

Maxwell J. Robb

Curriculum Vitae

Assistant Professor of Chemistry
California Institute of Technology
Division of Chemistry and Chemical Engineering
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Employment

- 2017–Present** Assistant Professor of Chemistry, California Institute of Technology, Pasadena, CA
- 2014–2017** Beckman Institute Postdoctoral Fellow, Beckman Institute for Advanced Science and Technology and Department of Chemistry, University of Illinois at Urbana-Champaign (with Professor Jeffrey S. Moore)

Education

- 2014** Ph.D. in Chemistry, University of California, Santa Barbara, CA (with Professor Craig J. Hawker)
Thesis Title: “Efficient methods for the synthesis of functional organic materials”
- 2009** B.S. in Chemistry, *summa cum laude*, Colorado School of Mines, Golden, CO

Honors and Awards

- 2020** Beckman Young Investigator Award
- 2020** ACS PRF Doctoral New Investigator Award
- 2018** Caltech Graduate Student Council Teaching Award
- 2018** Thieme Chemistry Journal Award
- 2016** ACS Henkel Award for Outstanding Graduate Research in Polymer Chemistry ([link](#))
- 2016** IChemE Global Award (Oil and Gas) for “Autonomous detection of damage in coatings” (BP/ICAM team)
- 2015** Beckman Institute Postdoctoral Fellowship ([link](#))
- 2012** CSP Technologies Fellowship
- 2010** Department of Energy Office of Science Graduate Fellowship (DOE SCGF)
- 2010** National Science Foundation Graduate Research Fellowship
- 2010** Phi Lambda Upsilon Award
- 2009** University of California Regents Special Fellowship
- 2009** Department of Chemistry and Biochemistry Fellowship
- 2009** Outstanding Senior Research Award
- 2009** Outstanding Graduating Senior, Department of Chemistry
- 2009** ACS Student Travel Grant
- 2008** Edna H. Dumke Memorial Scholarship
- 2008** Nutter Memorial Scholarship
- 2008** Staritzky Scholarship
- 2008** Outstanding Achievement Award in Analytical Chemistry
- 2007** Outstanding Achievement Award in Organic Chemistry
- 2007** CSM President’s Scholarship

Publications

Independent Career

41. Zeng, T.; Hu, X.; Robb, M. J. 5-Aryloxy substitution enables efficient mechanically triggered release from a synthetically accessible masked 2-furylcarbinol mechanophore. *Chem. Commun.* **2021**, *Advance Article*. [[doi](#)]
40. Barber, R. W.; Robb, M. J. A modular approach to mechanically gated photoswitching with color-tunable molecular force probes. *Chem. Sci.* **2021**, *12*, 11703–11709. [[doi](#)]
39. Hu, X.; Zeng, T.; Husic, C. C.; Robb, M. J. Mechanically triggered release of functionally diverse molecular payloads from masked 2-furylcarbinol derivatives. *ACS Cent. Sci.* **2021**, *7*, 1216–1224. [[doi](#)]

38. Osler, S. K.; McFadden, M. E.; Robb, M. J. Comparison of the reactivity of isomeric 2*H*- and 3*H*-naphthopyran mechanophores. *J. Polym. Sci.* **2021**, *early view*. [doi]
37. McFadden, M. E.; Robb, M. J. Generation of an elusive permanent merocyanine via a unique mechanochemical reaction pathway. *J. Am. Chem. Soc.* **2021**, *143*, 7925–7929. [doi]
36. Klein, I. M.;[‡] Husic, C. C.;[‡] Kovacs, D. P.; Choquette, N. J.; Robb, M. J. Validation of the CoGEF method as a predictive tool for polymer mechanochemistry. *J. Am. Chem. Soc.* **2020**, *142*, 16364–16381. [doi]
35. Versaw, B. A.; McFadden, M. E.; Husic, C. C.; Robb, M. J. Designing naphthopyran mechanophores with tunable mechanochromic behavior. *Chem. Sci.* **2020**, *11*, 4525–4530. [doi]
34. Hu, X.; Zeng, T.; Husic, C. C.; Robb, M. J. Mechanically triggered small molecule release from a masked furfuryl carbonate. *J. Am. Chem. Soc.* **2019**, *141*, 15018–15023. [doi]
33. McFadden, M. E.; Robb, M. J. Force-dependent multicolor mechanochromism from a single mechanophore. *J. Am. Chem. Soc.* **2019**, *141*, 11388–11392. [doi]
32. Barber, R. W.; McFadden, M. E.; Hu, X.; Robb, M. J. Mechanochemically gated photoswitching: Expanding the scope of polymer mechanochromism. *Synlett* **2019**, *30*, 1725–1732. [doi]
31. Hu, X.; McFadden, M. E.; Barber, R. W.; Robb, M. J. Mechanochemical regulation of a photochemical reaction. *J. Am. Chem. Soc.* **2018**, *140*, 14073–14077. [doi]

Prior to Caltech

30. Sulkanen, A. R.; Sung, J.; Robb, M. J.; Moore, J. S.; Sottos, N. R.; Liu, G. Y. Spatially selective and density-controlled activation of interfacial mechanophores. *J. Am. Chem. Soc.* **2019**, *141*, 4080–4085. [doi]
29. Kim, T. A.; Robb, M. J.; Moore, J. S.; White, S. R.; Sottos, N. R. Mechanical reactivity of two different spiropyran mechanophores in polydimethylsiloxane. *Macromolecules* **2018**, *51*, 9177–9183. [doi]
28. Sung, J.; Robb, M. J.; White, S. R.; Moore, J. S.; Sottos, N. R. Interfacial mechanophore activation using laser-induced stress waves. *J. Am. Chem. Soc.* **2018**, *140*, 5000–5003. [doi]
27. Patrick, J. F.; Robb, M. J.; Sottos, N. R.; Moore, J. S.; White, S. R. Polymers with autonomous life-cycle control. *Nature* **2016**, *540*, 363–370. [doi]
26. Robb, M. J.; Kim, T. A.; Halmes, A. J.; White, S. R.; Sottos, N. R.; Moore, J. S. Regioisomer-specific mechanochromism of naphthopyran in polymeric materials. *J. Am. Chem. Soc.* **2016**, *138*, 12328–12331. [doi]
25. Robb, M. J.; Li, W.; Gergely, R. C. R.; Matthews, C. C.; White, S. R.; Sottos, N. R.; Moore, J. S. A robust damage-reporting strategy for polymeric materials enabled by aggregation-induced emission. *ACS Cent. Sci.* **2016**, *2*, 598–603. [doi]
24. Kortan, A. M.; Cannizzaro, R. J.; Robb, M. J.; Knauss, D. M. Poly(ether sulfone)s using a rigid dibenzothiophene dioxide heterocycle. *J. Polym. Sci. Part A: Polym. Chem.* **2016**, *54*, 3127–3131. [doi]
23. May, P. A.; Munaretto, N. F.; Hamoy, M. B.; Robb, M. J.; Moore, J. S. Is molecular weight or degree of polymerization a better descriptor of ultrasound-induced mechanochemical transduction? *ACS Macro Lett.* **2016**, *5*, 177–180. [doi]
22. Russ, B.; Robb, M. J.; Popere, B. C.; Perry, E. E.; Mai, C.-K.; Fronk, S. L.; Patel, S. N.; Mates, T. E.; Bazan, G. C.; Urban, J. J.; Chabiny, M. L.; Hawker, C. J.; Segalman, R. A. Tethered tertiary amines as solid-state n-type dopants for solution-processable organic semiconductors. *Chem. Sci.* **2016**, *7*, 1914–1919. [doi]
21. Hartmeier, B. F.; Brady, M. A.; Treat, N. D.; Robb, M. J.; Mates, T. E.; Hexemer, A.; Wang, C.; Hawker, C. J.; Kramer, E. J.; Chabiny, M. L. Significance of miscibility in multidonor bulk heterojunction solar cells. *J. Polym. Sci. Part B: Polym. Phys.* **2016**, *54*, 237–246. [doi]
20. Robb, M. J.; Moore, J. S. A retro-Staudinger cycloaddition: Mechanochemical cycloelimination of a β -lactam mechanophore. *J. Am. Chem. Soc.* **2015**, *137*, 10946–10949. [doi]
19. Handa, N. V.; Serrano, A. V.; Robb, M. J.; Hawker, C. J. Exploring the synthesis and impact of end-functional poly(3-hexylthiophene). *J. Polym. Sci. Part A: Polym. Chem.* **2015**, *53*, 831–841. [doi]
18. Tsurui, K.; Murai, M.; Ku, S.-Y.; Hawker, C. J.; Robb, M. J.* Modulating the properties of azulene-containing polymers through controlled incorporation of regioisomers. *Adv. Funct. Mater.* **2014**, *24*, 7338–7347. [doi]

17. Oh, S. S.; Lee, B. F.; Leibfarth, F. A.; Eisenstein, M.; Robb, M. J.; Lynd, N. A.; Hawker, C. J.; Soh, H. T. Synthetic aptamer-polymer hybrid constructs for programmed drug delivery into specific target cells. *J. Am. Chem. Soc.* **2014**, *136*, 15010–15015. [doi]
16. Murai, M.; Ku, S.-Y.; Treat, N. D.; Robb, M. J.; Chabiny, M. L.; Hawker, C. J. Modulating structure and properties in organic chromophores: influence of azulene as a building block. *Chem. Sci.* **2014**, *5*, 3753–3760. [doi]
15. Robb, M. J.; Newton, B.; Fors, B. P.; Hawker, C. J. One-step synthesis of unsymmetrical *N*-alkyl-*N'*-aryl perylene diimides. *J. Org. Chem.* **2014**, *79*, 6360–6365. [doi]
14. Russ, B.; Robb, M. J.; Brunetti, F. G.; Miller, P. L.; Patel, S.; Ho, V.; Urban, J. J.; Chabiny, M. L.; Hawker, C. J.; Segalman, R. A. Power factor enhancement in solution-processed n-type thermoelectrics through molecular design. *Adv. Mater.* **2014**, *26*, 3473–3477. [doi]
13. Robb, M. J.; Ku, S.-Y.; Hawker, C. J. 25th Anniversary article: No assembly required: Recent advances in fully conjugated block copolymers. *Adv. Mater.* **2013**, *25*, 5686–5700. [doi]
12. Fors, B. P.; Poelma, J. E.; Menyo, M. S.; Robb, M. J.; Spokoyny, D. M.; Kramer, J. W.; Waite, J. H.; Hawker, C. J. Fabrication of unique chemical patterns and concentration gradients with visible light. *J. Am. Chem. Soc.* **2013**, *135*, 14106–14109. [doi]
11. Robb, M. J.; Montarnal, D.; Eisenmenger, N. D.; Ku, S.-Y.; Chabiny, M. L.; Hawker, C. J. A one-step strategy for end-functionalized donor–acceptor conjugated polymers. *Macromolecules* **2013**, *46*, 6431–6438. [doi]
10. Klinger, D.; Robb, M. J.; Spruell, J. M.; Lynd, N. A.; Hawker, C. J.; Connal, L. A. Supramolecular guests in solvent driven block copolymer assembly: from structured nanoparticles to micelles. *Polym. Chem.* **2013**, *4*, 5038–5042. [doi]
9. MacKenzie, R. C. I.; Shuttle, C. G.; Dibb, G. F.; Treat, N.; von Hauff, E.; Robb, M. J.; Hawker, C. J.; Chabiny, M. L.; Nelson, J. Interpreting the density of states extracted from organic solar cells using transient photocurrent measurements. *J. Phys. Chem. C* **2013**, *117*, 12407–12414. [doi]
8. Robb, M. J.; Ku, S.-Y.; Brunetti, F. G.; Hawker, C. J. A renaissance of color: New structures and building blocks for organic electronics. *J. Polym. Sci. Part A: Polym. Chem.* **2013**, *51*, 1263–1271. [doi]
7. Connal, L. A.; Lynd, N. A.; Robb, M. J.; See, K. A.; Jang, S. G.; Spruell, J. M.; Hawker, C. J. Mesostructured block copolymer nanoparticles: Versatile templates for hybrid inorganic/organic nanostructures. *Chem. Mater.* **2012**, *24*, 4036–4042. [doi]
6. Ku, S.-Y.; Brady, M. A.; Treat, N. D.; Cochran, J. E.; Robb, M. J.; Kramer, E. J.; Chabiny, M. L.; Hawker, C. J. A modular strategy for fully conjugated donor–acceptor block copolymers. *J. Am. Chem. Soc.* **2012**, *134*, 16040–16046. [doi]
5. Robb, M. J.; Connal, L. A.; Lee, B. F.; Lynd, N. A.; Hawker, C. J. Functional block copolymer nanoparticles: Toward the next generation of delivery vehicles. *Polym. Chem.* **2012**, *3*, 1618–1628. [doi]
4. Lin, B. F.; Marullo, R. S.; Robb, M. J.; Krogstad, D. V.; Antoni, P.; Hawker, C. J.; Campos, L. M.; Tirrell, M. V. De novo design of bioactive protein-resembling nanospheres via dendrimer-templated peptide amphiphile assembly. *Nano Lett.* **2011**, *11*, 3946–3950. [doi]
3. Lo Conte, M.; Robb, M. J.; Hed, Y.; Marra, A.; Malkoch, M.; Hawker, C. J.; Dondoni, A. Exhaustive glycosylation, PEGylation, and glutathionylation of a [G4]–ene₄₈ dendrimer via photoinduced thiol-ene coupling. *J. Polym. Sci. Part A: Polym. Chem.* **2011**, *49*, 4468–4475. [doi]
2. Antoni, P.; Robb, M. J.; Campos, L.; Montañez, M.; Hult, A.; Malmström, E.; Malkoch, M.; Hawker, C. J. Pushing the limits for CuAAC and thiol-ene reactions: Synthesis of a 6th generation dendrimer in a single day. *Macromolecules* **2010**, *43*, 6625–6631. [doi]
1. Robb, M. J.; Knauss, D. M. Poly(arylene sulfide)s by nucleophilic aromatic substitution polymerization of 2,7-difluorothianthrene. *J. Polym. Sci. Part A: Polym. Chem.* **2009**, *47*, 2453–2461. [doi]

Book Chapters

Robb, M. J.; Hawker, C. J. 'Click' Chemistry in Polymer Science: CuAAC and Thiol–Ene Coupling for the Synthesis and Functionalization of Macromolecules. In *Synthesis of Polymers: New Structures and Methods*; Schlüter, A. D., Hawker, C. J., Sakamoto, J., Eds.; Wiley-VCH: Weinheim, Germany, 2012; Vol. 2, pp 923–971. [isbn]

Patents

Robb, M. J.; Hu, X.; Zeng, T. Method for controlled release using mechanical force. Provisional Patent Appl. (CIT-8330-P3) filed April 7, 2021.

Robb, M. J.; Hu, X. Mechanochemical Regulation of a Photochemical Reaction. U.S. Patent Appl. US20210070741A1 filed September 11, 2020.

Moore, J. S.; White, S. R.; Sottos, N. R.; Li, W.; Matthews, C. C.; Robb, M. J. Fluorescence detection of mechanical damage. U.S. Patent 10,139,389 issued November 27, 2018.

Presentations

Invited Seminars

"Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." Department of Chemistry, University of Pittsburgh, Pittsburgh, PA, United States, April 23, 2021 (virtual format)

"Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." Department of Chemistry and Geochemistry, Colorado School of Mines, Golden, CO, United States, April 16, 2021 (virtual format)

"Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." Department of Chemistry and Biomolecular Science, Clarkson University, Potsdam, NY, United States, March 26, 2021 (virtual format)

"Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." SURF Summer Research Seminar, Caltech, Pasadena, CA United States, August 7, 2019

"Development of Mechanically Responsive Molecules and Polymeric Materials." BASF CSI² Seminar, Wyandotte, MI, United States, April 24, 2019

"Molecular Design Strategies for Functional Soft Materials." Materials Science Research Lecture, Department of Applied Physics and Materials Science, Caltech, Pasadena, CA, United States, October 25, 2017

"Harnessing Mechanical Force to Do Productive Chemistry." School of Chemistry, Tel Aviv University, Tel Aviv, Israel, May 21, 2017

"Enabling Function in Soft Materials Through Molecular Design." Division of Chemistry and Chemical Engineering, Caltech, Pasadena, CA, United States, January 10, 2017

"Enabling Function in Soft Materials Through Molecular Design." Department of Chemistry, University of Minnesota, Minneapolis, MN, United States, December 15, 2016

"Enabling Function in Soft Materials Through Molecular Design." Department of Chemistry, Colorado State University, Fort Collins, CO, United States, December 12, 2016

"Enabling Function in Soft Materials Through Molecular Design." Department of Chemistry, University of Wisconsin, Madison, WI, United States, December 8, 2016

"Enabling Function in Soft Materials Through Molecular Design." Department of Chemistry and Chemical Biology, Cornell University, Ithaca, NY, United States, December 6, 2016

"Enabling Function in Soft Materials Through Molecular Design." Department of Chemistry, New York University, New York, NY, United States, November 29, 2016

Invited Conference Presentations

"Strategic Covalent Bond Transformations Using Mechanical Force." ACS National Meeting, Virtual Format, EJ Corey Award Symposium, April 5, 2021.

"Leveraging Polymer Mechanics at the Molecular Scale for Chemical Reactivity." ACS National Meeting, Philadelphia, PA, United States, March 25, 2020 (*Canceled due to COVID-19*)

"Strategic Covalent Bond Transformations Using Mechanical Force." ACS National Meeting, Philadelphia, PA, United States, March 22, 2020 (*Canceled due to COVID-19*)

"Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." Materials Research Outreach Symposium, University of California, Santa Barbara, CA, United States, January 30, 2020

"Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." Australasian Polymer Symposium, Sunshine Coast, Australia, November 11, 2019

"Developing Force-Activated Covalent Bond Transformations via Polymer Mechanochemistry." Frontiers in Soft Matter and Macromolecular Networks, University of San Diego, San Diego, CA, United States, September 27, 2019

“Development of Mechanically Responsive Molecules and Polymeric Materials.” Weizmann–Caltech Workshop on Novel Materials, Caltech, Pasadena, CA, United States, November 20, 2018

“Toward the Design of Mechanochemically Active Molecules and New Methods of Activation.” ACS National Meeting, Washington DC, United States, August 21, 2017

“Developing Functional Materials from Dendrimers to Mechanophores.” ACS National Meeting, Philadelphia, PA, United States, August 23, 2016 (Henkel Award address)

Contributed Conference Presentations

“Force-Decoupled Strategies in Mechanochemically Active Polymers.” ACS National Meeting, San Diego, CA, United States, August 27, 2019

“A Retro-Staudinger Cycloaddition Enabled by Polymer Mechanochemistry.” ACS National Meeting, San Diego, CA, United States, March 15, 2016

“Multifunctional Conjugated Polymers for Organic Electronics.” ACS National Meeting, New Orleans, LA, United States, April 7, 2013

“New Chemistry: Multifunctional Block and Telechelic Conjugated Polymers.” Zing Polymer Chemistry Conference, Xcaret, Mexico, November 14, 2012

“Block Copolymer Nanoparticles: Toward the Next Generation of Delivery Vehicles.” ACS National Meeting, Denver, CO, United States, August 29, 2011

“Dendrimer Synthesis Using Orthogonal ‘Click’ Chemistry.” Pacificchem International Congress, Honolulu, HI, United States, December 18, 2010

“Thiol–Ene Approaches to Dendrimer Synthesis.” ACS National Meeting, Boston, MA, United States, August 25, 2010

“Nucleophilic Aromatic Substitution Polymerization of 2,7-Difluorothianthrene for the Synthesis of Novel Poly(Arylene Sulfide)s.” ACS National Meeting, Salt Lake City, UT, United States, March 22, 2009

Teaching

Fall 2017, 2018 Ch 144b: Advanced Organic Chemistry

Winter 2019, 2020 Ch 1b: General Chemistry

Fall 2019, 2021 Ch/ChE 147: Polymer Chemistry