Hozumi Takahashi, PhD

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EDUCATION

Doctor of Philosophy, Dept. of Applied Physics, Osaka University, Japan, Oct. 2021 - Mar. 2024
Thesis title: Spatiotemporal control of molecular crystal formation via laser ablation
Supervisor: Hiroshi Y. Yoshikawa (Full Professor)

Master of Science, Dept. of Chemistry, Saitama University, Japan, Apl. 2020 - Sep. 2021
Thesis title: Control of crystallization of organic materials via laser ablation

Bachelor of Science, Dept. of Chemistry, Saitama University, Japan, Apl. 2016 - Mar. 2020
Thesis title: Control of crystal growth of organic nonlinear optical crystals via laser ablation

RESEARCH INTERESTS / RESEARCH PROFILE

- His field of interest is laser processing and crystallization. So far, he has tackled control of crystallization events (including crystal nucleation, crystal growth, polymorphic phase transition) using laser techniques such as laser ablation and optical trapping.
- Specifically, he found that the ultrashort laser ablation of supercooled/supersaturated liquids could induce crystal nucleation from the vicinity of laser focus (*Appl. Phys. Express 2021, J. Phys. Chem. Lett. 2023, J. Phys. Chem. C 2024, J. Phys. Chem. C 2025, Phys. Chem. Chem. Phys 2025*).
- In addition, he demonstrated growth enhancement and crystalline seed generation of organic nonlinear optical crystals via laser ablation (*J. Phys. Chem. C 2021, J. Phys. Chem. C 2023*).
- Furthermore, he recently found that polymorphic phase transition of glycine crystals could be triggered by femtosecond laser ablation (*J. Phys. Chem. Lett. 2024, Cryst. Growth Des. 2024*).
- His recent interest is optical trapping-induced crystallization. He found laser trapping of solutions could provide dense liquid droplets at the laser focus, which contributed to crystallization of metastable polymorphs (*J. Photochem. Photobiol. A 2024, Commun. Chem. 2025*).
- These demonstrations suggest that our laser techniques would be promising for designing crystalline materials with tailored properties and investigating crystallization mechanism for various materials.

RESEARCH EXPERIENCE

Postdoctoral Fellow, Osaka University, Japan, Apl. 2024 – Mar. 2025
He have been working on the control of crystallization using lasers.

Visiting Postdoctoral Researcher, Université de Genève, Switzerland, Des. 2024 - Feb. 2025
He stays 3 months at Adach laboratory in University of Geneva to study microscopic spectroscopy (e.g., Raman spectroscopy, dynamic light scattering).

Visiting Postdoctoral Researcher, National Yang Ming Chiao Tung University, Taiwan, May. 2024 - Aug. 2024
He stayed 3 months at Prof. Teruki Sugiyama's laboratory in NYCU to demonstrate polymorphic control of organic compounds by laser ablation and optical trapping.

Assistant Professor, The University of Osaka, Japan, Apl. 2025 – present
He is currently working on the control and measurement of crystallization of organic and biomaterials using lasers.

GRANTS

- **Shimadzu Science Foundation**
  "Investigation of laser-induced condensation via high-temporal resolution and polarized Raman spectroscopy"
  Apr. 2026 – Mar. 2028
  1,000,000 JPY

- **KAKENHI (No. JP25K17959) supported by Japan Society for the Promotion of Science**
  "Raman spectroscopic study of optical trapping-induced crystallization"
  Apr. 2025 – Mar. 2028
  3,700,000 JPY

- **The Mazda Foundation**
  "Manipulation of crystal size and morphology via optical trapping technique"
  Nov. 2025 - Oct. 2027
  1,000,000 JPY

- **Izumi Science and Technology Foundation**
  "Control of crystal shape of organic nonlinear optical crystal via optical trapping"
  Oct. 2025 - Sep. 2027
  1,000,000 JPY

- **Research Foundation for Opto-Science and Technology**
  "Investigation of laser-induced nano-matter condensation mechanism for precise control of crystallization"
  Jan. 2026 - Dec. 2026
  1,000,000 JPY

- **Casio Science Promotion Foundation**
  "Precise control of crystal polymorphism via pulsed UV laser ablation"
  Jan. 2026 - Dec. 2026
  1,000,000 JPY

- **The Hattori Hokokai Foundation**
  "Precise control of crystal polymorphic transition using focused pulsed UV laser"
  Oct. 2025 - Sep. 2026
  1,000,000 JPY

- **Kurita Water Environment Foundation**
  "Development of an innovative laser system realizing high-speed imaging of ice crystallization dynamics"
  Oct. 2024 - Sep. 2025
  900,000 JPY

- **Iketani Science and Technology Foundation**
  "Three-dimensional precise control of ice crystallization by pattern irradiation with ultrashort laser pulses"
  Apl. 2024 - Mar. 2025
  2,000,000 JPY

- **Marubun Foundation**
  "Precise control of crystal polymorph via optical trapping"
  Des. 2024 - Feb. 2025
  1,500,000 JPY

- **Murata Science and Education Foundation**
  "Control of polymorphism of electronic materials by optical trapping and exploration of its formation mechanism"
  Des. 2024 - Feb. 2025
  800,000 JPY

- **Yazaki Memorial Foundation for Science and Technology**
  "Investigation of the pathway of crystal polymorphism under optical trapping condition"
  Des. 2024 - Feb. 2025
  200,000 JPY

- **ACT-X (No. JPMJAX23DC) supported by Japan Science and Technology Agency**
  "Development of innovative crystallization control technology utilizing light"
  Oct. 2023 - Mar. 2027
  9,663,000 JPY

- **JSPS Fellows (No. JP22J21666) supported by Japan Society for the Promotion of Science**
  "Creation of innovative crystalline material achieved by laser irradiation"
  Apl. 2022 - Mar. 2025
  2,500,000 JPY

- **SPRING (No. JPMJSP2138) supported by Japan Science and Technology Agency**
  "Production of high-functional crystalline materials by laser irradiation"
  Oct. 2021 - Mar. 2022
  450,000 JPY

AWARDS

- **The Outstanding Student Paper Award**
  "Control of Crystallization of Molecular Materials via Focused Irradiation with Laser Pulses"
  International Workshop on Laser Material Processing and Applications 2023
  Sep. 2023

- **The LPM2023 Outstanding Student Paper Award (Oral)**
  "High-speed observation of ice crystallization dynamics in supercooled water triggered by laser ablation"
  The 24th International Symposium on Laser Precision Microfabrication (LPM2023)
  Jun. 2023
  Acceptance rate: 8%

- **Poster Presentation award**
  "Processing of organic nonlinear optical crystals in solution by laser ablation"
  The Japan Society of Applied Physics, Kansai chapter, 1st Lecture Meeting
  Jun. 2023
  Acceptance rate: 11%

- **Oral Presentation Award**
  "Fine observation of ice crystallization dynamics by focused irradiation with a single ultrashort laser pulse"
  51st Japan Conference on Crystal Growth
  Dec. 2022

- **Oral Presentation Award**
  "Control of nucleation and growth of molecular crystals via laser ablation ~melts and organic nonlinear optical crystals~"
  The Laser Society of Japan, Young Researcher Workshop in Chugoku・Shikoku・Kansai 2022
  Dec. 2022
  Acceptance rate: 25%

- **Poster Presentation Award**
  "High-speed observation of ice crystallization dynamics achieved by laser ablation"
  OPTO Symposium on Photon and Beam Science 2022
  Jun. 2022
  Acceptance rate: 7%

- **Excellent Poster Presentation Award**
  "Laser Ablation-Induced Crystallization from Melt ~Glasial Acetic Acid~"
  International Workshop on Emergence of Life-Nano-Bio Science
  Mar. 2021
  Acceptance rate: 27%

- **Student Poster Presentation Award**
  "Crystal nucleation from melt triggered by laser ablation ~ Glacial Acetic Acid~"
  51st Japan Conference on Crystal Growth
  Nov. 2020

PROFESSIONAL MEMBERSHIPS / ORGANIZATIONS

- **The Japan Society of Applied Physics (2019 - present)**
- **Japanese Association for Crystal Growth (2020 - present)**
- **The Laser Society of Japan (2025 – present)**
- **The Spectroscopical Society of Japan (2026 – present)**

REPRESENTATIVE PUBLICATIONS (PEER REVIEWED, ORIGINAL PAPER)

1. Wataru Fushimoto, **Hozumi Takahashi**, Fumitaka Ishiwari, Itsuo Hanasaki, Mihoko Maruyama, Ryo Suzuki, Masaru Tachibana, Teruki Sugiyama*, Hiroshi Y. Yoshikawa*
   "Synergistic Laser-Induced Crystallization of C_{60} Fullerene in Solutions"
   ACS Applied Nano Materials **8**, 22993-23003 (2025).

2. **Hozumi Takahashi*** and Hiroshi Y. Yoshikawa*:
   "Metastable-phase crystallization of potassium acetate triggered by focused irradiation with ultrashort laser pulses"
   Physical Chemistry Chemical Physics **27**, 16067-16076 (2025).

3. **Hozumi Takahashi***, Hiroshi Y. Yoshikawa, and Teruki Sugiyama*:
   "Selective manipulation of L-cysteine crystal polymorphs using focused laser beams"
   Communications Chemistry **8**, 156 (2025).

4. **Hozumi Takahashi*** and Hiroshi Y. Yoshikawa*:
   "Enhancement of Crystallization of Ionic Liquids by Scanning Irradiation with Focused Ultrashort Laser Pulses"
   The Journal of Physical Chemistry C **129**, 8346 – 8353 (2025).

5. **Hozumi Takahashi***, Hiroshi Y. Yoshikawa, and Teruki Sugiyama*:
   "Exclusive and Accelerated β-to-α Polymorphic Transition in Glycine Crystals Induced by Femtosecond Laser Pulses"
   Crystal Growth and Design **24**, 10032 – 10037 (2024).

6. **Hozumi Takahashi**, Yusuke Takaoka, Satomi Ebihara, Yuka Tsuri, Mihoko Maruyama, Masashi Yoshimura, Yusuke Mori, and Hiroshi Y. Yoshikawa*:
   "Pseudopolymorphism of Sodium Acetate in Supersaturated Aqueous Solution Induced by Focused Irradiation with Ultrashort Laser Pulses"
   The Journal of Physical Chemistry C **128**, 11046 – 11053 (2024).

7. **Hozumi Takahashi**, Hiroshi Y. Yoshikawa*, and Teruki Sugiyama*:
   "Raman spectroscopic study of concentration dynamics in glycine crystallization achieved by optical trapping"
   Journal of Photochemistry and Photobiology A: Chemistry **456**, 115845 (2024).

8. **Hozumi Takahashi**, Yudai Yoshimura, Ryota Murai, Ryuzo Kawamura, Mihoko Maruyama, Masashi Yoshimura, Yusuke Mori, and Hiroshi Y. Yoshikawa*:
"Spatiotemporal Control of Polymorphic Phase Transition of Glycine Crystals by Three-Dimensional Femtosecond Laser Ablation Processing"
The Journal of Physical Chemistry Letters **15**, 180 – 186 (2024).
(**Selected as supplementary cover art**)

9. **Hozumi Takahashi**, Megumi Shiraiwa, Valynn Katrine Mag-usara, Ruochen Dai, Verdad C. Agulto, Kosaku Kato, Makoto Nakajima, Mayu Yamaji, Seiichiro Nakabayashi, Mihoko Maruyama, Yusuke Mori, Masashi Yoshimura, and Hiroshi Y. Yoshikawa*:
"Production of Single Crystalline Seeds of Organic Nonlinear Optical Materials via Laser Ablation"
The Journal of Physical Chemistry C **127**, 14005 – 14012 (2023).

10. **Hozumi Takahashi**, Tatsuya Kono, Kosuke Sawada, Satoru Kumano, Yuka Tsuri, Mihoko Maruyama, Masashi Yoshimura, Daisuke Takahashi, Yukio Kawamura, Matsuo Uemura, Seiichiro Nakabayashi, Yusuke Mori, Yoichiroh Hosokawa*, and Hiroshi Y. Yoshikawa*:
"Spatiotemporal Control of Ice Crystallization in Supercooled Water via an Ultrashort Laser Impulse"
The Journal of Physical Chemistry Letters **14**, 4394 – 4402 (2023).
(**Selected as supplementary cover art**)

11. **Hozumi Takahashi**, Mayu Yamaji, Jun Ikeyama, Makoto Nakajima, Hideaki Kitahara, Syouei Tetsukawa, Naritaka Kobayashi, Mihoko Maruyama, Teruki Sugiyama, Shuji Okada, Yusuke Mori, Seiichiro Nakabayashi, Masashi Yoshimura, and Hiroshi Y. Yoshikawa*:
"Growth Enhancement of Organic Nonlinear Optical Crystals by Femtosecond Laser Ablation"
The Journal of Physical Chemistry C **125**, 8391 – 8397 (2021).

12. **Hozumi Takahashi**, Teruki Sugiyama, Seiichiro Nakabayashi, and Hiroshi Y. Yoshikawa*:
"Crystallization from Glacial Acetic Acid Melt via Laser Ablation"
Applied Physics Express **14**, 045503 (4 pages) (2021).