Dr. TAKANORI FUKUSHIMA

Curriculum Vitae

Professor, Laboratory for Chemistry and Life Science
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Education

1999	Ph.D. in Science, Tohoku University, Japan
1994-1996	Doctoral Program in Chemistry, Graduate School of Science, Tohoku University Withdrew from the program in September 1996 upon appointment to an academic position; Ph.D. awarded in November 1999.
1992-1994	M.Sc. in Chemistry, Graduate School of Science, Tohoku University
1988-1992	B.Sc. in Chemistry, Faculty of Science, Tohoku University

Academic and Research Appointments

2024-present	Professor, Laboratory for Chemistry and Life Science, Institute of Integrated Research, Institute of Science Tokyo
2024-2026	Director, Research Center for Autonomous Systems Materialogy (ASMat), Institute of Integrated Research, Institute of Science Tokyo
2016-2024	Professor, Laboratory for Chemistry and Life Science, Institute of Innovative Research, Tokyo Institute of Technology
2010-2016	Professor, Chemical Resources Laboratory, Tokyo Institute of Technology
2010-2013	Team Leader, Energy Conversion Research Team, RIKEN Advanced Science Institute
2007-2010	Team Leader, Functional Soft Matter Engineering Team / Energy Conversion Research Team, RIKEN
2006-2007	Specially Appointed Associate Professor, Department of Chemistry and Biotechnology, Graduate School of Engineering, The University of Tokyo
2004-2007	Group Leader, ERATO Aida Nanospace Project, JST
2001-2003	Researcher, ERATO Aida Nanospace Project, JST

1996-2001	Assistant Professor, Department of Chemistry, Graduate School of Science, Tohoku University
1995-1996	Research Fellow, Japan Society for the Promotion of Science (JSPS)

Major Professional and Public Service

2023-present	Member, Science Council of Japan (Section III)
2026-present	Area Advisor, JST CREST Research Area “Ultra Enduring Materials”
2023-present	Area Advisor, JST ACT-X Research Area “Innovative Materials through Trans-scale Understanding”
2022-present	Panel Officer, JST FOREST Program
2020-2022	Advisor, JST FOREST (Fusion Oriented Research for Disruptive Science and Technology) Program
2024-present	Member, Second Materials Field Committee, Center for Research and Development Strategy (CRDS), JST

Awards and Honors

2021	The Award of the Society of Polymer Science, Japan (2020 Award) “Development of Functional Soft Materials by Precision Molecular Assembly”
2020	MEXT Award for Science and Technology, Research Category “Pioneering Research on Molecular Technology Bridging the Nano- and Macroscales”
2020	Teshima Seiichi Memorial Research Award (Research Paper Award), Tokyo Institute of Technology
2020	42nd Best Paper Award, The Japan Society of Applied Physics
2016	38th Best Paper Award, The Japan Society of Applied Physics
2015	Teshima Seiichi Memorial Research Award (Research Paper Award), Tokyo Institute of Technology
2012	Nagase Foundation Award, Nagase Science and Technology Foundation
2010	Asian Core Program Lectureship Award, 5th International Conference Cutting-Edge of Organic Chemistry in Asia (ICCEOCA), Hong Kong

2008	The Young Scientists' Prize, Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (MEXT) "Research on π-Electronic Nanomaterials"
2005	Wiley Award, The Society of Polymer Science, Japan "Creation of π-Electronic Supramolecular and Polymeric Materials"

Professional Memberships

The Chemical Society of Japan
The Society of Polymer Science, Japan
The Society of Synthetic Organic Chemistry, Japan
The Society of Physical Organic Chemistry, Japan
The Japan Society of Applied Physics
American Chemical Society

Research Interests

Organic, physical organic, supramolecular, and polymer chemistry; molecular self-assembly and precision molecular assembly; π-electronic molecular systems; functional soft materials; ordered molecular films and interfaces; liquid crystals and molecular crystals; molecular motion, energy conversion, and thermal transport in organic materials.

Selected Research Profile

Research centers on the molecular design and assembly of functional organic materials, with emphasis on controlling structure and dynamics across length scales from individual molecules to macroscopic matter. Representative themes include π-electronic supramolecular systems, triptycene-based molecular assemblies and interfaces, soft materials with long-range structural order, molecular motion in condensed phases, and heat/energy transport in organic materials.

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The representative publications within 5 years are highlighted in blue.

Selected Publications (Corresponding-author papers only)

1. T. Yokochi, H. Yokoyama, T. Tsukada, H. Sakai, T. Hasobe, T. Fukushima, Y. Shoji, Conformationally Driven Dual Fluorescence Properties of Higher Heteroacenes with Periodically Incorporated Boron Atoms, *Angew. Chem. Int. Ed.* **2026**, *65*, e3365679.
2. M. Zharnikov, Y. Shoji, T. Fukushima, Tripodal Triptycenes as a Versatile Building Block for Highly Ordered Molecular Films and Self-Assembled Monolayers, *Acc. Chem. Res.* **2025**, *58*, 312–324.
3. R. Takehara, T. Fukui, T. Tano, M. Ryu, S. Kitani, H. Kawaji, J. Morikawa, T. Fukushima, Covalent Bonds versus van der Waals Forces: A Picture in Thermal Conduction of Organic Materials, *J. Am. Chem. Soc.* **2024**, *146*, 30548–30552.
4. M. Fukumitsu, T. Fukui, Y. Shoji, T. Kajitani, R. Khan, N. V. Tkachenko, H. Sakai, T. Hasobe, T. Fukushima, Supramolecular scaffold-directed two-dimensional assembly of pentacene into a configuration to facilitate singlet fission, *Sci. Adv.* **2024**, *10*, eadn7763.
5. T. Ogawa, F. Ishiwari, F. Hajjaj, Y. Shoji, T. Kajitani, K. Yazawa, T. Ohkubo, T. Fukushima, 2D hexagonal assembly of a dipolar rotor with a close interval of 0.8 nm using a triptycene-based supramolecular scaffold, *Chem. Sci.* **2024**, *15*, 11021–11028.
6. R. Takehara, N. Kubo, M. Ryu, S. Kitani, S. Imajo, Y. Shoji, H. Kawaji, J. Morikawa, T. Fukushima, Insights into Thermal Transport through Molecular π-Stacking, *J. Am. Chem. Soc.* **2023**, *145*, 22115–22121.
7. Y. Shoji, R. Komiyama, M. Kobayashi, A. Kosaka, T. Kajitani, R. Haruki, R. Kumai, S. Adachi, T. Tada, N. Karasawa, H. Nakano, H. Nakamura, H. Sakurai, T. Fukushima, Collective bending motion of a two-dimensionally correlated bowl-stacked columnar liquid crystalline assembly under a shear force, *Sci. Adv.* **2023**, *9*, eadg8202.
8. Y. Chen, F. Ishiwari, T. Fukui, T. Kajitani, H. Liu, X. Liang, K. Nakajima, M. Tokita, T. Fukushima, Overcoming the entropy of polymer chains by making a plane with terminal groups: a thermoplastic PDMS with a long-range 1D structural order, *Chem. Sci.* **2023**, *14*, 2431–2440.
9. Y. Shoji, J. Kashida, T. Fukushima, Bringing out the potential of organoboron compounds by designing the chemical bonds and spaces around boron, *Chem. Commun.* **2022**, *58*, 4420–4434.
10. Y. Shoji, M. Kobayashi, A. Kosaka, R. Haruki, R. Kumai, S. Adachi, T. Kajitani, T. Fukushima, Design of discotic liquid crystal enabling complete switching along with memory of homeotropic and homogeneous alignment over a large area, *Chem. Sci.* **2022**, *13*, 9891–9901.
11. S. Fujii, Y. Shoji, T. Fukushima, T. Nishino, Visualization of Thermal Transport Properties of Self-Assembled Monolayers on Au(111) by Contact and Noncontact Scanning Thermal Microscopy, *J. Am. Chem. Soc.* **2021**, *143*, 18777–18783.
12. Y. Shoji, Y. Ikabata, I. Ryzhii, R. Ayub, O. El Bakouri, T. Sato, Q. Wang, T. Miura, B. S. B. Karunathilaka, Y. Tsuchiya, C. Adachi, H. Ottosson, H. Nakai, T. Ikoma, T. Fukushima, An Element-Substituted Cyclobutadiene Exhibiting High-Energy Blue Phosphorescence, *Angew. Chem. Int. Ed.* **2021**, *60*, 21817–21823.

13. T. Miyazaki, Y. Shoji, F. Ishiwari, T. Kajitani, T. Fukushima, Design of a molecular memory element with an alternating circular array of dipolar rotors and rotation suppressors, *Chem. Sci.* **2020**, *11*, 8388–8393.

14. T. Kajitani, K. Motokawa, A. Kosaka, Y. Shoji, R. Haruki, D. Hashizume, T. Hikima, M. Takata, K. Yazawa, K. Morishima, M. Shibayama, T. Fukushima, Chiral crystal-like droplets displaying unidirectional rotational sliding, *Nat. Mater.* **2019**, *18*, 266–272.

15. F. Ishiwari, G. Nascimbeni, E. Sauter, H. Tago, Y. Shoji, S. Fujii, M. Kiguchi, T. Tada, M. Zharnikov, E. Zojer, T. Fukushima, Triptycene Tripods for the Formation of Highly Uniform and Densely Packed Self-Assembled Monolayers with Controlled Molecular Orientation, *J. Am. Chem. Soc.* **2019**, *141*, 5995–6005.

16. F. Ishiwari, Y. Shoji, T. Fukushima, Supramolecular Scaffolds Enabling the Controlled Assembly of Functional Molecular Units, *Chem. Sci.* **2018**, *9*, 2028–2041.

17. T. Yokota, T. Kajitani, R. Shidachi, T. Tokuhara, M. Kaltenbrunner, Y. Shoji, F. Ishiwari, T. Sekitani, T. Fukushima, T. Someya, A few-layer molecular film on polymer substrates to enhance the performance of organic devices, *Nat. Nanotechnol.* **2018**, *13*, 139–144.

18. F. Hajjaj, T. Kajitani, H. Ohsumi, Y. Tanaka, K. Kato, M. Takata, H. Kitazawa, T. Arima, T. Aida, T. Fukushima, Rewriting the phase diagram of a diamagnetic liquid crystal by a magnetic field, *Nat. Commun.* **2018**, *9*, 4431.

19. Y. Shoji, Y. Ikabata, Q. Wang, D. Nemoto, A. Sakamoto, N. Tanaka, J. Seino, H. Nakai, T. Fukushima, Unveiling a New Aspect of Simple Arylboronic Esters: Long-Lived Room-Temperature Phosphorescence from Heavy-Atom-Free Molecules, *J. Am. Chem. Soc.* **2017**, *139*, 2728–2733.

20. Y. Shoji, N. Tanaka, S. Muranaka, N. Shigeno, H. Sugiyama, K. Takenouchi, F. Hajjaj, T. Fukushima, Boron-Mediated Sequential Alkyne Insertion and C–C Coupling Reactions Affording Extended π-Conjugated Molecules, *Nat. Commun.* **2016**, *7*, 12704.

21. N. Seiki, Y. Shoji, T. Kajitani, F. Ishiwari, A. Kosaka, T. Hikima, M. Takata, T. Someya, T. Fukushima, Rational synthesis of organic thin films with exceptional long-range structural integrity, *Science* **2015**, *348*, 1122–1126.

22. W. Zhang, W. Jin, T. Fukushima, A. Saeki, S. Seki, T. Aida, Supramolecular Linear Heterojunction Composed of Graphite-Like Semiconducting Nanotubular Segments, *Science* **2011**, *334*, 340–343.

23. E. Ohta, H. Sato, S. Ando, A. Kosaka, T. Fukushima, D. Hashizume, M. Yamasaki, K. Hasegawa, A. Muraoka, H. Ushiyama, K. Yamashita, T. Aida, Redox-responsive molecular helices with highly condensed π-clouds, *Nat. Chem.* **2011**, *3*, 68–73.

24. N. Hosono, T. Kajitani, T. Fukushima, K. Ito, S. Sasaki, M. Takata, T. Aida, Large-Area Three-Dimensional Molecular Ordering of a Polymer Brush by One-Step Processing, *Science* **2010**, *330*, 808–811.

25. Y. Yamamoto, G. Zhang, W. Jin, T. Fukushima, N. Ishii, A. Saeki, S. Seki, S. Tagawa, T. Minari, K. Tsukagoshi, T. Aida, Ambipolar-Transporting Coaxial Nanotubes with a Tailored Molecular Graphene–Fullerene Heterojunction, *Proc. Natl. Acad. Sci. U.S.A.* **2009**, *106*, 21051–21056.

26. M. A. Alam, J. Motoyanagi, Y. Yamamoto, T. Fukushima, J. Kim, K. Kato, M. Takata, A. Saeki, S. Seki, S. Tagawa, T. Aida, “Bicontinuous Cubic” Liquid Crystalline Materials from Discotic Molecules: A Special Effect of Paraffinic Side Chains with Ionic Liquid Pendants, *J. Am. Chem. Soc.* **2009**, *131*, 17722–17723.
27. Y. Yamamoto, T. Fukushima, Y. Suna, N. Ishii, A. Saeki, S. Seki, S. Tagawa, M. Taniguchi, T. Kawai, T. Aida, Photoconductive Coaxial Nanotubes of Molecularly Connected Electron Donor and Acceptor Layers, *Science* **2006**, *314*, 1761–1764.
28. T. Fukushima, K. Asaka, A. Kosaka, T. Aida, Fully Plastic Actuator through Layer-by-Layer Casting with Ionic-Liquid-Based Bucky Gel, *Angew. Chem. Int. Ed.* **2005**, *44*, 2410–2413.
29. J. P. Hill, W. Jin, A. Kosaka, T. Fukushima, H. Ichihara, T. Shimomura, K. Ito, T. Hashizume, N. Ishii, T. Aida, Self-Assembled Hexa-peri-hexabenzocoronene Graphitic Nanotube, *Science* **2004**, *304*, 1481–1483.
30. T. Fukushima, A. Kosaka, Y. Ishimura, T. Yamamoto, T. Takigawa, N. Ishii, T. Aida, Molecular Ordering of Organic Molten Salts Triggered by Single-Walled Carbon Nanotubes, *Science* **2003**, *300*, 2072–2074.