

Tetsu Ouchi, Ph.D.

Louisiana State University, Cain Department of Chemical Engineering
Room 3308A Patrick F. Taylor Hall
3304 S Quad Dr, Baton Rouge, LA USA 70803
Email: tetsuouchi@lsu.edu

Education

2019: Ph. D. in Polymer Science and Engineering, University of Massachusetts Amherst

Department of Polymer Science and Engineering

Thesis Advisor: **Professor Ryan C. Hayward**

2014: M. S. in Polymer Science and Engineering, University of Massachusetts Amherst

2012: M. S. in Engineering, Keio University (Japan)

Science for Open and Environmental Systems (Mechanical Engineering)

Thesis Advisor: **Professor Atsushi Hotta**

2010: B. S. in Engineering (Mechanical Engineering), Keio University (Japan)

Department of Mechanical Engineering

Thesis Advisor: **Professor Atsushi Hotta**

Professional Appointments/Employment

2024-Present **Assistant Professor, Louisiana State University**

Cain Department of Chemical Engineering

2019-2024 **Postdoctoral Associate, Duke University (Durham, NC)**

Department of Chemistry

- Advisor: **Professor Stephen L. Craig**
- Research topic: Mechanochemical transduction for strain-triggered acidification and probing molecular forces inside polymer networks

2013-2019 **Graduate Student Researcher, University of Massachusetts Amherst (Amherst, MA)**

Department of Polymer Science and Engineering

- Thesis Advisor: **Professor Ryan C. Hayward**
- Ph. D. Thesis: Competition between wrinkling, buckling, and creasing modes on the surfaces of soft materials and patterned bilayers

2010-2012 **Master Graduate Student Researcher, Keio University (Yokohama, Japan)**

Science for Open and Environmental Systems (Mechanical Engineering)

- Thesis Advisor: **Professor Atsushi Hotta**
- Master Thesis: Crystalline and gel structures and their transitions observed in stereoregular polymers

2006-2010 **Undergraduate Student Researcher, Keio University (Yokohama, Japan)**

Department of Mechanical Engineering

- Thesis Advisor: **Professor Atsushi Hotta**
- Undergraduate Thesis: The effects of strain and temperature on β to α form transition of syndiotactic polystyrene (sPS) induced by mechanical strain

Honors and Awards

- **2024 Materials Chemistry Horizon Prize from the Royal Society of Chemistry: Stephanie L Kwolek Prize** by the Royal Society of Chemistry, June 2024 (worked as one of the NSF Center for the Chemistry of Molecularly Optimized Networks team members)
- **2023 Polymeric Materials: Science and Engineering (PMSE) Future Faculty Honoree** by the American Chemical Society at ACS Fall 2023 Meeting, August 2023
- **3rd Place Poster Award** for the research, “Strain-triggered acidification in a double-network hydrogel enabled by multi-functional transduction of molecular mechanochemistry” at the Triangle Soft Matter Workshop, May 2023
- **2017 Journal of Polymer Science poster prize (3rd place in APS DPOLY poster competition)** for the research, “Surface instabilities of elastic bilayers with patterned stiff films” by the American Physical Society at APS March Meeting, March 2017
- Exempted from returning finance loan from Japan Student Services Organization, about \$26,400 (2,112,000 yen), for excellent achievements and high grades, May 2012
- **Excellence in Graduate Polymer Research** for the research, “ β to α crystalline phase transition of syndiotactic polystyrene (sPS) induced by mechanical strain” by the American Chemical Society at 241st ACS National Meeting & Exposition, March 2011
- **Keio Graduate Scholarship**, about \$6,410/year (500,000 yen/year), to Keio University for 2 consecutive years (2010-2012)
- **Hatakeyama Prize** for the 2nd highest grades in mechanical engineering, Keio University, by The Japan Society of Mechanical Engineers, March 2010, 1 of 2 (out of 166 candidates)

Publications

Peer Reviewed Journal Articles

13. Yunyan Sun, William J. Neary, Xiao Huang, Tatiana B. Kouznetsova, **Tetsu Ouchi**, Ilia Kevlishvili, Kecheng Wang, Yingying Chen, Heather J. Kulik, Stephen L. Craig, Jeffrey S. Moore, “A Thermally Stable SO₂-Releasing Mechanophore: Facile Activation, Single-Event Spectroscopy, and Molecular Dynamic Simulations”, *The Journal of American Chemical Society*, 146, 15, 10943-10952 (2024). Impact Factor: 14.8 <https://doi.org/10.1021/jacs.4c02139>
12. Zhuohong Wu, Jorge L. Bayón, Tatiana B. Kouznetsova, **Tetsu Ouchi**, Krister J. Barkovich, Sean K. Hsu, Stephen L. Craig, Nicole F. Steinmetz, “Virus-like Particles Armored by an Endoskeleton”, *Nano Letters*, 24, 10, 2989-2997 (2024). Impact Factor: 10.1 <https://doi.org/10.1021/acs.nanolett.3c03806>
11. **Tetsu Ouchi**^{*}, Wencong Wang^{*}, Brooke E. Silverstein[†], Jeremiah A. Johnson, Stephen L. Craig, “Effect of strand molecular length on mechanochemical transduction in elastomers probed with monodisperse force sensors”, *Polymer Chemistry*, 14, 1646-1655 (2023). Impact Factor: 4.6 <https://doi.org/10.1039/D3PY00065F>
 - ^{*}Equal contributors
 - [†]Undergraduate mentee
10. **Tetsu Ouchi**^{*}, Brandon Bowser^{*}, Tatiana B. Kouznetsova, Xujun Zheng, Stephen L. Craig, “Strain-triggered acidification in a double-network hydrogel enabled by multi-functional transduction of molecular mechanochemistry”, *Materials Horizons*, 10, 585-593 (2023). Impact Factor: 13.3 <https://doi.org/10.1039/D2MH01105K>
 - ^{*}Equal contributors
9. Liqi Wang^{*}, Xujun Zheng^{*}, Tatiana B. Kouznetsova, Tiffany Yen, **Tetsu Ouchi**, Cameron L. Brown, and Stephen L. Craig, “Mechanochemistry of Cubane”, *The Journal of American Chemical Society*, 144, 22865-22869 (2022). Impact Factor: 15.0 <https://doi.org/10.1021/jacs.2c10878>

8. Zi Wang, Xu Jun Zheng, **Tetsu Ouchi**, Tatiana Kouznetsova, Haley Beech, Sarah Av-Ron, Brandon Bowser, Shu Wang, Jeremiah Johnson, Julia Kalow, Bradley Olsen, Jian Ping Gong, Michael Rubinstein, Stephen Craig, "Toughening hydrogels through force-triggered chemical reactions that lengthen polymer strands", *Science*, 374, 6564, p. 193-196 (2021). Impact Factor: 56.9 [DOI: 10.1126/science.abg2689](https://doi.org/10.1126/science.abg2689)
7. **Tetsu Ouchi**, Misuzu Yamazaki, Tomoki Maeda, Atsushi Hotta, "Mechanical property of polypropylene gels associated with that of molten polypropylenes", *Gels*, 7, 99 (2021). Impact Factor: 5.2 <https://doi.org/10.3390/gels7030099>
6. Scott Danielsen, Haley K. Beech, Shu Wang, Bassil M. El-Zaatari, Xiaodi Wang, Liel Spair, **Tetsu Ouchi**, Zi Wang, Patricia N. Johnson, Yixin Hu, David J. Lundberg, Georgi Stoychev, Stephen L. Craig, Jeremiah A. Johnson, Julia A. Kalow, Bradley D. Olsen, Michael Rubinstein, "Molecular Characterization of Polymer Networks", *Chemical Reviews*, 121, p. 5042-5092 (2021). Impact Factor: 62.1 <https://doi.org/10.1021/acs.chemrev.0c01304>
5. **Tetsu Ouchi**, Ryan C. Hayward, "Harnessing multiple surface deformation modes for switchable conductivity surfaces", *ACS Applied Materials & Interfaces*, 12, 8, p. 10031-10038 (2020). Impact Factor: 9.5 <https://doi.org/10.1021/acsami.9b22662>
4. Qihan Liu*, **Tetsu Ouchi***, Lihua Jin, Ryan C. Hayward, Zhigang Suo, "Elastocapillary Crease", *Physical Review Letters*, 122, 098003 (2019). Impact Factor: Impact Factor 8.6 <https://doi.org/10.1103/PhysRevLett.122.098003>
 - *Equal contributors
 - Selected as Editors' Suggestion
3. **Tetsu Ouchi***, Jiawei, Yang*, Zhigang Suo, Ryan C. Hayward, "Effects of stiff film pattern geometry on surface buckling instabilities of elastic bilayers", *ACS Applied Materials & Interfaces*, 10, p. 23406-23413 (2018). Impact Factor 9.5 <https://doi.org/10.1021/acsami.8b04916>
 - *Equal contributors
2. Jinhye Bae, **Tetsu Ouchi**, Ryan C. Hayward, "Measuring the elastic modulus of thin polymer sheets by elastocapillary bending", *ACS Applied Materials & Interfaces*, 7, p. 14734-14742 (2015). Impact Factor: 9.5 <https://doi.org/10.1021/acsami.5b02567>
1. **Tetsu Ouchi**, Suguru Nagasaka, Atsushi Hotta, " β to α Form Transition Observed in the Crystalline Structures of Syndiotactic Polystyrene (sPS)", *Macromolecules*, 44, p. 2112-2119 (2011). Impact Factor: 5.5 <https://doi.org/10.1021/ma200166m>

Proceedings and Preprints

3. **Tetsu Ouchi**, Misuzu Yamazaki, Atsushi Hotta, "Thermal and Mechanical Properties of Polypropylene Gels and Homo Polypropylenes", 241st ACS National Meeting & Exposition, Joint PMSE/POLY Poster Session General Papers/New Concepts in Polymeric Materials, March 2011, Anaheim, California, America.
2. **Tetsu Ouchi**, Suguru Nagasaka, Atsushi Hotta, " β to α crystalline phase transition of syndiotactic polystyrene (sPS) induced by mechanical strain", 241st ACS National Meeting & Exposition, POLY/PMSE Poster Session Excellence in Graduate Polymer Research, March 2011, Anaheim, California, America.
1. **Tetsu Ouchi**, Suguru Nagasaka, Atsushi Hotta, " β to α form transition in crystalline structures of syndiotactic polystyrene (sPS)", 59th The Society of Polymer Science, Japan Annual Meeting, Polymer Physics, May 2010, Kanagawa, Japan, *Polymer Preprints, Japan*, 59, No.1, p. 700 (2010).

Doctoral Thesis of Polymer Science and Engineering at University of Massachusetts Amherst

- **Tetsu Ouchi**, "Competition Between Wrinkling, Buckling, and Creasing Instability Modes on the Surfaces of Soft Materials and Patterned Bilayers", p. 1-144 (2019).

Master Thesis of Science for Open and Environmental Systems at Keio University

- **Tetsu Ouchi**, "Crystalline and Gel Structures and Their Transitions Observed in Stereoregular Polymers", p.

Undergraduate Thesis of Mechanical Engineering at Keio University

- **Tetsu Ouchi**, "The effects of strain and temperature on β to α form transition of syndiotactic polystyrene (sPS) induced by mechanical strain", p. 1-70 (2010).

Google Scholar

[Google Scholar link \(click here\)](#)

Teaching and Mentoring Experience

2019-2024

Master and Undergraduate Mentor at Duke University

- Mentored a master student from Materials Science and Engineering department and 6 undergraduate students from Chemistry department: taught experimental planning, synthesis skills (e.g., small molecule and polymer synthesis), and characterization skills (e.g., GPC, NMR, UV-vis, tensile test)
- Taught reaction mechanisms and synthesis procedures in the class of Independent Study for undergraduate students

2017-2018

Undergraduate Mentor at University of Massachusetts Amherst

- Mentored an undergraduate chemical engineering student for Independent Research Project: taught experimental planning, scientific writing, and experimental skills (gel synthesis, rheological characterization, building experimental setups with a 3D CAD software and a 3D printer)

2010-2013

Teaching Assistant and Undergraduate Mentor at Keio University

- Worked as TA in the class of Practice in Mechanical Engineering Projects in 2010: helped sophomores determine research themes, plan and conduct experiments, and gave advice to students on how to write scientific reports for graduation thesis
- Mentored 2 graduate and 2 undergraduate students from Mechanical Engineering department: taught experimental planning, scientific writing and presentations, and experimental skills (mechanical testing, DSC thermal analysis, IR structural analysis), and reviewed his graduation thesis

University Service Activities

2019-2024

Outreach Program at Duke University

- Chemistry department and the Craig group outreach events: Presented interactive demonstrations using polymer materials synthesized in the Craig group to the public

2017-2018

Outreach Program at University of Massachusetts Amherst

- Polymer Science and Engineering Outreach/ASPIRE in 2017 and 2018: Presented interactive demonstrations about graduate research and polymer applications to local high school students

2014-2015

Tutoring Program at University of Massachusetts Amherst

- Polymer Science and Engineering Tutoring Program: tutored graduate students in polymer physics and polymer engineering

2009-2010

Outreach Program at Keio University

- Chosen to introduce the department of mechanical engineering and Professor Atsushi Hotta's research laboratory; to first year university students in December 2009 and 2010 via new student seminars; to high school students in December 2010; to elementary school students in March 2009