematic phase.
- Investigated liquid crystals (*e.g.*, para-quinquephenyl) up to 440°C using custom-built NMR apparatus in order to promote extensions to fundamental theories of liquid crystalline order.

Graduate Research Assistant - *California Institute of Technology*

- Designed and fabricated magnet assemblies, rf pulse system, high vacuum system, software, and associated components for novel force-detected NMR (FDNMR) spectrometer.
- Accomplished first experiments using FDNMR in a homogeneous field, including time-domain FT-NMR, spin echoes, heteronuclear J spectroscopy, and other solids and liquids experiments.
- Designed and fabricated micron-scale NMR detectors at the JPL Microdevices Laboratory.

Chemistry Research Assistant - *Carleton College, Northfield, MN* (Summers 1993 and 1994)

- Designed TOF mass spectrometer for X-ray molecular fragmentation studies and collected coincidence spectra on freons at Aladdin synchrotron (UW-Madison).

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TEACHING EXPERIENCE

Professor – *Virginia Tech, Blacksburg, VA*

- Chemistry 6624 – “Chemical Thermodynamics and Statistical Mechanics” (Fall 2006, 2007, 2008, 2011)
- Chemistry 5124 – “Analytical Spectroscopy” (Spring 2008, 2016, 2018)
- Chemistry 1036 – “General Chemistry” (Spring 2009)
- Chemistry 3615 – “Physical Chemistry: Thermodynamics” (Fall 2009, 2010, 2019)
- Chemistry 6664/5614 – “NMR Methods in Chemistry and Polymer Science” (Spring 2010-2012, 2013, 2015, 2017, 2019)
- Chemistry 3626 – “Physical Chemistry Lab – Quantum, Kinetics, and Spectroscopy” (Fall 2012, 2014-2019)

Graduate Teaching Assistant - *California Institute of Technology, Pasadena, CA*

- “Introduction to Quantum Chemistry” (Spring 1998, Winter and Spring 1999)
- “Basic NMR Spectroscopy” (Winter 1996, 1997, 2000)
- “Advanced Topics in Magnetic Resonance” (Spring 2000).

BROADER OUTREACH, MEDIA, AND DIVERSITY ACTIVITIES

- * Interviewed for the *Washington Post* (Teddy Amenabar and Luz Lazo) for article on battery-powered scooters – appeared June 20, 2019. “*Skip scooter service suspended in D.C., Arlington and Alexandria after fires*”
- * *Materials Research Society (MRS) Bulletin* feature article on *Nature Communications* “Double Helix” article, authored by Dr. Hortense LeFerrand and published May 2019. Title: “*Synthetic polymer forms double helix with high stiffness*”
- * Interview for web-based magazine “*The Verge*” on portable phone batteries – article appeared August 8, 2018.
- * Two interviews on National Public Radio (*NPR*), aired across Virginia
 - ❖ *WVTF* Blacksburg – aired March 31, 2016 (Madsen’s battery technology – Journalist Robbie Harris)
 - ❖ *WCVE* Richmond – aired October 12, 2016 (Samsung Note 7 fires – Journalist Charles Fishburne).
- * Three interviews aired on regional and statewide television news on Samsung phone fires and Madsen’s battery technology
 - ❖ *WDBJ Roanoke* – aired October 12-13, 2016. (Journalist Eamon O’Meara)
 - ❖ *WFXR Roanoke* – aired October 13-14, 2016. (Journalist Sophia Borrelli)
 - ❖ *WLSL Roanoke* – aired October 12-13, 2016. (Journalist Bethany Teague)
- * *VT Collegiate Times* newspaper interview on Madsen’s safe and high energy battery technology – published October 31, 2016.
- * Generation and propagation of K-12 outreach program for hands-on exploratory science. This includes participation in *The Virginia Tech Science Festival*, *KidsTech University*, and *Youths Experiencing Science (YES)* events since 2009, so far reaching more than 3000 kids and their parents in southwest Virginia.

HONORS, AWARDS, AND FELLOWSHIPS

- * John C. Schug Research Award, Department of Chemistry, Virginia Tech, 2013
- *Chemical Communications* Emerging Investigator, 2013
- 2013 Luckhurst-Samulski Prize (Best paper of 2012 in journal *Liquid Crystals*)
- 2012 (December 4) – Scholar of the Week at Virginia Tech
- NSF CAREER Award, 2009
- MAP-MURI ARO SEED Award, 2006
- Dow Graduate Fellowship, 1998-99
- Outstanding Graduate Teaching Assistant Service Award, Caltech, 1999
- NSF Graduate Fellowship, 1995-98

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- Phi Beta Kappa, 1994
- Smith Award for Excellence in Chemistry, Grinnell College, 1994
- Pew Midstates Consortium Summer Research Fellowship, Summer 1993
- Trustee Honor Fellowship, Grinnell College, 1990-1994

FUNDING (> \$3.1M TO MADSEN; > \$12.4M TOTAL)

Current

1. Department of Energy, EERE “*Molecular Ionic Composites: A New Class of Polymer Electrolytes to Enable All Solid-State and High Voltage Li Batteries*” Madsen lead PI, with co-PI Prof. Feng Lin (VT). \$1.0M total. \$506k to Madsen. October 2019 – September 2022.
2. National Science Foundation, CHE 1904852 “*Collaborative Research: Fundamental Basis for Molecular Weight Determination for Ionic Polymers*” With Prof. Ralph Colby (PSU). \$300k. \$120k to Madsen. September 2019 – August 2021.
3. Department of Energy, STTR “*Segmented and Blocky Hydrocarbon Ion Pair Membranes for Fuel Cells*” PI William Harrison, co-PIs Madsen and Robert Moore. \$100k. \$25k to Madsen. July 2019 – March 2020.
4. National Science Foundation, DMR 1810194 “*Multi-Scale Self-Assembled Structure and Properties in Polymeric Molecular Composites*” \$439k. June 2018 – May 2021.
5. 4-VA (State of Virginia) “*Controlling molecular configuration and diffusion in polymeric membranes for water purification and energy applications*” With Prof. Geoff Geise (UVA). \$40k. Madsen part \$10k. July 2018 – May 2020.
6. Institute for Critical Technology and Applied Science (ICTAS) at Virginia Tech seed funding. “*Molecular Ionic Composites (MICs) for Advanced Energy Storage and Conversion Technologies*” \$45k. Madsen part \$18k. Co-PIs Rui Qiao (Mechanical Engineering) and Feng Lin (Chemistry). July 2019 – June 2020.

Previous

1. Department of Energy, STTR “*Segmented and Blocky Proton Conducting Membranes for Solar Fuel Generator Applications*” PI William Harrison, co-PIs Madsen and Robert Moore. \$100k. \$25k to Madsen. February 2019 – November 2019.
2. Institute for Critical Technology and Applied Science (ICTAS) at Virginia Tech seed funding. “*Molecular Ionic Composites (MICs) for Advanced Energy Storage and Conversion Technologies*” \$45k. Madsen part \$10k. Co-PIs Rui Qiao (Mechanical Engineering) and Feng Lin (Chemistry). July 2018 – June 2019.
3. National Science Foundation, CHE 1560240 “*REU Site: Materials Innovation at the Intersection of Food-Energy-Water Systems (MII-FEWS)*” PI Timothy E. Long; Madsen collaborator and co-writer. \$350,000. April 2016 – March 2019.
4. National Science Foundation, DMR 1507764 “*Correlating Transport with Ionomer Membrane Structure from Molecular to Micron Scales*” \$400k. June 2015 – August 2018.
5. National Science Foundation, CHE 1531834 “*MRI: Acquisition of an X-ray Photoelectron Spectrometer for the Development of Materials and Catalysts for Next Generation Energy Solutions*” PI Amanda J. Morris; co-PIs Louis A. Madsen, Peizhen Lu, and Jonathan R. Morris. \$788,360, Madsen part 10%. Sept. 2015 – Aug. 2018.
6. National Science Foundation, CBET 1437831/1437767 “*Collaborative Research: Dynamics and Self-Assembly in Block Copolymer Micelles for Tailored Cargo Delivery*” PI Louis A. Madsen (Virginia Tech); PI Megan L. Robertson (University of Houston). \$330k, Madsen part \$165k. September 2014 – August 2017.

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7. National Science Foundation, DMR 1629290 “*Symposium: NMR Spectroscopy of Polymers and Biobased Materials (at Pacifichem Conference – Honolulu, HI, December 15-20, 2015)*” \$5000. June 2015 – May 2016.
8. National Science Foundation, DMR 0844933 – “*CAREER: Understanding and Controlling Anisotropy and Transport in Ionomers*” \$475k. February 2009 – January 2015.
9. IUPAC International Call in the Chemical Sciences (NSF funded - CHE-1057797) – “*Supramolecular Ion Conducting Membranes*” Total funded for German, French PIs and Madsen \$1.15M, Madsen part \$324k. September 2010 – August 2014.
10. National Science Foundation, DMR 1105895 – “*Polycation Beacons for Multiscale and Multimodal Imaging of Nucleic Acid Delivery*” \$420k. PI Theresa M. Reineke; co-PI Madsen (\$129k). Sept 2011 – Aug 2014.
11. ICTAS BioNano Seed Funding (Virginia Tech) – “*Transport Properties of Sensitive Nanocluster MRI Contrast Agents*” PI Madsen, co-PI Judy S. Riffle, \$45k total, Madsen part \$22k. October 1, 2012 – May 30, 2013.
12. Army Research Office - “*Ionic Liquids in Electro-Active Devices (ILEAD)*” MURI, \$6.25M over 5 yrs
Lead PI: T. Long in Chemistry at VT, Madsen co-writer and subcontractor at \$70k/yr (\$350k). August 2007 – July 2012.
13. Dow Chemical Company – “*Exploring Fundamental Interactions of Rheology Modifiers with Latex Surfaces using Rheo-NMR*” \$110k. May 2010 – April 2012.
14. American Chemical Society – Petroleum Research Fund (ACS-PRF) – “*Solute Morphology and Transport in Polymeric Fuel Cell Materials*” \$48,000 (Type G award + summer supplmt.). September 2007 – August 2010.
15. Arkema/DOE grant “*Polyelectrolytes for Low Cost PEMFCs*” Madsen subcontractor under Prof. James E. McGrath to study transport in aromatic fuel cell membranes. \$20k postdoc salary (Dr. Jing Li), 2009.
16. Army Research Office - “*Macromolecular Architecture for Performance (MAP)*” MURI, \$5M over 5 yrs
Lead PI: T. E. Long in Chemistry at VT, Madsen subcontractor - \$64k from July 2006 to November 2007.

GRADUATE STUDENTS AND POSTDOCS MENTORED

Previous (8 PhD, 3 MS, 3 postdocs)

1. Jianbo Hou (PhD in Chemistry 2012; postdoc at PNNL 2012-2013; currently Research Scientist at Dow Chemical in Midland, MI)
2. Kyle Wilmsmeyer (PhD in Chemistry 2012; currently Research Scientist at Grain Processing Corporation in Muscatine, IA)
3. Zhiyang Zhang (PhD in Chemistry 2013; currently statistics instructor at VT)
4. Kacey B. McCreary (MS in Chemistry 2012; currently Research Scientist at Flotek in Bedford, VA)
5. Xiaoling (Cocoa) Wang (PhD in Chemistry 2015; currently postdoc at the National High Magnetic Field Lab)
6. Ying Chen (PhD in Chemistry 2015; currently postdoc at Pacific Northwest National Lab)
7. Yongzheng Huang (MS in Chemistry 2015)
8. Bryce E. Kidd (PhD in Chemistry 2016; postdoc at Southern Illinois University, Carbondale, IL 2016-2018; currently Research Scientist at 3B Analytical in Portland, OR)
9. Ying Wang (PhD in Macromolecular Science and Engineering 2016; postdoc at Lawrence Berkeley National Lab 2016-2017; currently Data Scientist at Hughes Network Systems in Germantown, MD)
10. Lam M. Thieu (MS in Macromolecular Science and Engineering 2017, currently in Entrepreneurial degree program at Ryerson University, Canada)
11. Xiuli Li (PhD in Chemistry 2019; Research Scientist in Department of Chemistry, U. Florida, Gainesville, FL)

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12. Jing Li (Postdoc June 2008 – Dec 2010; currently research scientist at IFF in Ocean City, NJ)
13. Mark D. Lingwood (Postdoc May 2011 – July 2012; currently Assoc. Prof. at St. Mary's College, Moraga, CA)
14. Mithun Goswami (Postdoc Nov 2013 – Jan 2014; currently research scientist at DSM Corp. in The Netherlands)

Current PhD students

1. Andrew Korovich (PhD in Chemistry expected 2020)
2. Curt Zanelotti (PhD in Chemistry expected 2020)
3. Rui Zhang (PhD in Chemistry expected 2020)
4. Deyang Yu (PhD in Macromolecular Science and Engineering expected 2021)
5. Shravan Uppala (PhD in Chemistry expected 2022)
6. Nicholas Pietra (PhD in Macromolecular Science and Engineering expected 2024)
7. Syeda Anam Bukhari (PhD in Chemistry expected 2024)

PEER-REVIEWED PUBLICATIONS

(*Google Scholar: h-index = 28 and >2500 citations; ISI Web of Science: h-index = 24 and >1850 citations*)

1. "Relating Geometric Nanoconfinement and Local Molecular Environment to Diffusion in Ionic Polymer Membranes" Rui Zhang, Ying Chen, Diego Troya, and Louis A. Madsen. *Under review in Macromolecules*.
2. "Shear-Induced Gelation of a Liquid Crystalline Polyelectrolyte" Ryan J. Fox, Maruti Hegde, Amar S. Kumbhar, Edward T. Samulski, Louis A. Madsen, Stephen J. Picken, and Theo J. Dingemans. *Under review in ACS Macro Letters*.
3. "Ion Transport and Mechanical Properties of Non-Crystallizable Molecular Ionic Composite Electrolytes" Joshua E. Bostwick*, Curt J. Zanelotti*, Ciprian Iacob, Andrew Korovich, Louis A. Madsen, Ralph H. Colby. *In press in Macromolecules*. (* authors contributed equally)
4. "Strong Graphene Oxide Nanocomposites from Aqueous Hybrid Liquid Crystals" Maruti Hegde, Lin Yang, Francesco Vita, Ryan J. Fox, Renee van de Watering, Ben Norder, Ugo Lafont, Oriano Francescangeli, Louis A. Madsen, Stephen J. Picken, Edward T. Samulski, Theo J. Dingemans. *In press in Nature Communications*.
5. "Confined Interlayer Water Promotes Structural Stability for High-Rate Electrochemical Proton Intercalation in Tungsten Oxide Hydrates" James B. Mitchell, Natalie R. Geise, Alisa R. Paterson, Naresh C. Osti, Yangyunli Sun, Simon Fleischmann, Rui Zhang, Louis A. Madsen, Michael F. Toney, De-en Jiang, Alexander I. Kolesnikov, Eugene Mamontov, Veronica Augustyn. *ACS Energy Letters* (2019) 4, 12, 2805-2812. doi: 10.1021/acsenerylett.9b02040.
6. "Nanofibrillar Ionic Polymer Composites Enable High-Modulus Ion-Conducting Membranes" Ryan J. Fox, Deyang Yu, Maruti Hegde, Amar S. Kumbhar, Louis A. Madsen, Theo J. Dingemans. *ACS Applied Materials and Interfaces*. (2019) 11, 43, 40551-40563. doi: 10.1021/acсами.9b10921.
7. "Exploring ideality and reality in a prototypical rodlike nematic liquid crystal" Louis A. Madsen, Theo J. Dingemans, Chi-Duen Poon, and Edward T. Samulski. *Liquid Crystals* (2019). *Published online 9/18/19*. doi: 10.1080/02678292.2019.1662107.
8. "Double Helical Conformation and Extreme Rigidity in a Rodlike Polyelectrolyte" Ying Wang, Yadong He, Zhou Yu, Jianwei Gao, Stephanie ten Brinck, Carla Slebodnick, Gregory B. Fahs, Curt J. Zanelotti, Maruti Hegde, Robert B. Moore, Bernd Ensing, Theo J. Dingemans, Rui Qiao, and Louis A. Madsen. *Nature Communications* (2019) 10, 801. doi: 10.1038/s41467-019-08756-3.
9. "Detection of the Order-to-Disorder Transition in Block Copolymer Electrolytes Using Quadrupolar ⁷Li NMR Splitting" Lorena S. Grundy, Gurmukh K. Sethi, Michael D. Galluzzo, Whitney S. Loo, Jacqueline A.

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- Maslyn, Alexander A. Teran, Jacob L. Thelen, Ksenia Timachova, Jeffrey A. Reimer, Louis A. Madsen, and Nitash P. Balsara. *ACS Macro Letters* (2019) 8, 107-112. doi:10.1021/acsmacrolett.8b00809.
10. "Multiscale Tortuous Diffusion in Anion and Cation Exchange Membranes" Lam M. Thieu, Liang Zhu, Andrew G. Korovich, Michael A. Hickner, and Louis A. Madsen. *Macromolecules* (2019) 52, 24-35. doi:10.1021/acs.macromol.8b02206.
 11. "Influence of rubbery vs. glassy backbone dynamics on multiscale transport in polymer membranes" Kevin Chang,* Andrew Korovich,* Tianyi Xue, William A. Morris, Louis A. Madsen and Geoffrey M. Geise. *Macromolecules* (2018) 51, 9222–9233. doi:10.1021/acs.macromol.8b01830. (* authors contributed equally)
 12. "Mapping Coexistence Phase Diagrams of Block Copolymer Micelles and Free Unimer Chains" Xiuli Li, Tyler J. Cooksey, Bryce E. Kidd, Megan L. Robertson and Louis A. Madsen. *Macromolecules* (2018) 51, 8127-8135. doi:10.1021/acs.macromol.8b01220.
 13. "Polymerized Ionic Liquids: Effect of Counter-Anion on Ion Conduction and Polymerization Kinetics" Mingtao Chen, Jason W. Dugger, Xiuli Li, Yangyang Wang, Rajeev Kumar, Kelly M. Meek, David W. Uhrig, Louis A. Madsen, Timothy E. Long, and Bradley S. Lokitz. *Journal of Polymer Science A* (2018) 56, 1346-1357. doi:10.1002/pola.29015.
 14. "Anisotropic Viscoelasticity and Molecular Diffusion in Nematic Wormlike Micelles" Kyle G. Wilmsmeyer, Xiuli Li, and Louis A. Madsen. *Liquid Crystals* (2018) 45, 844-856. doi:10.1080/02678292.2017.1390792.
 15. "Anisotropic Ion Diffusion and Electrochemically Driven Transport in Nanostructured Block Copolymer Electrolytes" Ksenia Timachova, Irune Villaluenga, Lisa Cirrincione, Mallory Gobet, Rajashree Bhattacharya, Xi Jiang, John Newman, Louis A. Madsen, Steven G. Greenbaum, and Nitash P. Balsara. *Journal of Physical Chemistry B* (2018) 122, 1537-1544. doi: 10.1021/acs.jpcc.7b11371.
 16. "Bottom-Up Fabrication of Nanostructured Bicontinuous and Hexagonal Ion-Conducting Polymer Membranes" Jaime J. Hernandez, Heng Zhang, Ying Chen, Martin Rosenthal, Mark D. Lingwood, Mithun Goswami, Xiaomin Zhu, Martin Moeller, Louis A. Madsen, and Dimitri A. Ivanov. *Macromolecules* (2017) 50, 5392–5401. doi: 10.1021/acs.macromol.6b02674.
 17. "Tuning Biocompatible Block Copolymer Micelles by Varying Solvent Composition: Dynamics and Populations of Micelles and Unimers" Bryce E. Kidd, Xiuli Li, Rachele C. Piemonte, Tyler J. Cooksey, Avantika Singh, Megan L. Robertson, and Louis A. Madsen. *Macromolecules* (2017) 50, 4335–4343. doi: 10.1021/acs.macromol.6b02579.
 18. "Tuning Biocompatible Block Copolymer Micelles by Varying Solvent Composition: Core/Corona Structure and Solvent Uptake" Tyler J. Cooksey, Avantika Singh, Kim Mai Le, Shu Wang, Elizabeth G. Kelley, Lilin He, Sameer Vajjala Kesava, Enrique D. Gomez, Bryce E. Kidd, Louis A. Madsen, and Megan L. Robertson. *Macromolecules* (2017) 50, 4322–4334. doi: 10.1021/acs.macromol.6b02580.
 19. "Conformational Dynamics in an Organic Ionic Plastic Crystal" Liyu Jin, Kate M. Nairn, Chris D. Ling, Haijin Zhu, Luke A. O'Dell, Jiaye Li, Fang fang Chen, Adriano F. Pavan, Louis A. Madsen, Patrick C. Howlett, Douglas R. MacFarlane, Maria Forsyth, and Jennifer M. Pringle. *Journal of Physical Chemistry B* (2017) 121, 5439–5446. doi: 10.1021/acs.jpcc.7b02780.
 20. "Molecular Structure and Dynamics of Ionic Liquids in a Rigid-Rod Polyanion-Based Ion Gel" Zhou Yu, Yadong He, Ying Wang, Louis A. Madsen, and Rui Qiao. *Langmuir* (2017) 33, 322–331. doi: 10.1021/acs.langmuir.6b03798.
 21. "Highly Conductive and Thermally Stable Ion Gels with Tunable Anisotropy and Modulus" Ying Wang, Ying Chen, Jianwei Gao, Hyun Gook Yoon, Liyu Jin, Maria Forsyth, Theo J. Dingemans and Louis A. Madsen. *Advanced Materials* (2016) 28, 2571–2578. doi: 10.1002/adma.201505183.

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22. “Synthesis of a Polycation Containing Trehalose and Lanthanide Chelate Domains: A theranostic vehicle for siRNA delivery and monitoring” Lian Xue, Sneha S. Kelkar, Xiaoling Wang, Jie Ma, Louis A. Madsen and Theresa M. Reineke. *RSC Advances* (2015) 5, 74102-74106. doi: 10.1039/C5RA14325J.
23. “Sulfonimide-containing Triblock Copolymers for Improved Conductivity and Mechanical Performance” Chainika Jangu, Alice M. Savage, Zhiyang Zhang, Alison R. Schultz, Louis A. Madsen, Frederick L. Beyer, and Timothy E. Long. *Macromolecules* (2015) 48, 4520–4528. doi: 10.1021/acs.macromol.5b01009.
24. “A New Interleukin-13 Amino-Coated Gadolinium Metallofullerene Nanoparticle for Targeted MRI Detection of Glioblastoma Tumor Cells” Tinghui Li, Susan Murphy, Boris Kiselev, Kanwarpal Bakshi, Jianyuan Zhang, Amnah Eltahir, Yafen Zhang, Ying Chen, Jie Zhu, Richey Davis, Louis A. Madsen, Jonathan R. Morris, Daniel Karolyi, Stephen LaConte, Zhi Sheng, Harry S. Dorn. *Journal of the American Chemical Society* (2015) 137, 7881-7888. doi: 10.1021/jacs.5b03991.
25. “Multiscale Lithium and Counterion Transport Within an Electrospun Polymer-Gel Electrolyte” Bryce E. Kidd, Scott J. Forbey, Friedrich W. Steuber, Robert B. Moore, and Louis A. Madsen. *Macromolecules* (2015) 48, 4481–4490. doi: 10.1021/acs.macromol.5b00573.
26. “Water and sodium transport and morphological anisotropy in a liquid crystal sulfonated aramid membrane” Jianwei Gao, Ying Wang, Ben Norder, Santiago J. Garcia, Stephen J. Picken, Louis A. Madsen, Theo J. Dingemans. *Journal of Membrane Science*. (2015) 489, 194-203. doi: 10.1016/j.memsci.2015.03.090.
27. “Insights into the Reversible Oxygen Reduction Reaction in a Series of Phosphonium-Based Ionic Liquids” Cristina Pozo-Gonzalo, Patrick C. Howlett, Jennifer L. Hodgson, Louis A. Madsen, Douglas R. MacFarlane, and Maria Forsyth. *Physical Chemistry Chemical Physics* (2014) 16, 25062-25070. doi: 10.1039/C4CP04101A.
28. “Anisotropic MRI Contrast Reveals Enhanced Ionic Transport in Plastic Crystals” Konstantin Romanenko, Liyu Jin, Luke A. O'Dell, Louis A. Madsen, Jennifer M. Pringle, and Maria Forsyth. *Journal of the American Chemical Society* (2014) 136, 15638-15645. doi: 10.1021/ja508290z.
29. “Diffusion of Drug Delivery Nanoparticles into Biogels using Time-Resolved MicroMRI” Xiaoling Wang, Ying Chen, Nipon Pothayee, Lian Xue, Theresa M. Reineke, Judy S. Riffle, and Louis A. Madsen. *Journal of Physical Chemistry Letters* (2014) 5, 3825-3830. doi: 10.1021/jz501929u.
30. “Molecular Alignment and Ion Transport in Rigid Rod Polyelectrolyte Solutions” Ying Wang, Jianwei Gao, Theo J. Dingemans, Louis A. Madsen. *Macromolecules* (2014) 47, 2984–2992. doi: 10.1021/ma500364t.
31. “Influence of Zn²⁺ and Water on the Transport and Dynamics of a Pyrrolidinium Dicyanamide-Based Zinc Electrolyte” Tristan J. Simons, Zhiyang Zhang, Paul M. Bayley, Patrick C. Howlett, Douglas R. MacFarlane, Louis A. Madsen, and Maria Forsyth. *Journal of Physical Chemistry B* (2014) 118, 4895–4905. doi: 10.1021/jp501665g.
32. “Humidity-modulated phase control and nanoscopic transport in supramolecular assemblies” Ying Chen, Mark D. Lingwood, Mithun Goswami, Bryce E. Kidd, Jaime J. Hernandez Rueda, Martin Rosenthal, Dimitri A. Ivanov, Jan Perlich, Heng Zhang, Xiaomin Zhu, Martin Möller, and Louis A. Madsen. *Journal of Physical Chemistry B* (2014) 118, 3207–3217. doi: 10.1021/jp409266r.
33. “Observation of Separate Cation and Anion Electrophoretic Mobilities in Pure Ionic Liquids” Zhiyang Zhang and Louis A. Madsen. *Journal of Chemical Physics* (2014) 140, 084204. doi:10.1063/1.4865834. (*J. Chemical Physics* - *Editor's Choice* paper for 2014)

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34. "Cation and Anion Transport in a Dicationic Imidazolium-Based Plastic Crystal Ion Conductor" Bryce E. Kidd, Mark D. Lingwood, Minjae Lee, Harry W. Gibson, and Louis A. Madsen. *Journal of Physical Chemistry B* (2014) 118, 2176–2185. doi: 10.1021/jp4084629.
35. "Gd₃N@C₈₄(OH)_x: A New Egg-Shaped Metallofullerene Magnetic Resonance Imaging Contrast Agent" Jianyuan Zhang, Youqing Ye, Ying Chen, Christopher Pregot, Tinghui Li, Sharavanan Balasubramaniam, David Hobart, Yafen Zhang, Sungsool Wi, Richey M. Davis, Louis A. Madsen, John R. Morris, Stephen M. LaConte, Gordon T. Yee, Harry C. Dorn. *Journal of the American Chemical Society* (2014) 136, 2630-2636. doi: 10.1021/ja412254k.
36. "The Biaxial Nematic Phase of Oxadiazole Biphenol Mesogens" Theo J. Dingemans, Louis A. Madsen, Oriano Francescangeli, Francesco Vita, Demetri J. Photinos, Chi-Duen Poon, and Edward T. Samulski. *Liquid Crystals* (2013) 41, 1655-1677. doi: 10.1080/02678292.2013.824119.
37. "Semi-crystalline and Nano-phase-separated Morphology in Multi-block Poly(arylene sulfide sulfone nitrile)" Dong Won Shin, So Young Lee, Chang Hyun Lee, Kwan-Soo Lee, Chi Hoon Park, James E. McGrath, Mingqiang Zhang, Robert B. Moore, Mark D. Lingwood, Louis A. Madsen, Young Taek Kim, In Cheol Hwang, Young Moo Lee. *Macromolecules* (2013) 46, 7797-7804. doi: 10.1021/ma400889t.
38. "Quantitation of Complexed versus Free Polymers in Interpolyelectrolyte Polyplex Formulations" Xiaoling Wang, Sneha S. Kelkar, Amanda Hudson, Robert B. Moore, Theresa M. Reineke, and Louis A. Madsen. *ACS Macro Letters* (2013) 2, 1038-1041. doi: 10.1021/mz400500q.
39. "Correlating Morphology, Proton Conductivity, and Water Transport in Polyelectrolyte-Fluoropolymer Blend Membranes" Jianbo Hou, Jing Li, David Mountz, Marisa Hull, and Louis A. Madsen. *Journal of Membrane Science* (2013) 448, 292-299. doi:10.1016/j.memsci.2013.08.019.
40. "Hydroxyalkyl-Containing Imidazolium Homopolymers: Correlation of Structure with Conductivity" Michael H. Allen, Sharon Wang, Sean T. Hemp, Ying Chen, Louis A. Madsen, Karen I. Winey, Timothy E. Long. *Macromolecules* (2013) 46, 3037-3045, doi: 10.1021/ma302537f.
41. "Unraveling the local energetics of transport in a polymer ion conductor" Mark D. Lingwood, Zhiyang Zhang, Bryce E. Kidd, Kacey B. McCreary, Jianbo Hou, and Louis A. Madsen. *Chemical Communications* (2013) 49, 4283 – 4285, doi: 10.1039/C2CC37173A.
42. "New Insights for Accurate Chemically Specific Measurements of Slow Diffusing Molecules" J. Hou and L. A. Madsen. *Journal of Chemical Physics* (2013) 138, 054201, doi: 10.1063/1.4789923.
43. "Probing Alignment and Phase Behavior in Intact Wood Cell Walls Using ²H NMR Spectroscopy" S. Chowdhury, L. A. Madsen, and C. E. Frazier. *Biomacromolecules* (2012) 13, 1043-1050, doi: 10.1021/bm201770q.

Publications in next section are before promotion to tenure:

44. "Switchable Bistable Ordering and Real-Time Alignment Dynamics in Wormlike Micelles" K. G. Wilmsmeyer, X. Zhang, and L. A. Madsen. *Soft Matter* (2012) 8, 57-60, dx.doi.org/10.1039/C1SM06634J.
45. "Uniaxial to Biaxial Nematic Phase Transition in a Bent-Core Thermotropic Liquid Crystal" S. J. Picken, T. J. Dingemans, L. A. Madsen, O. Francescangeli, and E. T. Samulski. *Liquid Crystals* (2012) 39, 19-23, **cover article**, dx.doi.org/10.1080/02678292.2011.631593.
46. "Oriented Morphology and Anisotropic Transport in Uniaxially Stretched Perfluorosulfonate Ionomer Membranes" J. K. Park, J. Li, G. Divoux, L. A. Madsen, and R. B. Moore. *Macromolecules* (2011) 44, 5701–5710. dx.doi.org/10.1021/ma200865p.

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47. "Linear Coupling of Alignment with Transport in a Polymer Electrolyte Membrane" J. Li, J. K. Park, R. B. Moore, and L. A. Madsen. *Nature Materials* (2011) 10, 507-511. dx.doi.org/10.1038/NMAT3048. "News and Views" coverage in *Nature Materials*, and additional media coverage, including *US News & World Report*.
 48. "Cation/Anion Associations in Ionic Liquids Modulated by Hydration and Ionic Medium" J. Hou, Z. Zhang, and L. A. Madsen. *Journal of Physical Chemistry B* (2011) 115, 4576-4582. dx.doi.org/10.1021/jp1110899.
 49. "Disulfonated poly(arylene ether sulfone) random copolymer blends tuned for rapid water permeation via cation complexation with poly(ethyleneglycol) oligomers" C. H. Lee, D. VanHouten, O. Lane, J. E. McGrath, J. Hou, L. A. Madsen, J. Spano, S. Wi, J. Cook, W. Xie, H.-J. Oh, G. Geise, B. Freeman. *Chemistry of Materials* (2011) 23, 1039-1049.
 50. "Ion Transport and Storage of Ionic Liquids in Ionic Polymer Conductor Network Composite Actuators" Y. Liu, S. Liu, J. Lin, D. Wang, J. R. Heflin, J. Li, L. A. Madsen, and Q. M. Zhang. *Applied Physics Letters* (2010) 26, 223503.
 51. "Anisotropy and Transport Properties in Poly(arylene ether sulfone) Hydrophilic-Hydrophobic Block Copolymers" J. Hou, J. Li, and L. A. Madsen. *Macromolecules* (2010) 43, 347-353.
 52. "Polymer Beacons for Luminescence and Magnetic Resonance Imaging of DNA Delivery" J. M. Bryson, K. M. Fichter, W.-J. Chu, J.-H. Lee, J. Li, L. A. Madsen, P. M. McLendon, and T. M. Reineke. *Proceedings of the National Academy of Sciences* (2009) 106, 16913-16918.
 53. "The Role of Water in Transport of Ionic Liquids in Polymeric Artificial Muscle Actuators" J. Li, K. G. Wilmsmeyer, J. Hou, and L. A. Madsen. *Soft Matter* (2009) 5, 2596-2602.
 54. "Anisotropic Diffusion and Morphology in Perfluorosulfonate Ionomers Investigated by NMR" J. Li, K. G. Wilmsmeyer, and L. A. Madsen. *Macromolecules* (2009) 42, 255-262.
 55. "Hydrophilic Channel Alignment Modes in Perfluorosulfonate Ionomers: Implications for Proton Transport" J. Li, K. G. Wilmsmeyer, and L. A. Madsen. *Macromolecules* (2008) 41, 4555-4557.
 56. "Rheo-NMR of Wormlike Micelles Formed from Non-Ionic Pluronic Surfactants" B. S. Douglass, R. H. Colby, L. A. Madsen, and P. T. Callaghan. *Macromolecules* (2008) 41, 804-814.
- Publications below are before starting faculty position:***
57. "Uniaxial and Biaxial Nematic Liquid Crystals" T. J. Dingemans, L. A. Madsen, N. A. Zafiroopoulos, W. Lin, and E. T. Samulski *Philosophical Transactions of the Royal Society A: Mathematical, Physical, and Engineering Sciences* (2006) 364, 2681-2696.
 58. "Comment on 'Thermotropic Biaxial Nematic Liquid Crystals' – Reply" L. A. Madsen, T. J. Dingemans, M. Nakata, and E. T. Samulski. *Physical Review Letters* (2006) 96, 219804.
 59. "Plasticization of Poly(ethylene oxide) in Fluid CO₂ Measured by In-Situ NMR" L. A. Madsen*. *Macromolecules* (2006) 39, 1483-1487.
 60. "Addressing Non-Idealities in NMR Experiments on Rotating Liquid Crystals" L. A. Madsen and E. T. Samulski. *Liquid Crystals* (2005) 32, 1419-1425.
 61. "Investigating the Core Moiety of Banana-Shaped Liquid Crystals using ²H NMR Coupled with Quantum Simulations" V. Domenici, L. A. Madsen, E. J. Choi, E. T. Samulski, and C. A. Veracini. *Chemical Physics Letters* (2005) 402, 318-323.

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62. "Observation of Force-Detected Nuclear Magnetic Resonance in a Homogeneous Field" L. A. Madsen, G. M. Leskowitz, and D. P. Weitekamp. *Proceedings of the National Academy of Sciences* (2004) 101, 12804-12808. News coverage in *C&E News*, *Physics Web*, and *Spectroscopy Now*.
63. "Thermotropic Biaxial Nematic Liquid Crystals" L. A. Madsen, T. J. Dingemans, M. Nakata, and E. T. Samulski. *Physical Review Letters* (2004) 92, 145505. Coverage in *C&E News*, *Nature*, and *Phys. Rev. Focus*.
64. "Force-Detected Magnetic Resonance Without Field Gradients" G. M. Leskowitz, L. A. Madsen, and D. P. Weitekamp. *Solid-State Nuclear Magnetic Resonance* (1998) 11, 73-86.

PATENTS

1. "Transverse Fiber Optical Devices for Optical Sensing" L. A. Madsen and D. P. Weitekamp, US Patent No. **6,882,429** (2005).
2. "A Method for Suppressing Noise in Measurements" P. J. Carson, L. A. Madsen, G. M. Leskowitz, and D. P. Weitekamp, US Patent Nos. **6,078,872** and **6,081,119** (2000).

INVITED BOOK CHAPTERS AND PEER-REVIEWED CONFERENCE PROCEEDINGS

1. Invited Book Chapter: "NMR Diffusometry for Study of Energy-Related Soft Materials" by L. A. Madsen and J. Hou, in Diffusion NMR of Confined Systems: Fluid Transport in Porous Solids and Heterogeneous Materials, edited by Prof. Rustem Valiullin, Published by Royal Society of Chemistry (2016). doi: 10.1039/9781782623779-00464.
2. Invited Book Chapter: "Characterization: NMR Spectroscopy" by L. A. Madsen, in Biaxial Nematic Liquid Crystals: Theory, Simulations, and Experiment, edited by Prof. Geoffrey R. Luckhurst and Prof. Timothy J. Sluckin (2015).
3. "Understanding Anisotropy, Transport and Ion Associations Inside Ionic Polymers" J. Hou, J. Li, K. G. Wilmsmeyer, Z. Zhang, L. A. Madsen, in ACS Symposium Series volume 1077 entitled: NMR Spectroscopy of Polymers: Innovative NMR Strategies for Complex Macromolecules. Chapter 15, pg. 251-263 (2011).
4. "Transport of ionic liquids in ionic polymer conductor network composite actuators" Yang Liu, Sheng Liu, Junhong Lin, Dong Wang, Vaibhav Jain, Reza Montazami, James R. Heflin, Jing Li, Louis Madsen and Q. M. Zhang, *Proc. SPIE* 7642, *Electroactive Polymer Actuators and Devices* (EAPAD) (2010), 76421A (April 09, 2010); doi:10.1117/12.847618.
5. "MEMS-based Force-Detected Nuclear Magnetic Resonance Spectrometer for In-Situ Planetary Exploration," T. George, L. Madsen, W. Tang, A. Chang-Chien, G. Leskowitz, and D. Weitekamp. *Aerospace Conference: 2001 IEEE Proceedings*. **1**, 273-278 (2001).

MINOR PUBLICATIONS

1. "Probing Transport Processes from Nanometer to Micron Scales in Self-Organized Ionomers" L. A. Madsen, J. Hou, Z. Zhang, and M. D. Lingwood. *Polymer Preprints* **53**, 449-450 (2012).
2. "Multi-Axis and Multi-Timescale Dynamics in Supramolecular Phases of Ionic Wedge-Shaped Amphiphiles" M. D. Lingwood, B. E. Kidd, and L. A. Madsen. *PMSE Preprints* **106**, 401-402 (2012).
3. "Correlating Ion and Water Transport and Anisotropy in Ionomer Membranes Via NMR Spectroscopy and Diffusion Measurements" J. Hou, J. Li, and L. A. Madsen, *Polymer Preprints* **51**, 419-420 (2010).
4. "Transport and Anisotropy in PEMs with Varying Composition and After Fuel Cell Operation" L. A. Madsen, J. Li, J. Hou, M. A. Yandrasits, and G. M. Haugen, *Polymer Preprints* **51**, 421-422 (2010).

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5. "Probing Transport in Ionomer Membranes Via NMR Anisotropy and Diffusion Measurements" L. A. Madsen, J. Li, and J. Hou, *Polymer Preprints* **50**, 788-789 (2009).
6. "Correlating Ionic Channel Alignment and Water Diffusion Anisotropy in Nafion Using NMR" J. Li, and L. A. Madsen, *Polymer Preprints* **50**, 743-744 (2009).
7. "Hydrophilic Channel Alignment Modes in Ionomers Measured by ^2H NMR" K. G. Wilmsmeyer and L. A. Madsen, *Polymer Preprints* **49**, 687-688 (2008).
8. "Shear and Field Alignment of Cetyl Trimethylammonium Bromide (CTAB) Wormlike Micelles Observed Using Rheo-NMR" K. G. Wilmsmeyer and L. A. Madsen, *Polymer Preprints* **49**, 722-723 (2008).
9. "Plasticization of polyethylene oxide in fluid CO_2 measured by in situ NMR" L. A. Madsen and E. T. Samulski, *PMSE Preprints* **93**, 1034-1035 (2005).
10. "Motion and Phase Behavior of CO_2 -Processed Teflon AF and Copolymers Measured by High Temperature NMR" L. A. Madsen, A. Chao, and E. T. Samulski, *Polymer Preprints* **45**, 517-518 (2004).
11. "A Deuterium NMR Study of Bent-core Liquid Crystals: I. Synthesis and Characterization of Deuterium-labeled Oxadiazole-containing Liquid Crystals" Theo J. Dingemans, Louis A. Madsen, and Edward T. Samulski. NASA ICASE Report No. 2002-37 (2002).

INVITED CONFERENCE TALKS, AND UNIVERSITY AND CORPORATE SEMINARS

1. "Tailoring transport by understanding nanoconfinement effects and harnessing non-covalent interactions" Louis A. Madsen. *Advanced Membranes Workshop (sponsored by ARO)*, University of Pennsylvania, Philadelphia, PA, December 17-18, 2019.
2. "Understanding molecular-scale confinement effects using NMR diffusometry" Louis A. Madsen. *12th Australian and New Zealand Society for Magnetic Resonance (ANZMAG) Conference*, Bunker Bay, Australia, November 24-28, 2019. (keynote presentation)
3. "Understanding polymeric materials from molecular to micron scales with multi-modal NMR" Louis A. Madsen. *Eastern Analytical Symposium (EAS)*, Princeton, NJ, November 18-20, 2019. (keynote presentation)
4. "Confinement Effects on Diffusion in Nanostructured Polymers" Louis A. Madsen. *Materials Sciences Group at Pacific Northwest National Lab (PNNL)*, Richland, WA, October 23, 2019.
5. "Non-flammable solid battery electrolytes based on a charged double helical polymer" *Department of Chemistry, University of Richmond*, Richmond, VA, October 4, 2019.
6. "Confinement Effects on Diffusion in Nanostructured Polymers" Louis A. Madsen, Rui Zhang, Ying Chen, Andrew G. Korovich, Ying Wang, and Diego Troya. *ACS Fall National Meeting (PHYS division)* San Diego, CA, August 25-29, 2019.
7. "Fabricating self-assembled electrolytes and understanding their multi-scale structure and transport" Louis A. Madsen. *Virginia Energy Storage and Conversion Workshop*, Charlottesville, VA, June 24, 2019.
8. "Quantifying tortuosity and diffusion over multiple scales in ionic and non-ionic polymer membranes" Louis A. Madsen. *North American Membrane Society (NAMS) National Meeting*, Pittsburgh, PA, May 11-15, 2019.
9. "Stiff solid ion conductors based on a double helix polyelectrolyte" *Department of Chemical Engineering, Columbia University*, New York, NY, March 26, 2019.

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10. A modular “molecular composite” electrolyte platform based on a double helix polyelectrolyte” *Department of Chemical Engineering and Materials Science, and Nanotechnology Seminar Series, Stevens Institute of Technology, Hoboken, NJ, March 27, 2019.*
11. “Anion/Cation Diffusion Asymmetry, Single-File Diffusion, and Nanoconfinement in Ionic Polymers” Ying Chen, Rui Zhang, Jianbo Hou, Ying Wang, and Louis A. Madsen. *ACS Workshop on Polymers for Fuel Cells, Energy Storage and Conversion.* Pacific Grove, CA, February 23 - 27, 2019.
12. “When is a liquid also a solid? Exploring transport and cohesion in molecular ionic composites” *Department of Applied Physical Sciences, University of North Carolina, Chapel Hill, NC, November 19, 2018.*
13. “Quantifying Contributions to Transport from Molecular to Micron Scales in Ion-Dense Electrolytes” *Department of Chemistry, University of Florida, Gainesville, FL, November 6, 2018.*
14. “Measuring transport on multiple scales in proton- and hydroxide-exchange membranes” *19th Symposium on Solid-State Proton Conductors (SSPC-19)* Stowe, VT, Sept 16-21, 2018.
15. “Double helix polyanion plus ionic liquid: Molecular ionic composites” *ACS Fall National Meeting (POLY division)* Boston, MA, August 19-23, 2018.
16. “Measuring transport on multiple scales in polymeric materials” *ACS Fall National Meeting (PMSE division)* Boston, MA, August 19-23, 2018.
17. “Stiff and conductive electrostatic networks formed from a double helix polyelectrolyte” *Polymer Physics Gordon Research Conference (GRC).* South Hadley, MA, July 22-27, 2018.
18. “Double helix polyanion plus ionic liquid: Molecular ionic composites” *16th International Symposium on Polymer Electrolytes (ISPE-16)* in Yokohama, Japan, June 24-29, 2018. (keynote presentation)
19. “Measuring transport on multiple scales in polymeric materials” *Department of Materials Science and Engineering, The Pennsylvania State University, State College, Pennsylvania, April 6, 2018.*
20. “Molecular ionic composite electrolytes to enable safer and higher energy density batteries” *ACS Spring National Meeting (ENFL division)* New Orleans, LA, March 18-22, 2018.
21. “Measuring multi-scale tortuosity in polymer membranes” *ACS Spring National Meeting (POLY division)* New Orleans, LA, March 18-22, 2018.
22. “Molecular ionic composites: Stiff solids with liquid-like ions inside” *ACS Spring National Meeting (POLY division)* New Orleans, LA, March 18-22, 2018.
23. “Quantifying Contributions to Transport from Molecular to Micron Scales in Ion-Dense Electrolytes” *21st International Symposium on Solid-State Ionics (SSI-21)*, Padova, Italy, June 18-23, 2017.
24. “Correlated liquid + oriented liquid = reinforced liquid: Conduction, alignment, and stiffness in a soft material” *ACS Fall National Meeting*, Washington DC, August 20-24, 2017.
25. “Combining a Kevlar-Like Polymer with Ionic Liquids to Enable Safer and Higher Density Batteries” Ying Wang, Curt J. Zanelotti, Zhou Yu, Yadong He, Ryan J. Fox, Robert Kerr, Maria Forsyth, Rui Qiao, Theo J. Dingemans and Louis A. Madsen. *69th Southeast Regional Meeting of the ACS (SERMACS)*, Charlotte, NC, Nov 8-11, 2017.
26. “Converting a Liquid into a Solid Electrolyte: Molecular Ionic Composites for Advanced Batteries” *2nd Southeast Polymer Forum*, Blacksburg, VA, June 5-7, 2017.

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27. "Safe and High Density Li Batteries: New Technology Outlooks and Enabling Materials" *ATARC Federal Mobile Computing Summit*. Hosted by the Advanced Technology Academic Research Center (ATARC). Marriot Metro Center Hotel, Washington, DC. *Invited visionary keynote speaker*. March 28, 2017.
28. "Understanding Transport and Dynamics in Soft Materials (with NMR!)" *Hyperpolarized MRI Group at MD Anderson Cancer Center, Houston TX*. March 9, 2017.
29. "Combining a Kevlar-like Polymer with Ionic Liquids to Enable Safer and Higher Density Batteries" *Lawrence Berkeley National Lab – The Molecular Foundry, Berkeley, CA*. March 3, 2017.
30. "Combining a Kevlar-like Polymer with Ionic Liquids to Enable Safer and Higher Density Batteries" *IBM Almaden Research Labs, San Jose, CA*. March 2, 2017
31. "Combining a Kevlar-like Polymer with Ionic Liquids to Enable Safer and Higher Density Batteries" *ACS Symposium on Polymers for Fuel Cells, Energy Storage and Conversion*. Pacific Grove, CA February 26 - March 1, 2017.
32. "Combining a Kevlar-like Polymer with Ionic Liquids to Enable Safer and Higher Density Batteries" *Department of Applied Physical Sciences, University of North Carolina, Chapel Hill, NC*. December 13, 2016.
33. "Electrostatic Network Ion Gels Formed from Rigid-Rod Polyelectrolytes and Ionic Liquids" *15th International Symposium on Polymer Electrolytes (ISPE)*. Uppsala, Sweden. Aug 14-19, 2016. (keynote presentation)
34. "Quantifying Contributions to Transport in Ionic Polymers Across Multiple Length Scales" *National Institute of Standards and Technology (NIST), Gaithersburg, MD*, May 16, 2016.
35. "Quantifying Contributions to Transport in Ionic Polymers Across Multiple Length Scales" *American Physical Society March (National) Meeting, Baltimore, MD*, March 14-19, 2016.
36. "Combining a Kevlar-like Polymer with Ionic Liquids to Enable Safer and Higher Density Batteries" *Departments of Physics and Chemistry, Hunter College (CUNY), New York, NY*, March 4, 2016.
37. "Understanding Transport and Structure in Soft Materials from Molecular to Millimeter Scales" *City University of New York (CUNY) Advanced Science Research Center (ASRC), New York, NY*, March 3, 2016.
38. "Using NMR diffusometry and MRI to probe soft materials from molecular to millimeter scales" *Pacificchem 2015, Honolulu, HI*, December 15-20, 2015. (keynote presentation)
39. "Understanding Transport and Alignment in Soft Materials Using Multi-Modal NMR" *Department of Chemistry, Brock University, St. Catherines, ON*, November 13, 2015.
40. "Understanding Transport from Molecular to Micron Scales in Polymeric Ion Conductors" *Department of Chemistry, McMaster University, Hamilton, ON*, November 12, 2015.
41. "Understanding Transport and Alignment in Soft Materials Using Multi-Modal NMR" *Bruker-Biospin Corp. Billerica, MA*, November 2, 2015.
42. "Understanding Transport from Molecular to Micron Scales in Polymeric Ion Conductors" *Harry Allen Symposium, Department of Chemistry, Clark University, Worcester, MA*, October 31, 2015. (keynote presentation)
43. "Diffusion Deconvolved: Quantifying Molecular and Morphological Contributions to Transport in Polymers" *Department of Chemistry, Colorado School of Mines, Golden, CO*, September 11, 2015.

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44. “Deconvolving Molecular and Morphological Contributions to Transport in Polymers” Louis A. Madsen, Ying Chen, Mithun Goswami, Bryce E. Kidd, Ying Wang, Xiaoling Wang, and Mark D. Lingwood. *MI Conference and Review*, Virginia Tech, Blacksburg, VA, April 20-22, 2015.
45. “Understanding transport and alignment in soft materials using multi-modal NMR” Louis A. Madsen, Bryce E. Kidd, Ying Wang, Ying Chen, Mithun Goswami. *New Mexico Regional NMR Conference*, Albuquerque, NM, March 21, 2015. (keynote presentation)
46. “Diffusion Deconvolved: Quantifying Molecular and Morphological Contributions to Transport in Polymers” *Sandia National Lab*, Albuquerque, NM, March 19, 2015.
47. “Transport and Molecular Interactions of Polymer-Based Nanoparticle Theranostic Agents” *Institute for Critical Technologies and Applied Sciences (ICTAS) Bio-Based Materials Center (BBMC)*, Virginia Tech, February 20, 2015.
48. “Understanding Molecular Associations and Transport in Ion-Dense Electrolytes” *UC Berkeley Chemical Engineering Battery Materials Group*, Berkeley, CA, February 14, 2015.
49. Mithun Goswami, Ying Chen, Bryce E. Kidd, Xiaoling Wang, Ying Wang, and Louis A. Madsen. “Diffusion Deconvolved: Quantifying Molecular and Morphological Contributions to Transport in Polymer Membranes” *ACS Symposium: Advances in Polymers for Fuel Cells and Energy Devices*, Pacific Grove, CA, February 8-11, 2015.
50. “Understanding Transport and Molecular Interactions in Ionic Polymer Membranes and Theranostic Agents” *Department of Chemistry, University of Minnesota*, Minneapolis, MN, 1/15/15.
51. “Understanding Molecular Associations and Transport in Ion-Dense Electrolytes” *Department of Materials Science and Engineering, The Pennsylvania State University*, State College, Pennsylvania, 12/9/14.
52. “Understanding transport and alignment in soft materials using multi-modal NMR” *NMR Users Conference, Departments of Chemistry and Polymer Science and Engineering, University of Akron*, Akron, Ohio 10/30/14.
53. “Diffusion Deconvolved: Quantifying Molecular and Morphological Contributions to Transport in Polymers” *Department of Chemistry, University of North Carolina*, Chapel Hill, NC, 10/23/14.
54. “Understanding Water and Ion Transport in Polymer Membranes from Molecular to Micron Scales” *Department of Chemistry, University of Miami*, Miami, FL, 10/03/14.
55. “Understanding transport from molecular to micron scales in polymeric ion conductors” *14th International Symposium on Polymer Electrolytes (ISPE14)*, Geelong, Australia, August 24-29, 2014. (plenary speaker)
56. “Diffusion Deconvolved: Quantifying Molecular and Morphological Contributions to Transport in Polymers” Mithun Goswami, Ying Chen, Bryce E. Kidd, Xiaoling Wang, Ying Wang, and Louis A. Madsen, *248th National ACS Meeting*, San Francisco, CA, August 14-19, 2014
57. “Domain Boundaries, Ion Transport, and Crystallite Alignment in a Dicationic Organic Ionic Plastic Crystal” *Institute for Frontier Materials (IFM), Deakin University*, Melbourne, Australia, April 11, 2014.
58. “Direct Measurement of Cation and Anion Mobilities in Ion-Dense Electrolytes” Zhiyang Zhang and Louis A. Madsen. *International Battery Association Conference (IBA) 2014*, Brisbane, Australia, March 3-7, 2014.
59. “Understanding Molecular Associations and Transport in Ion-Dense Electrolytes” *University of Western Sydney, Nanoscale Organization and Dynamics Seminar*, Sydney, Australia, 4/1/14.

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60. "Understanding Transport and Molecular Interactions in Ion-Dense Organic Conductors" *University of New South Wales, Department of Chemistry, Sydney, Australia, 3/31/14.*
61. "Diffusion and Molecular Associations in Materials via NMR" *Deakin University NMR Workshop, Melbourne, Australia, November, 27, 2013.*
62. "Understanding Transport and Molecular Interactions in Ion-Dense Organic Conductors" *Commonwealth Scientific and Industrial Research Organisation (CSIRO), Melbourne, Australia, November 14, 2013.*
63. "Understanding transport from molecular to micron scales in polymeric ion conductors" Mithun Goswami, Ying Chen, Jianbo Hou, Mark D. Lingwood, Zhiyang Zhang, Bryce E. Kidd, Ying Wang, and Louis A. Madsen. *Asia-Pacific NMR Symposium and ANZMAG, 10/27-11/1/13.*
64. "Understanding Transport from Molecular to Micron Scales in Polymeric Ion Conductors" *Symposium on the Application of SSNMR in Advanced Materials, Tianjin, China, June 8-11, 2013. Invited keynote speaker.*
65. "Multiscale transport and collective interactions in ionic liquids and polymers: Vistas from gradient NMR" Louis A. Madsen, Jianbo Hou, Zhiyang Zhang, Mark D. Lingwood, Ying Wang, and Bryce E. Kidd. *245th National ACS Meeting, New Orleans, LA, April 7-11, 2013.*
66. "Understanding Transport from Molecular to Micron Scales in Nanostructured Ionomers" *Advances in Materials for Proton Exchange Membrane Fuel Cells Systems: ACS Symposium, Pacific Grove, CA 2/17/13 – 2/20/13.*
67. "Understanding transport and collective interactions from nanometer to micron scales in ion-conducting materials" *University of Aachen (RWTH), Aachen, Germany, 1/17/13.*
68. "Understanding transport and collective interactions in ionic polymer membranes and polymeric theranostic agents" *MD Anderson Cancer Center, Houston, TX, 11/9/12.*
69. "Understanding transport and collective interactions in ionic polymer membranes and polymeric theranostic agents" *Department of Chemical Engineering, University of Houston, 11/8/12*
70. "Nanostructured Polymer Membranes and Micellar Solutions" *Kraton Polymers Technical Seminar Series, Houston, TX, 11/7/12.*
71. "Understanding Transport and Collective Interactions from Nanometer to Micron Scales in Ionic Polymers" *Department of Materials Science and Engineering, University of Wisconsin, Madison, WI, 10/11/12.*
72. "Transport and Collective Interactions from Nanometer to Micron Scales in Ionomers" Louis A. Madsen, Jianbo Hou, Zhiyang Zhang, and Mark D. Lingwood. Invited oral presentation. *IUPAC World Polymer Congress, Virginia Tech, Blacksburg, VA, 6/24/12 – 6/29/12.*
73. "Understanding Order and Transport in Supramolecular Wedge-Shaped Amphiphiles" Louis A. Madsen, Mark D. Lingwood, Bryce E. Kidd, Lei Li, Heng Zhang, Xiaomin Zhu, Martin Möller, Jaime J. Hernandez Rueda, and Dimitri A. Ivanov. *IUPAC World Polymer Congress, Virginia Tech, Blacksburg, VA, 6/24/12 – 6/29/12. Invited keynote speaker.*
74. "Understanding Transport and Collective Interactions in Nanostructured Polymers" Louis A. Madsen, Jianbo Hou, Zhiyang Zhang, Jing Li, Mark D. Lingwood, and Bryce E. Kidd. *International Symposium on Polymer Chemistry, Changchun, China, 6/2/12 – 6/4/12.*
75. "Understanding Transport and Collective Interactions in Nanostructured Polymers" *Department of Chemistry, Fudan University, Shanghai, China, 6/12/12.*

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76. "Understanding Transport and Collective Interactions in Macromolecular Systems" *Milliken Corporation Research Center, Spartanburg, SC, 4/23/12.*
77. "Understanding Transport and Collective Interactions in Nanostructured Soft Materials" *University of North Carolina, Department of Chemistry, Chapel Hill, NC, 4/5/12.*
78. "Understanding Mobility and Aggregation in Ionic Liquids" Louis A. Madsen, Jianbo Hou, and Zhiyang Zhang. Invited oral presentation. *243rd National ACS Meeting, San Diego, CA, 3/24/12 – 3/29/12.*
79. "Molecular Associations, Transport, and Anisotropy in Nanostructured Polymer Membranes" *Department of Chemistry, Rutgers University, New Brunswick, NJ, 11/1/11.*
80. "Molecular Associations, Transport, and Anisotropy in Nanostructured Polymer Membranes" *Kraton Polymers Technical Seminar Series, Houston, TX, 10/10/11.*
81. "Understanding Collective Interactions in Nanostructured Soft Materials" *Department of Physics, University of Mulhouse, Mulhouse, France, 9/29/11.*
82. "Understanding Collective Interactions in Nanostructured Soft Materials" *Department of Chemical Engineering Faculty Colloquium, Technical University of Delft, The Netherlands, 9/26/11.*
83. "Understanding Motions in Nanostructured Soft Materials" *Department of Chemistry, Virginia Tech, Blacksburg, VA, 9/16/11.*
84. "Understanding Transport and Anisotropy in Nanostructured Macromolecular Systems" *School of Macromolecular Science and Engineering, Case-Western Reserve University, Cleveland, OH, 2/4/11.*
85. Louis A. Madsen, Jianbo Hou, Jing Li, Zhiyang Zhang, and Kyle G. Wilmsmeyer "Understanding transport and anisotropy in ionic polymers." *Pacifichem, Honolulu, HI, 12/16/10 – 12/21/2010. Invited keynote speaker.*
86. "Understanding Transport and Anisotropy in Nanostructured Soft Materials" *Department of Chemical Engineering, University of California, Berkeley, CA, 9/22/10.*
87. Understanding Conduction and Anisotropy in Nanostructured Soft Materials using Multi-Modal NMR. Invited oral presentation. *3rd International Symposium on the Manipulation of Advanced Smart Materials (ISMASM), Osaka, Japan, 8/31/10 – 9/2/2010. Invited keynote speaker.*
88. "Understanding Wood Structure and Adhesion Using Multi-Modal NMR" *USDA Forest Products Laboratory, Madison, WI, 5/11/10.*
89. Understanding Anisotropy and Transport in Soft Materials via NMR Spectroscopy and Diffusometry. *Washington DC area NMR Meeting (held at National Institutes of Health), 4/16/10.*
90. "Understanding Transport and Anisotropy in Nanostructured Membranes and Fluids." *Department of Polymers, Textiles, and Fiber Engineering, Georgia Institute of Technology, Atlanta, Ga, 3/29/10.*
91. Advanced Analysis of Ionic Polymers for Fuel Cells, Water Desalinization, and Artificial Muscles. *Department of Chemistry, Jackson State University, Jackson, MS, 3/5/10.*
92. What can I do with this ²H nucleus? *2009 Symposium on Oriented Soft Materials, University of North Carolina, Chapel Hill, NC, 10/23/09 – 10/24/09.*
93. Understanding Order and Transport in Nanostructured Soft Materials via NMR Spectroscopy and Diffusometry. *St. Louis Area Magnetic Resonance Group (Headed by Washington University), St. Louis, MO, 11/23/09.*

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94. Molecular Ordering and Dynamics in Sheared Micellar Fluids via Rheo-NMR. *Colloids Group Seminar Series in Chemistry and Chemical Engineering, Virginia Tech, Blacksburg, VA, 12/4/09.*
95. Understanding Molecular Transport and Morphology in Nanostructured Soft Materials. *Department of Chemistry, Southern University of Illinois at Carbondale (SIUC), Carbondale, IL, 9/25/09.*
96. Understanding Ordered Transport Pathways in Nanostructured Soft Materials. *Department of Chemistry, University of Virginia, Charlottesville, VA, 9/18/09.*
97. Louis A. Madsen, Jing Li, and Jianbo Hou. "Probing Transport in Ionomer Membranes Via NMR Anisotropy and Diffusion Measurements." Invited oral presentation. *238th National ACS Meeting, Washington, DC, 8/16/09 – 8/21/09.*
98. Louis A. Madsen, Jianbo Hou, Kyle G. Wilmsmeyer, Jing Li, and Zhiyang Zhang. Relating Transport and Anisotropy in Ionomer-IL Membranes and Actuators. Invited oral presentation. *Conference on Polymers and Ionic Liquids: From Synthesis to Performance, Arlington, VA, 10/5/09-10/6/09.*
99. Designing Polymers for Fuel Cells, Water Desalinization, and Artificial Muscles. *Department of Chemistry, Howard University, Washington, DC, 2/6/09.*
100. Understanding Molecular Order and Transport in Ionic Polymers Using NMR. *3M Corporation, Invited Tech Forum seminar, St. Paul, MN, 6/9/08.*
101. Understanding and Manipulating Polymeric Ion Transport Via NMR Spectroscopy and Diffusometry. *Department of Chemistry, University of California, Riverside, CA, 4/30/08.*
102. Diffusion, Dynamics, and Order in Ionomers Probed Using NMR. *Materials Science and Engineering Department, Pennsylvania State University, State College, PA, 2/12/08.*
103. "Revealing Novel Molecular Order in Soft Materials Using NMR" *Department of Chemistry, Virginia Tech, Blacksburg, VA, 3/21/06.*
104. "Revealing Novel Molecular Order in Soft Materials Using NMR" *Department of Chemistry, University of Pennsylvania, Philadelphia, PA, 1/27/06.*
105. "Revealing Novel Molecular Order in Soft Materials Using NMR" *Department of Chemistry, University of Iowa, Iowa City, IA, 1/5/06.*
106. "Revealing Novel Molecular Order in Soft Materials Using NMR" *Department of Chemistry, North Carolina State University, Raleigh, NC, 1/21/06.*
107. "Revealing Novel Molecular Order in Soft Materials Using NMR" *Department of Chemistry, Rensselaer Polytechnic Institute, Troy, NY, 2/04/06.*
108. "Revealing Molecular Symmetries Using Nuclear Magnetic Resonance" *Department of Physics, Grinnell College, Grinnell, IA, 12/4/05.*
109. "Thermotropic Biaxial Nematic Liquid Crystals" *Departments of Physics and Chemistry, Massey University, Palmerston North, New Zealand, 4/22/05.*
110. "Biaxial Nematic Liquid Crystals Formed from Nonlinear Molecules" *Department of Physics and MacDiarmid Institute for Advanced Materials and Nanotechnology, Victoria University, Wellington, New Zealand, 4/26/05.*
111. "Force Detected NMR in a Homogeneous Field and the Future of Ultrasensitive NMR" *Departments of Medical Physics and Radiology, University of Wisconsin, Madison, WI, 6/2/04.*

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SELECTED ACADEMIC ORGANIZATION ACTIVITIES

1. Symposium co-organizer, fundraiser, and session chair – *ACS Fall National Meeting “Molecular, Electronic and Ionic Transport in Materials for Energy” (PHYS division)* San Diego, CA, August 25-29, 2019.
2. Symposium co-organizer, member of Scientific Advisory Board, and session chair - *16th International Symposium on Polymer Electrolytes (ISPE16)*, Yokohama, Japan, June 24-29, 2018.
3. Symposium co-organizer, fundraiser, and session chair – *ACS Spring National Meeting “International Symposium on Structure and Dynamics of Materials via NMR Methods”* New Orleans, March 18-22, 2018. (80 speakers and 20+ posters, full 5-day symposium at ACS meeting).
4. Focus topic co-organizer and session chair – *APS March National Meeting “Mechanisms of Ionic Conduction and Diffusion in Polymeric Ion Conductors”* Los Angeles, March 4-9, 2018.
5. Symposium co-organizer, fundraiser, and session chair – *69th Southeastern Regional Meeting of the ACS (SERMACS) “NMR of Biomolecules and Macromolecules”* Charlotte, NC, November 7-10, 2017.
6. Member of Scientific Advisory Board - *Solid-State Ionics – SSI* (started serving in 2016, last conference was SSI-21 in Padova, Italy, June 2017)
7. Symposium co-organizer, member of Scientific Advisory Board, and session chair - *15th International Symposium on Polymer Electrolytes (ISPE15)*, Uppsala, Sweden, August 14-19, 2016.
8. Symposium co-organizer, member of Scientific Advisory Board, and session chair - “*NMR Spectroscopy of Polymers and Biobased Materials” Pacificchem Conference*, Honolulu, HI, December 15–20, 2015.
9. Symposium co-organizer, member of Scientific Advisory Board, and session chair - *14th International Symposium on Polymer Electrolytes (ISPE14)*, Geelong, Australia, August 24-29, 2014.
10. Poster judge for *Asia-Pacific NMR Symposium and ANZMAG*, Brisbane, Australia, 10/27-11/1/13.
11. Symposium co-organizer, member of Scientific Advisory Board, and session chair - “*Understanding Complex Macromolecular and Supramolecular Systems using Innovative Magnetic Resonance Strategies” 245th National ACS Meeting*, New Orleans, LA, 4/7/13 – 4/11/13.
12. Session chair, poster judge, and conference co-organizer/volunteer - *IUPAC World Polymer Congress*, Virginia Tech, Blacksburg, VA, 6/24/12 – 6/29/12.
13. Symposium co-chair, focus topic organizer, and session chair - “*Polymers for Energy Storage and Conversion” American Physical Society (APS) March Meeting*, Dallas, TX, 3/21/11 – 3/25/11.
14. Session chair and discussion leader - *3rd International Symposium on the Manipulation of Advanced Smart Materials (ISMASM)*, Osaka, Japan, 8/31/10 – 9/2/2010.
15. Session chair and discussion Leader - *Polymer Physics Gordon Research Conference*, Mt. Holyoke College, South Hadley, MA, 6/27/10 - 7/1/2010.
16. Co-organized and chaired (with Prof. Theo J. Dingemans, *Technical University of Delft*, The Netherlands) *Symposium on Oriented Soft Materials*, University of North Carolina, Chapel Hill, NC, 10/23/09 – 10/24/09.
17. Co-organized and chaired (with Assoc. Prof. Yossef Elabd, *Drexel University*, Philadelphia, PA) *Conference on Polymers and Ionic Liquids: From Synthesis to Performance*, Arlington, VA, 10/5/09-10/6/09.

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OTHER INTERESTS AND ACTIVITIES

- Auto repair and custom fabrication (1987 – present)
 - 1964 Dodge Dart featured in *Popular Hot Rodding* magazine (article by Scott Parkhurst, August 2002), and in *Mopar Action* magazine (April, 2009)
 - 1968 Dodge Dart and 1966 Plymouth Valiant featured in *New River Valley Magazine* (article by Carl Kazacs, September 2017)
 - 1966 Plymouth Valiant “Best in Show” at Spring Auto Show of the *Car Club at Virginia Tech* (04/27/19)
- Rugby player, coach, club officer, captain, and referee (1991 – 2018)
 - Mid-Atlantic Champions and Division III Nat’l Quarterfinalists (6th in US), Blacksburg Rugby Club (2009)
- Jazz saxophonist, vocalist, and band leader/director (1987 – present)
 - Over 445 public performances in small jazz, swing, and rock combos and jazz big bands, with over 310 paid performances