Tomonori Saito

Research Scientist
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Education and Training:

Waseda University, Tokyo, Japan	B.S.	2001	Applied Chemistry
Waseda University, Tokyo, Japan	M.S.	2003	Chemical Engineering
Virginia Tech, Blacksburg, VA	Ph.D.	2008	Chemistry (Organic Polymer)

Research and Professional Experience:

2012 – present R&D Associate, Oak Ridge National Laboratory, Chemical Sciences Division
Lead PI on polymeric gas separation membrane. Technical lead for novel polymer synthesis for CO_2 separation membranes, uranium adsorbents, ion-conducting polymers for batteries, and ionic liquid polymers using living anionic polymerization, ATRP, RAFT, ROMP, conventional free radical polymerization, olefin polymerization, step-growth polymerization, and post-functionalization chemistry. Also technical lead on binder jet 3D printing as well as UV 3D printing.

2010 – 2012 Postdoctoral Associate, Oak Ridge National Laboratory, Materials Science and Technology Division
Designed and developed polyolefin-based carbon fiber, lignin based-carbon fiber, and lignin-based novel thermoplastics

2008 – 2010 Postdoctoral Associate, The Pennsylvania State University, Materials Science and Engineering, Environmental Engineering
Synthesis of novel proton and anion exchange membranes for hydrogen and methanol fuel cells. Served as a material expert in microbial fuel cells in all the components including polymer binder, polymer coating, and membranes.

Dr. Tomonori Saito is a synthetic polymer chemist, who has extensive experience in the synthesis of well-defined polymers via living/controlled polymerization as well as post-modification of various polymers. His expertise has been applied to various projects at ORNL including CO_2 separation membranes, uranium extraction from seawater, ion-conducting polymers for batteries, ionic liquid polymers, polymer nanocomposites, additive manufacturing, polyolefin-based carbon fibers, lignin based-carbon fibers, and lignin-based novel renewable thermoplastics. He has published 47 peer-reviewed manuscripts, 2 patents issued (one was recently licensed.), won R&D 100 in 2012.

Academic Awards and Membership

2012	2012 R&D 100, "HiCap Adsorbents", Christopher J. Janke, Yatsandra Oyola, Sheng Dai, Chris Bauer, Richard Mayes, **Tomonori Saito**, Xiao-Guang Sun, Costas Tsouris, Jim Brang, Jeff Haggard
2006.5	ACS Polymer Division Travel Award – POLY Biennial Meeting
2005.1- 2005.6	MII (**Macromolecules and Interfaces Institute** *at Virginia Tech*) Frontiers in Graduate Research Fellowships
2003.3.5	Best Research Award (Kurita award) in 2003 at 37th Japan Society on Water Environment Conference in Kumamoto, Japan, Mar. 3-7, 2003
2005 -	Member of American Chemical Society (POLY, PMSE)

Research Accomplishments

Peer-reviewed Publications (total 47)

2016

Kunyue Xing, Sabornie Chatterjee, **Tomonori Saito**, Catalin Gainaru, and Alexei P. Sokolov, Impact of Hydrogen Bonding on Dynamics of Hydroxyl-Terminated Polydimethylsiloxane, *Macromolecules*, 2016**,** *49* (8), pp 3138–3147, DOI: 10.1021/acs.macromol.6b00262

Dmitry Voylov,* **Tomonori Saito**,* Bradley Lokitz, David Uhrig, Yangyang Wang, Alexander Agapov, Adam Holt, Vera Bocharova, Alexander Kisliuk, and Alexei P. Sokolov, "Graphene Oxide as a Radical Initiator: Free Radical and Controlled Radical Polymerization of Sodium 4‐Vinylbenzenesulfonate with Graphene Oxide" ACS Macro Lett. 2016, 5, 199−202

Shiwang Cheng, Adam P. Holt, Huiqun Wang, Fei Fan, Vera Bocharova, Halie Martin, Thusitha Etampawala, B. Tyler White, **Tomonori Saito**, Nam-Goo Kang, Mark D. Dadmun, Jimmy W. Mays, Alexei P. Sokolov, "Unexpected Molecular Weight Effect in Polymer Nanocomposites" *PhysRevLett.* 2016, 116, 038302

Sabornie Chatterjee, Vyacheslav Bryantsev, Suree Brown, J. Casey Johnson, Christopher Grant, Richard T. Mayes, Benjamin Hay*, Sheng Dai, **Tomonori Saito*** "Synthesis of Naphthalimidedioxime Ligand-Containing Fibers for Uranium Adsorption from Seawater" *Ind. Eng. Chem. Res.* 2016, 55, 4161−4169,, DOI: 10.1021/acs.iecr.5b03212

Suree Brown*, Sabornie Chatterjee, Meijun Li, Yanfeng Yue, Costas Tsouris, Christopher J. Janke, **Tomonori Saito***, Sheng Dai*, "Uranium Adsorbent Fibers Prepared by Atom-Transfer Radical Polymerization from Chlorinated Polypropylene and Polyethylene Trunk Fibers", *Ind. Eng. Chem. Res.* 2016, 55, 4130−4138, DOI: 10.1021/acs.iecr.5b03667

Suree Brown*, Yanfeng Yue, Li-Jung Kuo, Nada Mehio, Meijun Li, Gary Gill, Costas Tsouris, Richard T. Mayes, **Tomonori Saito***, and Sheng Dai*, "Uranium Adsorbent Fibers Prepared by Atom-Transfer Radical Polymerization (ATRP) from Poly(vinyl chloride)-co-chlorinated poly(vinyl chloride) (PVC-co-CPVC) Fiber" *Ind. Eng. Chem. Res.* 2016, 55, 4139−4148 DOI: 10.1021/acs.iecr.5b03355

2015

Tao Hong, Zhenbin Niu, Xunxiang Hu, Kevin Gmernicki, Shiwang Cheng, Fei Fan, J. Casey Johnson, Eunice Hong, Shannon Mahurin, De-en Jiang, Brian Long, Jimmy Mays, Alexei Sokolov, **Tomonori Saito***, "Effect of Cross-Link Density on Carbon Dioxide Separation in PDMS Norbornene Membranes" *ChemSusChem*, 2015, 8, 3595 – 3604

Tao Hong, Zhenbin Niu, Xunxiang Hu, Kevin Gmernicki, Shiwang Cheng, Fei Fan, J. Casey Johnson, Eunice Hong, Shannon Mahurin, De-en Jiang, Brian Long, Jimmy Mays, Alexei Sokolov, **Tomonori Saito***, Cover and Cover Profile,"Effect of Cross-Link Density on Carbon Dioxide Separation in PDMS Norbornene Membranes", *ChemSusChem*, 2015, 8, 3522, 3524

Sabornie Chatterjee, **Tomonori Saito,** "Lignin-derived Advanced Carbon Materials" *ChemSusChem*, 2015, 8, 3941 – 3958

Sabornie Chatterjee, **Tomonori Saito,** Priyanka Bhattacharya "Lignin-derived Carbon Fibers" *Lignin in Polymer Composites, 1st Edition* Chapter 11, 2015, 207-216

Fei Fan, Yangyang Wang, Tao Hong, Maximilian F. Heres, **Tomonori Saito**, Alexei P. Sokolov, "Ion Conduction in Polymerized Ionic Liquids with Different Pendant Groups", *Macromolecules*, 2015**,** *48* (13), 4461–4470

Ziqi Tian, **Tomonori Saito**, and De-en Jiang,"Ab Initio Screening of CO_2-philic Groups", *J. Phys. Chem. A* 2015, 119 (16), 3848−3852

2014

Gopal K. Mor, David Jones, Thinh P. Le, Zhengrong Shang, Patrick J. Weathers, Megumi K. B. Woltermann, Kiarash Vakhshouri, Bryan P. Williams, Sarah A. Tohran, **Tomonori Saito**, Rafael Verduzco, Alberto Salleo, Michael A. Hickner, Enrique D. Gomez, "Contact Doping with Sub-Monolayers of Strong Polyelectrolytes for Organic Photovoltaics" *Advanced Energy Materials* 2014, *4* (13) 1400439

Sabornie Chatterjee, **Tomonori Saito*,** "Solvent Fractionation of Lignin" *ACS Symposium Series, 1173 Polymer-Derived Carbon*, 2014 Chapter 7, 153-168

Sabornie Chatterjee, **Tomonori Saito,** Orlando Rios, Alexader Johs "Lignin Based Carbon Materials for Energy Storage Applications" *ACS Symposium Series, 1186 Green Technologies for the Environment*, 2014 Chapter 11, 203-218

Tomonori Saito*, Suree Brown, Sabornie Chatterjee, Jungseung Kim, Costas Tsouris, Richard T. Mayes, Li-jung Kuo, Gary Gill, Yatsandra Oyola, Christopher J. Janke, Sheng Dai, "Uranium Recovery from Seawater: Development of Fiber Adsorbents Prepared via Atom-Transfer Radical Polymerization," *Journal of Materials Chemistry A* 2014, *2*, 14674–14681.

Yangyang Wang, Fei Fan, Alexander L. Agapov, **Tomonori Saito**, Jun Yang, Xiang Yu, Kunlun Hong, Jimmy Mays,

Alexei P. Sokolov, "Examination of the fundamental relation between ionic transport and segmental relaxation in polymer electrolytes" *Polymer*, 2014, 55(16), 4067-4076.

Tomonori Saito*, Joshua H. Perkins, Frederic Vautard, Harry M. Meyer, Jamie M. Messman, Balazs Tolnai, and Amit K. Naskar, "Methanol Fractionation of Softwood Kraft Lignin: Impact on the Lignin Properties" *ChemSusChem*, 2014, 7 (1), 221 – 228

2013

Tomonori Saito, Joshua H. Perkins, Daniel C. Jackson, Neil Trammel, Marcus A. Hunt, and Amit K. Naskar, "Development of Lignin-based Polyurethane Thermoplastics" *RSC Advances*, 2013, 3**,** 21832–21840

Jarod M. Younker, **Tomonori Saito**, Marcus A. Hunt, Amit K. Naskar, Ariana Beste, "Pyrolysis Pathways of Sulfonated Polyethylene, an Alternative Carbon Fiber Precursor" *Journal of the American Chemical Society***,** 2013**,** 135 (16), 6130–6141

Jungseung Kim, Costas Tsouris, Richard T. Mayes, Yatsandra Oyola, **Tomonori Saito**, Christopher J. Janke, Sheng Dai, Erich Schneider, and Darshan Sachde, "Recovery of Uranium from Seawater: A Review of Current Status and Future Research Needs", *Separation Science and Technology*, 2013, 48 (3)**,** 367-387

2012

Tomonori Saito, Rebecca H. Brown, Marcus A. Hunt, Deanna L. Pickel, Joseph M. Pickel, Jamie M. Messman, Fredrick S. Baker, Martin Keller and Amit K. Naskar, "Turning Renewable Resources into Value-added Polymer: Development of Lignin-based Thermoplastic" *Green Chemistry*, 2012, 14 (12)**,** 3295-3303, **selected for a journal cover**.

Marcus A. Hunt, **Tomonori Saito**, Rebecca H. Brown, Amar S. Kumbhar, Amit K. Naskar, "Patterned Functional Carbon Fibers from Polyethylene" *Advanced Materials* 2012, 24(18), 2386-2389, **selected for a journal back cover**.

Hengjing Yan, **Tomonori Saito**, John M. Regan, "Nitrogen Removal in a Single-Chamber Microbial Fuel Cell with Nitrifying Biofilm Enriched at the Air Cathode " *Water Research* 2012, 46, 2215-2224.

Jeremy N. Fowler, **Tomonori Saito**, Renlong Gao, Eric S. Fried, Timothy E. Long, David L. Green, "Impact of Diblock Copolymers on Droplet Coalescence, Emulsification, and Aggregation in Immiscible Homopolymer Blends " *Langmuir* 2012, 28(5), 2347-2356.

2011

Tomonori Saito, Timothy H. Roberts, Timothy E. Long, Bruce E. Logan, Michael A. Hickner, "Neutral Hydrophilic Cathode Catalyst Binders for Microbial Fuel Cells" *Energy and Environmental Science* 2011, 4(3), 928-934.

Lu Zhang, Brian L. Chaloux, **Tomonori Saito**, Michael A. Hickner, Jodie L. Lutkenhaus, "Ion Conduction in Poly(ethylene oxide) Ionically Assembled Complexes" *Macromolecules* 2011, 44(24), 9723-9730.

Akshay Kokil, **Tomonori Saito**, Wade DePolo, Casey Elkins, Garth L. Wilkes, Timothy E. Long, "Multiple hydrogen bonding for enhanced mechanical performance of polymer-carbon nanotube composites," *Journal of Macromolecular Science Part A: Pure and Applied Chemistry*, 2011, 48(12), 1016-1021.

Xie He, **Tomonori Saito**, Michael A. Hickner, "Zeta potential of ion-conductive membranes by streaming current measurements," *Langmuir* 2011, 27(8), 4721-4727.

David Lee, **Tomonori Saito**, Alan Benesi, Michael A. Hickner, Harry Allcock,, "Characterization of Water in Proton Conducting Membranes by Deuterium NMR T1 Relaxation," *The Journal of Physical Chemistry B* 2011, 115(5), 776-783.

Valerie J. Watson, **Tomonori Saito**, Michael A. Hickner, Bruce E. Logan, "Polymer Coatings as Separator Layers for Microbial Fuel Cell Cathodes," *Journal of Power Source* 2011, 196(6), 3009-3014.

Fang Zhang, Matthew D. Merrill, Justin C. Tokash, **Tomonori Saito**, Shaoan Cheng, Michael A. Hickner, Bruce E. Logan, "Mesh optimization for microbial fuel cell cathodes constructed around stainless steel mesh current collectors," *Journal of Power Source* 2011, 196(3), 1097-1102.

Tomonori Saito, Maha Mehanna, Xin Wang, Roland Cusick, Yujie Feng, Michael A. Hickner, Bruce E. Logan, "Effect of Nitrogen Addition on the Performance of Microbial Fuel Cell Anodes" *Bioresource Technology* 2011, 102, 395–398.

2010

Maha Mehanna, **Tomonori Saito**, Jingling Yang, Michael Hickner, Xiaoxin Cao, Xia Huang, Bruce. E. Logan "Using microbial desalination cells to reduce water salinity prior to reverse osmosis" *Energy & Environmental Science* 2010, 3(8), 1114-1120.

Hunter D. Moore, **Tomonori Saito**, Michael A. Hickner, "Morphology and Transport Properties of Midblock-sulfonated Triblock Copolymers" *Journal of Materials Chemistry* 2010, 20(30), 6316-6321.

Woo-Sik Jang, **Tomonori Saito**, Michael A. Hickner, Jodie L. Lutkenhaus, "Electrostatic Assembly of Poly(ethylene glycol) Nanotubes" *Macromolecular Rapid Communications* 2010, 31(8), 745-751.

Tomonori Saito, Hunter D. Moore, Michael A. Hickner, "Synthesis of Midblock-Sulfonated Triblock Copolymers" *Macromolecules* 2010, 43(2), 599-601.

Tomonori Saito, Matthew D. Merrill, Valerie J. Watson, Bruce E. Logan, Michael A. Hickner, "Investigation of Ionic Polymer Cathode Binders for Microbial Fuel Cells" *Electrochimica Acta* 2010, 55(9), 3398-3403.

Fang Zhang, **Tomonori Saito**, Shaoan Cheng, Michael A. Hickner, Bruce E. Logan, "Microbial Fuel Cell Cathodes with Poly(dimethylsiloxane) Diffusion Layers Constructed around Stainless Steel Mesh Current Collectors." *Environmental Science & Technology* 2010, 44(4), 1490-1495.

2009 and earlier

Xin Wang, Shaoan Cheng, Yujie Feng, Matthew D. Merrill, **Tomonori Saito**, Bruce E. Logan, "Use of Carbon Mesh Anodes and the Effect of Different Pretreatment Methods on Power Production in Microbial Fuel Cells" *Environmental Science & Technology* 2009, 43(17), 6870-6874.

Tomonori Saito, Brian D. Mather, Philip J. Costanzo, Frederick L. Beyer, and Timothy E. Long, "Influence of Site-Specific Sulfonation on Acrylic Graft Copolymer Morphology" *Macromolecules* 2008, 41(10), 3503-3512.

Tomonori Saito, Kim C. Harich and Timothy E. Long, "Pseudo-Living Anionic Telomerization of 1,3-butadiene," *Macromolecular Chemistry and Physics*, 2008, 209(19), 1983-1991 **Selected for a journal cover**.

Tomonori Saito, Hidetaka Kawakita, Kazuya Uezu, Satoshi Tsuneda, Masao Tamada, "Introduction process of *N*-methylglucamino groups to the polymer brush for binding antimony(III)," *Ars Separatoria Acta*, 2006, 4, 8-17

Tomonori Saito, Hidetaka Kawakita, Kazuya Uezu, Satoshi Tsuneda, Akira Hirata, Kyoichi Saito, Masao Tamada and Takanobu Sugo, "Structure of Polyol-Ligand-Containing Polymer Brush for Antimony(III) Binding," *Journal of Membrane Science* 2004, 236(1-2), 65-71.

Tomonori Saito, Satoshi Tsuneda, Kyoichi Saito, Akira Hirata, Kazuya Uezu, Shin-ya Nishiyama, Kaori Saito, Kazuyuki Sugita, Masao Tamada and Takanobu Sugo, "Removal of Antimony using Polyol-Ligand-Containing Porous Hollow-Fiber Membranes," *Separation Science and Technology*, 2004, 39(13), 3011-3022.

Shin-ya Nishiyama, Kaori Saito, Kyoichi Saito, Kazuyuki Sugita, **Tomonori Saito**, Satoshi Tsuneda, Akira Hirata, Masao Tamada and Takanobu Sugo, "High-speed Recovery of Antimony using Chelating Porous Membrane," *Journal of Membrane Science*, 2003, 214(2), 275-281.

Tomonori Saito, Satoshi Tsuneda, Kyoichi Saito and Akira Hirata, "Treatment of Wastewater Containing Antimony," *Mizu Shori Gijutsu (Water Purification and Liquid Water Treatment)* 2001, 42, (3), 103-111 (in Japanese) highlighted in another journal "Yosui To Haisui".

Preprints (total 14)

He, Xie, Tomonori Saito, Kui Xu, Qing Wang, Michael A. Hickner, "Selective transport properties and water binding in proton exchange membranes," *Preprints of Symposia* 2010, 55(2), 240-242.

Stephanie A. Petrina, Tomonori Saito, Nikolas Podraza, Michael A. Hickner, "Dynamic swelling, morphology, and conductivity in thin ionic block copolymer films," *Polymer Preprints* 2010, 51(2), 176-177.

Sarah k. McIntyre, Todd M.. Alam, Hunter D. Moore, Tomonori Saito, Michael A. Hickner, "Characterization of water dynamics and membrane interactions in midblock-sulfonated triblock copolymers using 2H NMR spectroscopy," *Polymer Preprints* 2010, 51(2), 201-202.

Tomonori Saito, Michael A. Hickner, "Midblock-sulfonated triblock copolymers: Synthesis and properties" *Polymer Preprints* 2009, 50(2), 769-770.

He, Xie, Jinling Yan, Tomonori Saito, Michael A. Hickner, "Selective transport properties and the state of water in anionic and cationic polymer membranes," *Polymer Preprints* 2009, 50(2), 790-791.

Stephanie A. Petrina, Tomonori Saito, Michael A. Hickner, "Morphology and transport of thin films of highly sulfonated poly(styrene)-poly(methyl methacrylate) diblock copolymers", *Polymer Preprints* 2009, 50(2), 773-774.

Renlong Gao, Tomonori Saito, Jeremy Fowler, David Green Timothy E. Long, "Well-defined PEP and PEP-*b*-PDMS copolymers: Synthesis and the impact on PEP/PDMS blends," *Polymer Preprints* 2009, 50(2), 735-736.

Kyle C. Bryson, Tomonori Saito, Michael A. Hickner, "Real-time measurement of dimensional swelling in proton-conductive membranes for fuel cells," *Preprints of Symposia* 2009, 54(2), 589-590.

Woo-Sik Jang, Tomonori Saito, Michael A. Hickner, Jodie L. Lutkenhaus, "Polyethylene oxide nanotubes" *PMSE Preprints* 2009, 101, 899-900.

Tomonori Saito, Brian D. Mather, Frederick L. Beyer, Timothy E. Long, "Does the location of sulfonated blocks matter?: Influence of selective sulfonation in graft copolymer architecture," *Polymer Preprints* 2008, 49(1), 32-33.

Tomonori Saito, Akshay Kokil, and Timothy E. Long, "Self-Complementary Multiple Hydrogen Bonding in Styrene-Butadiene Rubber," *Polymer Preprints* 2008, 49(1), 1066-1067.

Tomonori Saito, Timothy E. Long, "Living Anionic Telomerization of 1,3-butadiene," *Polymer Preprints* 2008, 49 (1), 513-514.

Akshay Kokil, Tomonori Saito, Wade DePolo, Casey Elkins, Garth L. Wilkes, Timothy E. Long, "Multiple hydrogen bonding functionalized carbon nanotubes," *PMSE Preprints* 2008, 98, 212-213.

Tomonori Saito, Brian D. Mather, Frederick L. Beyer and Timothy E. Long, "Influence of Selective Sulfonation on Acrylic Graft Copolymer Morphology," *PMSE Preprints* 2007, 97, 682-683.

Patent

Amit K. Naskar, **Tomonori Saito,** Joseph M. Pickel, Frederick S. Baker, Cliff Eberle, Robert E. Norris, Jr., Jonathan R. Mielenz, "Lignin-Derived Thermoplastic Co-Polymers and Methods of Preparation" U.S. Patent No. 8,748,537 issued: June 10, 2014 ***licensed on March 2015***

Amit K. Naskar, Marcus A. Hunt, **Tomonori Saito,** "Methods for preparation of carbon fibers from polyolefin fiber precursors, and carbon fiber made thereby" US Patent No. 9096955 B2, August 4, 2015.

Tao Hong, Sabornie Chatterjee, Brian K. Long, De-en Jiang, Shannon M. Mahurin, Jimmy W. Mays, Alexei Sokolov, **Tomonori Saito**, "Cross-linked Polymeric Membranes for Carbon Dioxide Separation" Provisional Patent filed, Application number 14826338

Suree Brown, **Tomonori Saito**, Sheng Dai, "Surface-functionalized polyolefin fibers and their use in methods for extracting metal ions from liquid solutions" Provisional Patent filed

Tolga Aytug, Robert C. Duckworth, Keith J Leonard, Parans Mariappan Paranthaman, Georgios Polyzos, **Tomonori Saito**, "Method for producing radiation-resistant polymer composite materials" Provisional Patent filed, Application number 62/105,796