

Tomonori Saito

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Job

Oak Ridge National Laboratory	Oak Ridge, TN, U.S.A.
Distinguished R&D Staff	April 2024 – current
Senior R&D Staff	January 2021 – March 2024
R&D Staff	January 2017 – December 2020
R&D Associate	December 2012 – December 2016
Soft Materials and Membrane Group Chemical Sciences Division	
Postdoctoral Research Associate	August 2010 – November 2012
Polymer Matrix Composites Group Materials Science and Technology Division	

Service

The University of Tennessee, Knoxville	Knoxville, TN, U.S.A.
Joint Faculty (Faculty Advisor) 2019-current	
The Bredesen Center for Interdisciplinary Research and Graduate Education Materials Science and Engineering	

Education

The Pennsylvania State University	University Park PA, U.S.A.
Postdoctoral Research Associate	May 2008 – August 2010
Department of Materials Science and Engineering Department of Civil and Environmental Engineering Research Advisors: Prof. Bruce E. Logan (CEE), Prof. Michael A. Hickner (MATSE)	
Virginia Polytechnic Institute and State University	Blacksburg, VA, U.S.A.
Ph.D. Organic Polymer Chemistry	May 2008
Department of Chemistry Research Advisor: Prof. Timothy E. Long Dissertation: “Synthesis and Characterization of Multiphase Block Copolymers: Influence of Functional Groups in Macromolecular Architecture”	
Waseda University	Tokyo, Japan
M. S. Chemical Engineering	March 2003
B. S. Applied Chemistry	March 2001

Research Expertise

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 polymer upcycling, vitrimers, flow battery, fuel cell membranes, ion-conducting polymers for batteries and battery binders, CO₂ separation membranes, polymer nanocomposites, additive manufacturing, polymer nanoparticles, elastomers, self-healing materials, thermal insulation materials, gas pipeline renewal, uranium extraction from seawater, carbon fiber composites, polyolefin-based carbon fibers, lignin based-carbon fibers, and lignin-based renewable thermoplastics. He has published more than 160 peer-reviewed articles (*h*-index 57), 17 patents issued (many were licensed.), won R&D 100 in 2012, 2016, 2019, 2021, 2024, 2025, and FLC award in 2025, as well as received the inventor of the year by Battelle in 2023, and elected for Battelle distinguished inventor in 2024.

His strength in research relies on the use of his skills in synthetic polymer chemistry to impact material sciences, energy, and chemical & environmental engineering applications. His polymer synthesis experience includes synthesis of block, graft, random copolymers with functional groups using living anionic polymerization, ATRP, RAFT, ROMP, conventional free radical polymerization, step-growth polymerization, and post-functionalization chemistry. His engineering expertise includes design, process and characterization of polymeric materials using various techniques for applications such as 3D printing, thermal insulation materials, renewable/upcycled plastics, carbon fibers, composites, gas pipe rehabilitation, CO₂ separation membranes, fuel cell, flow battery, self-healing materials, elastomers, metal adsorbents, ion-conducting polymers for energy storage, etc..

Current Research Focus

- Polymer Upcycling
- Polymer Composites
- Self-healing and Dynamic Polymers (Vitrimers)
- Polymers with Non-equilibrium States
- Additive Manufacturing (Binger Jet 3D Printing, FDM, DIW)
- Polymer Electrolytes
- Energy Storage (Li-ion Battery, Flow Battery, Fuel Cell)
- Building Materials (Thermal Insulation)
- Adhesives

He current leads projects as a lead PI on 1. Polymer Upcycling (BES), 2. New Frontier in Polymer Matrix Composites via Tailored Vitriemer Chemistry (EERE VTO), 3. Understanding Multi-stage Non-equilibrium States of Soft Matter (LDRD), 4. Robust Membranes and Ionomers for HT PEMFC (EERE HFOT), 5. Mixed Plastic Waste Recycling (DOE OTT TCF). He also has multiple projects as a co-PI and key contributor: 1. Development of facer and facer bonding for

thermal insulation foams, and development of R10 foams (EERE BTO), 2. Self-healing sealants (EERE BTO, and TCF), 3. Preinstall sealants for Prefab Components (EERE BTO), 4. Bio-based Foams (EERE BTO, and TCF), 5. High-Energy-Density, Organic Radical-Mediated Redox Flow Batteries (OE), 5. FaCT EFRC, 6. Bio-based Adhesives for CLTs, and a several other projects.

Research Accomplishments

Peer-reviewed Publications (total 160)

2025

1. Karen P. Cortes-Guzman, Diana Hun, **Tomonori Saito**, and Zoriana Demchuk, “Force-Triggered, Biobased Sealants for Prefabricated Building Components: Toward Improved Efficiency and Performance”, *ACS Sustainable Chem. Eng.* 2025, 13, 41, 17586–17595 **Journal cover**
2. Nicholas J. Galan, Isaiah T. Dishner, Bobby G. Sumpter, Vilmos Kertesz, Nabihan B. Abdul Rahman, Felipe Polo-Garzon, Zoriana Demchuk, **Tomonori Saito*** and Jeffrey C. Foster*, “Upcycling of polyethylene terephthalate to high-value chemicals by carbonate-interchange deconstruction”, *Green Chem.*, 2025, Advance Article, **Journal cover**
3. Jackie Zheng, Nicholas J. Galan, Mairead Boucher, Octavio Jupp, Menisha S. Karunarathna, Jihye Choi, Chethani C.M. Kehelkadu Withanage, Toby L. Nelson, Jeffrey C. Foster, **Tomonori Saito***, “Tailored Glycolysis of Nylon 6 to Enable Upcycling into High-Strength Adhesives” *Cell Reports Physical Science*, 2025, 6, 102928
4. Jackie Zheng[‡], Octavio Jupp[‡], Nicholas J. Galan[‡], Bobby Sumpter, Sheng Dai, Jeffrey C. Foster, **Tomonori Saito***, “Understanding and Tuning Organocatalysts for Versatile Condensation Polymer Deconstruction”, *J. Mat. Chem. A* 2025, 13, 32111, **Journal back cover**
5. Hongwei Li, Qinyu Zhu, Yuya Shinohara, Yangyang Wang, Panagiotis Christakopoulos, Autumn F. Kudlack, Zitan Huang, Peter V. Bonnesen, Changwoo Do, Md Anisur Rahman, Michelle L. Lehmann, **Tomonori Saito**, Ralph H. Colby, Rajeev Kumar*, Jodie L. Lutkenhaus*, “Emergent Nanostructure and Ion Transport in Polyzwitterion/Polyanion Blends” *Macromolecules* 2025, 58, 16, 8658–8669
6. Hamandeep Singh*, Ivan Popov, Michelle L. Lehmann, Md Anisur Rahman, Kenneth S. Schweizer, Rajeev Kumar, **Tomonori Saito**, Alexei P. Sokolov, and Catalin P. Gainaru*, “Revisiting the Role of Mobile Ion Size for the Activation Barrier of Charge Transport in Single Ion Conducting Polymers”, *ACS Appl. Polym. Mater.* 2025, 7, 9661–9668 **Journal Back Cover**
7. Ain Uddin, Michelle Lehmann, Hamandeep Singh, Vera Bocharova, Logan T. Keamey, Joshua T. Damron, Yifan Liu, Valentino R. Cooper, Rajeev Kumar, Kenneth S. Schweizer, Alexei P. Sokolov, **Tomonori Saito***, Catalin Gainaru*, “Unraveling the Pathway towards Superionic Transport in Polymer Electrolytes” *Materials Today*, 88 (2025) 322–327
8. Mary K. Danielson, Bobby G. Sumpter, Zoriana Demchuk, Catalin Gainaru, Chuyi Pan, **Tomonori Saito**, Md Anisur Rahman*, “High-performance reversible adhesive from PET waste for underwater, structural, and pressure-sensitive applications”, *Sci. Adv.* 11, eadw1288 (2025)
9. Shiwanka V. Wanasinghe, Zoriana Demchuk, Achutha Tamrapami, Janak Triwari, Tianli Feng, Catalin P. Gainaru, Bo Kyung Park, Sungjin Kim, Diana Hun, **Tomonori Saito**, and Som S Shrestha*, “Design and Fabrication of Polyisocyanurate Foams toward Significantly Enhanced Thermal Resistivity” *ACS Appl. Eng. Mater.* 2025, 3, 7, 2087–2098
10. Ain Uddin, Michelle L. Lehmann, Tanya Agarwal, Heemin Park, Catalin Gainaru, Lilin He, Alexei P. Sokolov, Yu Seung Kim, and **Tomonori Saito***, “Design of Robust and Versatile Hydrocarbon-based Single-ion Conducting Polymer Electrolytes” *Cell Reports Physical Science* 6, 102712, July 16, 2025
11. Robert L. Sacci, Lingyao Meng, Monojoy Goswami*, Christopher C. Bowland, Jeffrey C. Foster, Holly E. Humphreya, Damilola O. Akamo, Zoriana Demchuk, Md Anisur Rahman, **Tomonori Saito***, Vera Bocharova*, “Corrosion resistant hot melt adhesive to bind metals”, *Composites Part B* 306 (2025) 112793
12. Mary K. Danielson, Catalin Gainaru, Zoriana Demchuk, Chuyi Pan, Jihye Choi, Hong-Hai Zhang, Jeffrey C. Foster, **Tomonori Saito*** and Md Anisur Rahman*, “Closed-Loop Recyclable Vitrimer Plastics from PET Waste: A Design for Circularity” *ChemSusChem* 2025, 18, e202500898, **Journal cover**

13. Michelle L. Lehmann,* Jiyoung Ock, Catalin Gainaru, Alexei P. Sokolov, Xi Chelsea Chen, and **Tomonori Saito***, Single-Ion Conducting Polymer Electrolyte Enabled via Aza-Michael Addition, *Macromolecules* 2025, 58, 9, 4708–4714 **Journal cover**
14. Liqi Qiu, Felipe Polo-Garzon, Luke L. Daemen, Min-Jae Kim, Jinghua Guo, Bobby G. Sumpter, Michael R. Koehler, Carlos Alberto Steren, Tao Wang, Logan T Keamey, **Tomonori Saito**, Zhenzhen Yang,* and Sheng Dai* Polyethylene Upcycling to Liquid Alkanes in Molten Salts under Neat and External Hydrogen Source-Free Conditions, *J. Am. Chem. Soc.* 2025, 147, 16207–16216, **Journal cover**
15. Jong-Ho Choi, Tanya Agarwal, Heemin Park, Jiyoung Jung, Ain Uddin, Su Min Ahn, Jeffrey Michael Klein, Albert S. Lee, Michelle Lehmann, Cy Fujimoto, Eun Joo Park, **Tomonori Saito**, Rod L. Borup, and Yu Seung Kim*, “Performance-Limiting Factors of Hydrocarbon Ionomeric Binders for Fuel Cells and Electrolyzers”, *ACS Energy Lett.* 2025, 10, 2392–2399
16. Jeffrey Foster*, Isaiah Dishner, Joshua Damron, Vilmos Kertesz, Ilya Popovs, **Tomonori Saito**, Towards Efficient Entropic Recycling by Mastering Ring-Chain Kinetics, *Macromolecules* 2025, 58, 5, 2694–2700, **Journal cover**
17. Weixing Min, Lengwan Li, Mingli Wang, Shuaijiang Ma, Hao Feng, Weirong Wang, Hang Ding, Tianhui Cheng, Zhenxi Li, **Tomonori Saito**, Huabin Yang, Peng-Fei Cao, Mastering the Copolymerization Behavior of Ethyl Cyanoacrylate as Gel Polymer Electrolyte for Lithium-metal Battery Application, *Angew. Chem. Int. Ed.* 2025, 64, e202422510
18. Menisha S. Karunaratna, Md Anisur Rahman*, Guang Yang, Catalin Gainaru, Zoriana Demchuk, Christopher C. Bowland, Harry M Meyer III, Natasha Ghezawi, **Tomonori Saito*** “Tough and Circular Glass Fiber Composites via Tailored Dynamic Boronic Ester Interface”, *Mater. Horiz.*, 2025, 12, 788 - 801 **Journal back cover**

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19. Shalini J. Rukmani, Sungjin Kim, Md Anisur Rahman, Xiao Zhao, Alexei P. Sokolov, **Tomonori Saito,*** Loukas Petridis, Jan-Michael Camillo, and Aditya Savara*, “Source of Processable Vitrimers Viscosities: Swap Frequencies and Steric Factors”, *Macromolecules* 2024, 57, 23, 11020–11029
20. Zitan Huang, Michelle L. Lehmann, Amit Bhattacharya, Yifan Liu, Valentino R. Cooper, Raphael J. Clement, **Tomonori Saito**, Michael A. Hickner, and Ralph H. Colby, “Enhanced Anhydrous Proton Conductivity in Azole Phosphonic Acid Mixtures” *ACS Appl. Energy Mater.* 2024, 7, 23, 10826–10833
21. Jeffrey C. Foster,* Joshua T. Damron, Jackie Zheng, Chao Guan, Ilya Popovs, Md. Anisur Rahman, Nicholas J. Galan, Isaiah T. Dishner, and **Tomonori Saito**, “Polyalkenamers as Drop-in Additives for Ring-Opening Metathesis Polymerization: A Promising Upcycling Pathway”, *J. Am. Chem. Soc.* 2024, 146, 48, 33084–33092 **Journal cover, featured in multiple media**
22. Michelle L. Lehmann, **Tomonori Saito**, Mohamed Kamaludeen, and Guang Yang, “Development of Tailored Hydrocarbon-Based Pentablock Copolymer Membranes for Sodium-Polysulfide Flow Batteries”, *Batteries & Supercaps* 2024, e202400401
23. Sungjin Kim*, Catherine Biju, Menisha S. Karunaratna, Niya Y. Grimes, Nadim S. Hmeidat, July Reyes-Zacarias, Shradha Agarwal, Md Anisur Rahman, Dustin B. Gilmer, Brett G. Compton, Steve E. Bullock, **Tomonori Saito***, Corson L. Cramer*, “Tuning Crosslinking of Hybrid Pre-ceramic Polymers in Vat Photopolymerization toward Controlled Ceramic Yields”, *Chemical Engineering Journal* 499 (2024) 156585
24. Ding Ma, Ye Wang, Michele L. Sarazen, Cyrille Boyer, **Tomonori Saito**, Haohong Duan, Wenyu Huang, “Catalysis for plastic deconstruction and upcycling”, *Cell Reports Physical Science* 5, 102209, October 16, 2024 <https://doi.org/10.1016/j.xcrp.2024.102209>
25. S. Shrestha, Z. Demchuk, F. Polo Garzon, A. Tamrapami, J. Damron, D. Howard, **T. Saito**, A.P. Sokolov, D. Hun, C. Gainaru, “An experimental toolbox for the physical characterization of thermal insulating polymeric foams”, *Heliyon* 10 (2024) e36074
26. Ji-young Ock, Amit Bhattacharya, Tao Wang, Catalin Gainaru, Yangyang Wang, Katie L. Browning, Michelle Lehmann, Md Anisur Rahman, Miaofang Chi, Fan Wang, Jong K. Keum, Logan Keamey, **Tomonori Saito**, Sheng Dai, Raphaële J. Clément*, Alexei P. Sokolov*, Xi Chelsea Chen*, “Percolating Interfacial Layers Enhance Conductivity in Polymer-Composite Electrolytes”, *Macromolecules* 2024, 57, 15, 7489–7498
27. Xiao Zhao, Zoriana Demchuk, Jia Tian, Jiancheng Luo, Bingrui Li, Ke Cao, Alexei P. Sokolov, Diana Hun,* **Tomonori Saito***, Peng-Fei Cao*, “Ductile adhesive elastomers with force-triggered ultra-high adhesion strength”, *Mater. Horiz.*, 2024, 11, 969-977

28. Xiaomin Tang, Changhao Liu, Jihua Chen, Rajeev Kumar, Christopher Bowland, **Tomonori Saito**, Brent Dial, Jong Keum*, Changwoo Do*, Xi Chelsea Chen*, “Probing the interface structure of block copolymer compatibilizers in semicrystalline polymer blends”, *J. App. Poly. Sci.*, 2024, e55178
29. Pardeep Kumar, Bobby G. Sumpster, **Tomonori Saito** and Robert J. Davis*, “Importance of hydrogen bonding in Base-Catalyzed transesterification reactions with vicinal diols,” *J. Catal.* 429, 115246 (2024)
30. Dustin Gilmer, Sungjin Kim, Desarae J Goldsby, Peeyush Nandwana, Amy Elliott*, **Tomonori Saito*** “Predictive Binder Jet Additive Manufacturing enabled by Clean Burn-off Binder Design” *Additive Manufacturing* 80, 103955 (2024)

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31. Jeffrey C. Foster*, Jackie Zheng, Md. Arifuzzaman, Md. Anisur Rahman, Joshua T. Damron, Chao Guan, Ilja Popovs, Nick Galan, Zoriana Demchuk, and **Tomonori Saito***, “Closed-loop recycling of semi-aromatic polyesters upcycled from poly(ethylene terephthalate)”, *Cell Reports Physical Sciences*, 2023, 4, 101734
32. Md Anisur Rahman,* Menisha Mahappu Korallalage, Christopher C. Bowland, Guang Yang, Catalin Gainaru, Bingrui Li, Sungjin Kim, Vivek Chawla, Natasha Ghezawi, Harry M Meyer III, Amit K. Naskar, Dayakar Penumadu, Alexei P Sokolov, **Tomonori Saito***, “Tough, Recyclable Carbon-Fiber Composites with Exceptional Interfacial Adhesion via a Tailored Vitrimer-Fiber Interface”, *Cell Reports Physical Science* 2023, 4, 101695, **featured in multiple media**
33. Bingrui Li, Sirui Ge, Xiao Zhao, Qiyi Chen, Jia Tian, Diana Hun, Alexei P. Sokolov, **Tomonori Saito***, Pengfei Cao*, “Well-Tunable, 3D-printable, and Fast Autonomous Self-Healing Elastomers”, *Supramolecular Materials*, 2 (2023) 100042
34. Md. Arifuzzaman, Bobby G. Sumpster, Zoriana Demchuk, Changwoo Do, Mark A. Amould, Md Anisur Rahman, Peng-Fei Cao, Ilja Popovs, Robert J. Davis, Sheng Dai, **Tomonori Saito***, "Selective deconstruction of mixed plastics by a tailored organocatalyst" *Mater. Horiz.*, 2023, 10, 3360–3368 DOI: 10.1039/d3mh00801k **Journal Front Cover, featured in multiple media such as ORNL, Chemistry World, eurekaalert, phys.org, newswise, sciencedaily, sceincetimes, selected for 2024 Materials Horizons HOT Article! and 2023 Materials Horizons Most Popular Articles!**
35. Catalin Gainaru, Rajeev Kumar, Ivan Popov, Md Anisur Rahman, Michelle Lehmann, Eric Stacy, Vera Bocharova, Bobby G. Sumpster, **Tomonori Saito**, Kenneth S. Schweizer, Alexei P. Sokolov, Mechanisms Controlling the Energy Barrier for Ion Hopping in Polymer Electrolytes, *Macromolecules* 2023, 56, 15, 6051–6059
36. Michelle Lehmann, Ethan Self, **Tomonori Saito**, Guang Yang, “Composite Membrane for Sodium Polysulfide Hybrid Redox Flow Batteries”, *Membranes* 13 (8), 700
37. Bingrui Li, Sirui Ge, Sheng Zhao, Kunyue Xing, Alexei P. Sokolov, Peng-Fei Cao* and **Tomonori Saito***, Puncture-Resistant Self-Healing Polymers with Multi-cycle Adhesion and Rapid Healability, *Mater. Horiz.*, 2023, 10, 2868–2875, **Journal Back Cover**
38. Jackie Zheng, Md Arifuzzaman, Xiaomin Tang, Xi Chelsea Chen*, **Tomonori Saito***, Recent Development of End-of-Life Strategies for Plastic in Industry and Academia: Bridging Their Gap for Future Deployment, *Mater. Horiz.*, 2023, 10, 1608–1624 **Journal Back Cover, Materials Horizons Outstanding Review 2023!**
39. Syed Islam, Md. Arifuzzaman, Gemot Rother, Vera Bocharova, Robert Sacci, Jacek Jakowski, Jingsong Huang, Ilia Ivanov, Ramesh Bhave, **Tomonori Saito**, David Sholl, “A Membrane Contactor Enabling Energy-efficient CO₂ Capture from Point Sources with Deep Eutectic Solvents” *Ind. Eng. Chem. Res.*, 2023, 62, 10, 4455–4465 **Journal Cover**
40. Bingrui Li, Peng-Fei Cao, **Tomonori Saito***, Alexei P. Sokolov*, “Intrinsically Self-Healing Polymers: From Mechanistic Insight to Current Challenges”, *Chem. Rev.* 2023, 123, 701–735, **Journal Cover**
41. Michelle Lehmann, Daniel Leonard, Jackie Zheng, Lilin He, Xiaomin Tang, Xi Chelsea Chen, Katie Heeyum Lim, Sandip Maurya, Yu Seung Kim,* and **Tomonori Saito***, Quaternized Polynorbomene Random Copolymers for Fuel Cell Devices, *ACS Appl. Energy Mater.* 2023, 6, 3, 1822–1833
42. Lu Han, Dustin B. Gilmer, Amy Elliott*, **Tomonori Saito***, “Spray coating for washout tooling by binder jet additive manufacturing”, *Composites Part B* 250, 2023, 110436
43. Shilun Gao, Zhenxi Li, Zhen Zhang, Bingrui Li, Xi Chelsea Chen, Guang Yang, **Tomonori Saito**, Ming Tian, Huabin Yang, Peng-Fei Cao, Constructing a Multi-Functional Polymer Network for Ultra-Stable and Safe Li-metal Batteries, *Energy Storage Materials*, 55 (2023) 214–224

44. Jiadeng Zhu, Sheng Zhao, Jiancheng Luo, Wei Niu, Joshua T. Damron, Zhen Zhang, Md Anisur Rahman, Mark A. Amould, **Tomonori Saito**, Rigoberto Advincula, Alexei P. Sokolov, Bobby G. Sumpter, Peng-Fei Cao, “A Novel Dynamic Polymer Synthesis via Chlorinated Solvent Quenched Depolymerization”, *CCS Chem.* 2023, 5, 1841–1853

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45. Daniel P. Leonard, Michelle Lehmann, Jeffrey M. Klein, Ivana Matanovic, Cy Fujimoto, **Tomonori Saito**,* and Yu Seung Kim*, Phenyl-Free Polynorbomenes for Potential Anion Exchange Ionomers for Fuel Cells and Electrolyzers, *Adv. Energy Mater.* 2022, 2203488
46. Jacob Fischer, Lu Han, **Tomonori Saito**, Mark Dadmun, When does a macromolecule transition from a polymer chain to a nanoparticle? *Nanoscale Adv.*, 2022, 4, 5164–5177
47. Zhengping Zhou, Sungjin Kim, Christopher C. Bowland, Bingrui Li, Natasha Ghezawi, Edgar Lara-Curzio, Ahmed Hassen, Amit K. Naskar, Md Anisur Rahman*, **Tomonori Saito***, “Unraveling a Path for Multi-Cycle Recycling of Tailored Fiber-reinforced Vitrimer Composites”, *Cell Reports Physical Science* 3, 101036, 2022, **featured in more than 10 media**
48. Michelle L. Lehmann, Guang Yang, Jagjit Nanda,* **Tomonori Saito***, “Unraveling Ion Transport in Trifluoromethanesulfonimide Pentablock Copolymer Membranes in Nonaqueous Electrolytes” *Macromolecules*, 2022, 55, 7740–7751
49. Lingyao L. Meng, Alexander S. Ivanov, Sungjin Kim, Xiao Zhao, Navin Kumar, Amanda Young-Gonzales, Tomonori Saito, Wim Bras, Kyle Gluesenkamp, and Vera Bocharova*, “Alginate–Sodium Sulfate Decahydrate Phase Change Composite with Extended Stability”, *ACS Appl. Polym. Mater.* 2022, 4, 9, 6563–6571
50. Sungjin Kim, Md Anisur Rahman, Md Arifuzzaman, Dustin B. Gilmer, Bingrui Li, Jackson K. Wilt, Edgar Lara-Curzio, **Tomonori Saito***, Closed-loop Additive Manufacturing of Upcycled Commodity Plastic through Dynamic Crosslinking, *Sci. Adv.* 2022, 8, eabn6006, **featured in more than 20 media such as ORNL, eurekaalert, phys.org, newswise, materials today etc.**
51. Michelle L. Lehmann, Landon Tyler, Ethan C. Self, Guang Yang, Jagjit Nanda*, **Tomonori Saito***, “Membrane Design for Non-Aqueous Redox Flow Batteries: Current Status and Path Forward”, *Chem* 8, 1–26, June 9, 2022
52. Jiancheng Luo, Zoriana Demchuk, Xiao Zhao, **Tomonori Saito**, Ming Tian, Alexei P. Sokolov, Peng-Fei Cao*, “Elastic vitrimers: Beyond thermoplastic and thermoset elastomers” *Matter* 5, 1391–1422, May 4, 2022
53. Guang Yang, Peng-Fei Cao, Ethan C. Self, Michelle Lehmann, Xi Chelsea Chen, Sheng Zhao, Sirui Ge, Chenhui Zhu, **Tomonori Saito**, Frank M. Delnick, Jagjit Nanda, “Selective Plasticization of Poly(ethylene oxide) (PEO) Block in Nanostructured Polystyrene–PEO–Polystyrene Triblock Copolymer Electrolytes” *Journal of The Electrochemical Society*, 2022 169 050506
54. Adrienne K. Blevins, Mengyuan Wang, Michelle L. Lehmann, Leiqing Hu, Shouhong Fan, Christopher M. Stafford, Jason P. Killgore, Haiqing Lin, **Tomonori Saito**, Yifu Ding, Photopatterning of two stage reactive polymer networks with CO₂-philic thiol–acrylate chemistry: enhanced mechanical toughness and CO₂/N₂ selectivity, *Polym. Chem.* 2022, 13, 2495–2505
55. Xiaomin Tang, Changhao Liu, Jong Keum, Jihua Chen, Brent E. Dial, Yangyang Wang, Wan-Yu Tsai, Wim Bras, **Tomonori Saito**, Christopher C. Bowland, X. Chelsea Chen, “Upcycling of semicrystalline polymers by compatibilization: mechanism and location of Compatibilizers”, *RSC Adv.*, 2022, 12, 10886
56. Mohammadreza Mahmoudi, Sungjin Kim, Md. Arifuzzaman, **Tomonori Saito**, Corson L. Cramer, Majid Minary-Jolandan, Processing and 3D printing of SiCN polymer-derived ceramics, *Int. J. Appl. Ceram Technol.* 2022, 19, 939–948

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57. Ye Zhang, Guang Yang, Michelle L. Lehmann, Chaoshan Wu, Lihong Zhao, **Tomonori Saito**, Yanliang Liang, Jagjit Nanda, Yan Yao, “Separator Effect on Zinc Electrodeposition Behavior and Its Implication for Zinc Battery Lifetime,” *Nano Lett.* 2021, 21, 24, 10446–10452
58. Md Anisur Rahman, Christopher Bowland, Sirui Ge, Shree Ram Acharya, Sungjin Kim, Valentino R. Cooper, Xi Chen, Stephan Irl, Alexei Sokolov, Aditya Savara, **Tomonori Saito***, “Design of Tough Adhesive from Commodity Thermoplastics through Dynamic Crosslinking”, *Sci. Adv.* 2021; 7 : eabk2451, **featured in more than 20 media including Newsweek, ORNL, eurekaalert, phys.org, newswire, ritzherald, newsbreak, National Geographic (Russia), Romanian TV and many others.**
59. Dustin B. Gilmer, Lu Han, Michelle L. Lehmann, Derek H. Siddel, Guang Yang, Azhad U. Chowdhury, Benjamin Doughty, Amy M. Elliott*, **Tomonori Saito***, “Additive Manufacturing of Strong Silica Sand Structures enabled by

Polyethyleneimine Binder”, *Nat Comm*, 2021, 12, 5144, **featured in Nat Comm Editor’s highlights, Nat Comm’s additive manufacturing articles’ highlight, featured in multiple media including Mashable, ORNL, Phys.org, Defense Digest, STEM Magazine: Chosen for Top 10 short video by Springer Nature**

60. Corson L. Cramer, Jackson K. Wilt, Quinn A. Campbell, Lu Han, **Tomonori Saito**, Andrew T. Nelson, “Accuracy of stereolithography printed alumina with digital light processing”, *Open Ceramics* 8 (2021) 100194
61. Subama Samanta, Sungjin Kim, **Tomonori Saito**, Alexei P. Sokolov, “Polymers with Dynamic Bonds: Adaptive Functional Materials for Sustainable Future”, *J. Phys. Chem. B* 2021, 125, 33, 9389–9401, **Journal Cover**
62. Martin Tress, Maximilian Vielhauer, Pierre Lutz, Rolf Mülhaupt, Friedrich Kremer, Kunyue Xing, Sirui Ge, Pengfei Cao, **Tomonori Saito**, Alexei Sokolov, “Polymer Dynamics in Nanostructured Environments: Structure-Property Relations Unraveled by Dielectric Spectroscopy”, *ACS Symposium Series* Vol. 1375, Chapter 10 p 223-238
63. Christine Fisher, Bruce J. Wamack, Yongchao Yu, Lydia N. Skolrood, Kai Li, Pooran C. Joshi, **Tomonori Saito**, Tolga Aytug, “All-aerosol-jet-printed highly sensitive and selective polyaniline-based ammonia sensors: a route toward low-cost, low-power gas detection”, *J Mater Sci*, 2021, 56 (22), 12596-12606
64. X. Chelsea Chen, Yiman Zhang, Laura C. Merrill, Charles Soulen, Michelle L. Lehmann, Jennifer L. Schaefer, Zhijia Du, **Tomonori Saito**, Nancy J. Dudney, “Gel composite electrolyte—an effective way to utilize ceramic fillers in lithium batteries”, *J. Mater. Chem. A*, 2021, 9, 6555–6566
65. Guang Yang*, Michelle L. Lehmann, Sheng Zhao, Bingrui Li, Sirui Ge, Peng-Fei Cao, Frank M. Delnick, Alexei P. Sokolov, **Tomonori Saito***, Jagjit Nanda*, Anomalously high elastic modulus of a poly(ethylene oxide)-based composite electrolyte, *Energy Storage Materials* 35 (2021) 431–442
66. Jackson K. Wilt, Dustin Gilmer, Sungjin Kim, Brett G. Compton, **Tomonori Saito***, “Direct Ink Writing Techniques for In-situ Gelation and Solidification”, *MRS Communications*, 2021 (11) 106–121
67. Bingrui Li, Sheng Zhao, Jiadeng Zhu, Sirui Ge, Kunyue Xing, Alexei P. Sokolov, **Tomonori Saito***, Peng-Fei Cao*, “Rational Polymer Design of Stretchable Poly(ionic liquid)s Membranes for Dual Applications”, *Macromolecules* 2021, 54, 896–905, **Journal Cover**
68. Martin Tress, Sirui Ge, Kunyue Xing, Peng-Fei Cao, **Tomonori Saito**, Anne-Caroline Genix, Alexei P. Sokolov, “Turning Rubber into a Glass: Mechanical Reinforcement by Microphase Separation”, *ACS Macro Lett.* 2021, 10, 2, 197–202

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159. 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.
160. **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”.

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1. **Tomonori Saito**, Michelle Lehmann, Jagjit Nanda, High ionic conductivity polymer electrolyte compositions for alkali and beyond alkali metal batteries, US 12,407,020, Sep 2, 2025
2. Diana Hun, Pengfei Cao, Xiao Zhao, Jiancheng Luo, Zoriana Demchuk, **Tomonori Saito**, Preinstalled Sealant for Prefab Components, US Patent No. 12180391, December 31, 2024
3. Diana Hun, Pengfei Cao, **Tomonori Saito**, Zhen Zhang, Bingrui Li, Natasha Ghezawi, Self-Healing Adhesive Composition, US Patent No. 12157845, December 3, 2024
4. **Tomonori Saito**, Zhengping Zhou, Md Anisur Rahman, Recyclable crosslinked polymeric compositions, US Patent No. 11945947, April 2, 2024
5. **Tomonori Saito**, Amy M Elliott, Indirect additive manufacturing process, US Patent No. 11,642,841, May 9, 2023
6. **Tomonori Saito**, Lu Han, Amy M Elliott, Dustin B. Gilmer, Water soluble barrier coatings for washout tooling for a composite layup, US Patent No. 11524427, Dec, 13, 2022
7. Kaushik Biswas, David Lee Wood III, Kelsey M Grady, Natasha B Ghezawi, Pengfei Cao, **Tomonori Saito**, “Roll-to-roll slot die coating method to create interleaving multi-layered films with chemical slurry coatings” US Patent No. 11446915, Sep 20, 2022 *licensed on November 2023*
8. Kaushik Biswas, Pengfei Cao, **Tomonori Saito**, “Self-healing barrier films for vacuum insulation panels”, US Patent No. 11287079, Mar. 29, 2022 *licensed on November 2023*
9. **Tomonori Saito**, Amy M Elliott, Daniel T Brunermer, Dustin Blake Gilmer, Michelle Lehmann, Huayun Yu, “Indirect additive manufacturing process using amine-containing adhesive polymers” US Patent No. 11254617, February 22, 2022, *licensed on 2019*
10. **Tomonori Saito**, Pengfei Cao, “Super-stretchable self-healing polymer” US Patent No. 11,008,461, May 18, 2021
11. **Tomonori Saito**, Pengfei Cao, Jagjit Nanda, “Block graft copolymer binders and their use in silicon-containing anodes of lithium-ion batteries” US Patent No. 11,005,101, May 11, 2021
12. **Tomonori Saito**, Pengfei Cao, Jagjit Nanda, “Crosslinked functional binders and their use in silicon-containing anodes of lithium-ion batteries” US Patent No. 10897045 B2, Jan 19 2021
13. Sheng Dai, Suree Brown, **Tomonori Saito**, “Surface-Functionalized Polyolefin Fibers and Their Use in Methods For Extracting Metal Ions from Liquid Solutions” US Patent No. 10391472, August 27, 2019

14. 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” US Patent No. 9873094, January 23, 2018
15. Amit K. Naskar, Marcus A. Hunt, **Tomonori Saito**, “Methods for preparation of carbon fibers from polyolefin fiber precursor” US Patent No. 9828770, November 27, 2017
16. 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, August 4, 2015
17. 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*

Mentoring History

He currently mentors a few staff members, 3 postdocs, 2 graduate students, and 3 undergraduate students. The list of current and past advisees with current institutions is listed as follows:

Postdoctoral Advisees:

- Dr. Zhenbin Niu, currently at Dow Corning
- Dr. Sabornie Chatterjee, currently at Firmenich
- Dr. Casey Johnson, Amy Research Laboratory, then currently at DuPont
- Dr. Pengfei Cao, a staff at Oak Ridge National Laboratory, then a professor at Beijing University of Chemical Technology
- Dr. Konstantinos Misichronis, currently at BIC
- Dr. Lu Han, currently at Kaneka
- Dr. Md Anisur Rahman, a staff at Oak Ridge National Laboratory
- Dr. Sungjin Kim, a staff Oak Ridge National Laboratory, then an assistant professor at The University of New Mexico
- Dr. Md. Arifuzzaman, a founder of a start-up, Re-Du
- Dr. Menisha S. Karunaratna, currently at UTK
- Dr. Ain Uddin, Oak Ridge National Laboratory, currently at Avery Dennison
- Dr. Ke Cao, Oak Ridge National Laboratory, currently in China
- Dr. Bokyung Park, currently at Huntsman
- Dr. Nick Galan, Oak Ridge National Laboratory
- Dr. Beibei Yao, Oak Ridge National Laboratory
- Dr. Erin Krist, Oak Ridge National Laboratory

Postmaster Advisees:

- Dr. Bingrui Li, graduate school, UTK, then a postdoc at Fudan University
- Ms. Eunice Hong, currently at Acella Performance Materials

Postbachelor Advisees:

- Dr. Tyler White, then graduate school, Virginia Tech
- Dr. Michelle Lehmann, then graduate school, UTK, then a staff at ORNL

Ms. Natasha Ghezawi, currently at graduate school, UTK

Ms. Christine Rukeyser (ECO and GEM), then graduate school at Northwestern University

Graduate Student Advisees:

Dr. Tao Hong, University of Tennessee, Knoxville, currently an assistant professor at Xi'an Jiaotong University

Dr. Michelle Lehmann, University of Tennessee, Knoxville, currently a technical staff member at ORNL

Dr. Dustin Gilmer, University of Tennessee, Knoxville, currently a faculty at University of Tennessee, Knoxville

Dr. Bingrui Li, University of Tennessee, Knoxville, currently a postdoc at Fudan University in China

Dr. Jackie Zheng, University of Tennessee, Knoxville, currently a Senior Consultant for GEP

Ms. Natasha Ghezawi, University of Tennessee, Knoxville

Ms. Jihye Choi, University of Tennessee, Knoxville

Undergraduate Student (SULI or HERE) Advisees (indicating their next career step):

Ms. Sophia Lai, graduate school at Harvard University (SULI from Cornell)

Mr. Tyler White, graduate school at Virginia Tech (SULI from UTK)

Mr. Christopher Scanlon, graduate school at University of Southern Mississippi (SULI from Columbus State)

Mr. Connor Smith (SULI from Cornell)

Mr. Jay Hingu (SULI from New Jersey College)

Mr. Leo Parsons, graduate school at UC Davis (SULI from Cal Poly)

Mr. Dustin Gilmer, graduate school at UTK (SULI and HERE from East Tennessee State)

Ms. Michelle Lehmann, graduate school at UTK (SULI and HERE from UTK)

Mr. Hoang Pham, graduate school at UC Davis (HERE from Colorado College)

Mr. Tony Su, graduate school at Northwestern Univ (HERE from Grinnell College)

Mr. Alex Huynh (SULI from U of Houston)

Ms. Maria Furukawa, SOLVAY (SULI from Georgia Tech), then graduate school at UNC Chapel Hill

Mr. Benjamin Stacy, graduate school at U of Texas Austin (SULI from U of Kentucky)

Ms. Lauryn Carver, graduate school at U of Chicago (SULI from U of Oklahoma)

Ms. Christine Fisher, graduate school at CUNY, then Beiersdor (HERE from CUNY)

Mr. Jackson Wilt (HERE and SULI from UTK), Fulbright Scholar in Netherland, graduate school at Harvard University

Ms. Sylvie Blanton (SULI from Georgia Tech)

Ms. Mairead Boucher (SULI from Ave Maria University) then graduate school at Villanova

Ms. Christine Rukeyser (ECO and GEM from The University of Tennessee, Chattanooga), graduate school at Northwestern University

Mr. Octavio Jupp (MSIIP from U Texas Rio Grande Valley)

Ms. Marybeth Appleyard (SMART from Virginia Tech) then graduate school at UTK

Mr. Ju-An Kim (SULI from UC Irvine) then graduate school at Scripps Research Institute

Mr. Avanish Bharadwaj (SULI from UNC Chapel Hill)

Ms. Denally Hernandez (MSIIP from U Texas Rio Grande Valley)

Ms. Mackenzie Young (SULI from Emory University)

Awards and Membership

2025	2025 R&D 100, “Next-Gen High-Performance Polyiso Foam Insulation” Som Shrestha, Tomonori Saito , Diana Hun, Shiwanka Wanasinghe, Achutha Tamraparni, Catalin Gainaru, Zoriana Demchuk
2025	FLC Award: Transforming Sustainable Construction with Self-Healing Barrier Film for Vacuum Insulation, Tomonori Saito , Diana Hun, Natasha Ghezawi, Andreana Leskovjan, Andrea Bowers, Michael Merwin
2024	Battelle Distinguished Inventor, Tomonori Saito
2024	2024 R&D 100, “Selective Mixed Plastic Recycling” Tomonori Saito , Md Arifuzzaman, Bobby Sumpter, Changwoo Do, Zoriana Demchuk, Sheng Dai, Ilja Popovs, Jeff Foster, Nick Galan and Jackie Zheng; and Robert Davis
2023	Battelle - ORNL Inventor of the Year, Tomonori Saito
2022	ORNL Award, Research Accomplishment, Tomonori Saito
2022	ORNL Award, Outstanding Scholarly Output, Amy Elliott, Tomonori Saito , Michelle Lehmann, Desarae Goldsby, Guang Yang and Benjamin Doughty
2022	ORNL BTSD 2022 Outstanding ORNL Collaborator Award, Tomonori Saito
2021	2021 R&D 100, “Autonomous self-healing sealant”, Diana Hun, Pengfei Cao, Tomonori Saito , Zhen Zhang, Bingrui Li, Natasha Ghezawi and Zoriana Demchuk
2019	2019 R&D 100, “High Strength Binder System for Additive Manufacturing”, Tomonori Saito , Amy Elliott, Dustin Gilmer, Michelle Lehmann, Lu Han, Rick Lucas, Dan Brunermer
2017	ORNL Research Team Award, Carter Abney, Vyacheslav Bryantsev, Christopher J. Janke, Sheng Dai, Richard Mayes, Tomonori Saito , Costas Tsouris
2016	2016 R&D 100, “U Grabber”, Sheng Dai, Suree Brown, Robin Rogers, Christopher J. Janke, Richard Mayes, Tomonori Saito , Ronnie Hanes
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 37 th Japan Society on Water Environment Conference in Kumamoto, Japan, Mar. 3-7, 2003
2005 -	Member of American Chemical Society (ACS) (POLY, PMSE)
2016 -	Member of Materials Research Society (MRS)
2018 -	Member of North American Membrane Society (NAMS)
2018 -	Member of the American Institute of Chemical Engineers (AIChE)

Synergistic Activities:

- Oak Ridge National Laboratory, Distinguished Staff Fellow Committee, 2018-2021
- Georgia Tech, Polymer Depolymerization MURI Advisory Panel, 2020-
- DOE EERE AMMTO SUPR Verification Team, 2022-
- ACS Division of Polymer Chemistry, Webinar Committee (Chair 2023-), 2019 –

- Organizer of symposia at ACS National Meetings, MRS Meetings, Euromat, Southeast Polymer Forum. Organizer for ACS CCC: “Sustainable Polymers: A Multidisciplinary Challenge” 2022-2023
- Contributor to the workshop report and factual document for DOE BES Roundtable on Chemical Upcycling of Polymers
- Serving as a reviewer for many proposals and many journals such as *Nature*, *Science*, *Science Advances*, *Nature Communications*, *Nature Sustainability*, *JACS*, *Advanced Materials*, *Angewandte Chemie*, *Advanced Functional Materials*, *Materials Horizons*, *Energy Storage Materials*, *Macromolecules*, *Additive Manufacturing*, *ACS Applied Interfaces*, *J. Mat. Chem. A.*, *ACS Applied Energy Materials*, *Green Chemistry*, *Chemical Engineering Journal*, etc.