Stanford

Danielle Mai

Assistant Professor of Chemical Engineering and, by courtesy, of Materials Science and Engineering

Curriculum Vitae available Online

Bio

BIO

Danielle J. Mai joined the Department of Chemical Engineering at Stanford in January 2020. She earned her B.S.E. in Chemical Engineering from the University of Michigan and her M.S. and Ph.D. in Chemical Engineering from the University of Illinois at Urbana-Champaign. Dr. Mai was an Arnold O. Beckman Postdoctoral Fellow at MIT, where she engineered materials with selective biomolecular transport properties, elucidated mechanisms of toughness and extensibility in entangled associative hydrogels, and developed high-throughput methods for the discovery of polypeptide materials. The Mai Lab engineers biopolymers, which are the building blocks of life. Specifically, the group integrates precise biopolymer engineering with multi-scale experimental characterization to advance biomaterials development and to enhance fundamental understanding of soft matter physics. Dr. Mai's work has been recognized through the AIChE 35 Under 35 Award (2020), APS DPOLY/UKPPG Lecture Exchange (2021), Air Force Office of Scientific Research Young Investigator Program Award (2022), ACS PMSE Arthur K. Doolittle Award (2023), and MIT Technology Review List of 35 Innovators Under 35 (2023).

ACADEMIC APPOINTMENTS

- Assistant Professor, Chemical Engineering
- Assistant Professor (By courtesy), Materials Science and Engineering
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance

HONORS AND AWARDS

- Scialog Fellow: Sustainable Minerals, Metals, and Materials, Research Corporation for Science Advancement (2024)
- 35 Innovators Under 35, MIT Technology Review (2023)
- Arthur K. Doolittle Award, Division of Polymeric Materials: Science and Engineering, American Chemical Society (2023)
- Asian American Faculty Award, Stanford Asian American Activities Center (A3C) (2023)
- Doctoral New Investigator Award, ACS Petroleum Research Fund (2023)
- AFOSR Young Investigator Program, Air Force Office of Scientific Research (2022)
- Inspiring Early Academic Career Award, Stanford Faculty Women's Forum (2022)
- DPOLY/UKPPG Exchange Lectureship, Division of Polymer Physics, American Physical Society (2021)
- AIChE 35 Under 35, American Institute of Chemical Engineers (2020)
- 1st Place Poster Prize, Division of Polymer Physics, American Physical Society (2018)
- Future Faculty Scholar, Division of Polymeric Materials: Science and Engineering, American Chemical Society (2018)

- MIT IMPACT Fellow, Massachusetts Institute of Technology (2018)
- Arnold O. Beckman Postdoctoral Fellowship, Arnold and Mabel Beckman Foundation (2017)
- Outstanding Graduate Student Award, Lam Research Corporation (2015)
- NSF Graduate Research Fellowship, National Science Foundation (2013)
- Illinois Distinguished Fellowship, University of Illinois (2011)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Editorial Board Member, ACS Macro Letters (2024 - present)
- Editorial Board Member, Journal of Polymer Science (2023 - present)
- Polymers (Area 08A) Programming Vice-Chair / Chair, American Institute of Chemical Engineers (2023 - present)
- AIChE 35 Under 35 Award Steering Committee, American Institute of Chemical Engineers (2023 - 2023)
- Early Career Member-at-Large, American Physical Society Division of Polymer Physics (2022 - 2024)
- Fluid Mechanics (Area 01J) Programming Committee, American Institute of Chemical Engineers (2020 - present)
- Chair, Polymer Physics Gordon Research Seminar (2016 - 2018)

PROFESSIONAL EDUCATION

- Postdoc, Massachusetts Institute of Technology , Chemical Engineering
- PhD, University of Illinois , Chemical Engineering (2016)
- MS, University of Illinois , Chemical Engineering (2014)
- BSE, University of Michigan , Chemical Engineering (2011)

LINKS

- Mai Lab: https://mailab.stanford.edu
- DJM - Google Scholar: https://scholar.google.com/citations?user=qwASCMQAAAAJ&hl=en
- DJM - Stanford Chemical Engineering: https://cheme.stanford.edu/people/danielle-mai

Teaching

COURSES

2026-27

- Polymer Physics: CHEMENG 466 (Spr)

2025-26

- Introduction to Chemical Engineering Thermodynamics: CHEMENG 110A (Aut)
- Polymer Physics: CHEMENG 466 (Win)

2024-25

- Fundamentals and Applications of Spectroscopy: CHEMENG 345 (Spr)
- Introduction to Chemical Engineering Thermodynamics: CHEMENG 110A (Aut)

2023-24

- Introduction to Chemical Engineering Thermodynamics: CHEMENG 110A (Aut)
- Polymer Physics: CHEMENG 466 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

David Dumas, Christian Williams

Postdoctoral Faculty Sponsor

Ziyu Cui

Doctoral Dissertation Advisor (AC)

Vic Hempstead, Michelle Quan, Eleanor Quirk

Doctoral Dissertation Co-Advisor (AC)

Rebecca Avrutin, Vidushi Bansal, Centaine Joseph

Publications

PUBLICATIONS

- **Small-Angle Neutron Scattering Reveals Structural Hierarchy of Polymer- Nanoparticle Hydrogels** *MACROMOLECULES*
  Eckman, N., Saouaf, O. M., Jons, C. K., Pingali, S., Prossnitz, A. N., Kasse, C. M., Mai, D. J., Appel, E. A.
  2026
- **Repetitive proteins that undergo large conformational changes evade structural prediction algorithms.** *The Journal of chemical physics*
  Chang, M. P., Jin, T., Gudinas, A. P., Fernandez, D., Alexander-Katz, A., Matsui, T., Mai, D. J.
  2025; 163 (22)
- **Ion-selective conformational stabilization of a disordered repeats-in-toxin protein domain.** *Biophysical journal*
  Gudinas, A. P., Shambharkar, G. M., Chang, M. P., Fernández, D., Matsui, T., Mai, D. J.
  2025
- **In situ Photo-rheology Monitors Viscoelastic Changes in Photo-responsive Polymer Networks.** *Journal of visualized experiments : JoVE*
  Quirk, E. L., Burroughs, M. C., Mai, D. J.
  2025
- **Light-Responsive Star Polymers for Reprocessable Network Formation and Deconstruction** *MACROMOLECULES*
  Burroughs, M. C., Quirk, E. L., Wirtz, B. M., Schloemer, T. H., Congreve, D. N., Mai, D. J.
  2025
- **Biomolecular Actuators for Soft Robots.** *Chemical reviews*
  Quan, M. C., Mai, D. J.
  2025
- **Sequence-defined structural transitions by calcium-responsive proteins** *POLYMER CHEMISTRY*
  Chang, M. P., Huang, W., Shambharkar, G. M., Hernandez, K. M., Mai, D. J.
  2024
- **Protease-Driven Phase Separation of Elastin-Like Polypeptides.** *Biomacromolecules*
  Wirtz, B. M., Yun, A. G., Wick, C., Gao, X. J., Mai, D. J.
  2024
- **Engineered selective biotoxin-binding hydrogels for toxin sequestration** *JOURNAL OF POLYMER SCIENCE*
  Morris, M. A., Yang, Y., Mai, D. J., Olsen, B. D.
  2024
- **Single-molecule studies in polymer science** *JOURNAL OF POLYMER SCIENCE*
  Qiang, Z., Ullal, C., Mai, D.
  2024

- **Spatially Controlled Uv Light Generation at Depth Using Upconversion Micelles.** *Advanced materials (Deerfield Beach, Fla.)*
  Zhou, Q., Wirtz, B. M., Schloemer, T. H., Burroughs, M. C., Hu, M., Narayanan, P., Lyu, J., Gallegos, A. O., Layton, C., Mai, D. J., Congreve, D. N.
  2023: e2301563
- **Polymeric protagonists for biological processes.** *Nature chemistry*
  Gudinas, A. P., Mai, D. J.
  2023
- **Gelation Dynamics during Photo-Cross-Linking of Polymer Nanocomposite Hydrogels.** *ACS polymers Au*
  Burroughs, M. C., Schloemer, T. H., Congreve, D. N., Mai, D. J.
  2023; 3 (2): 217-227
- **Democratizing the rapid screening of protein expression for materials development** *MOLECULAR SYSTEMS DESIGN & ENGINEERING*
  Morris, M. A., Bataglioli, R. A., Mai, D. J., Yang, Y., Paloni, J. M., Mills, C. E., Schmitz, Z. D., Ding, E. A., Huske, A. C., Olsen, B. D.
  2022
- **Turn on the Stereo: Engaging in Mentorship from all Directions** *CHEMICAL ENGINEERING PROGRESS*
  Mai, D. J.
  2022; 118 (3): 16
- **Monomer-scale design of functional protein polymers using consensus repeat sequences** *JOURNAL OF POLYMER SCIENCE*
  Chang, M. P., Huang, W., Mai, D. J.
  2021
- **Tuning Selective Transport of Biomolecules through Site-Mutated Nucleoporin-like Protein (NLP) Hydrogels.** *Biomacromolecules*
  Yang, Y. J., Mai, D. J., Li, S., Morris, M. A., Olsen, B. D.
  2021
- **100th Anniversary of Macromolecular Science Viewpoint: Single-Molecule Studies of Synthetic Polymers** *ACS MACRO LETTERS*
  Mai, D. J., Schroeder, C. M.
  2020; 9 (9): 1332–41
- **Glycoprotein Mimics with Tunable Functionalization through Global Amino Acid Substitution and Copper Click Chemistry.** *Bioconjugate chemistry*
  Seifried, B. M., Qi, W., Yang, Y. J., Mai, D. J., Puryear, W. B., Runstadler, J. A., Chen, G., Olsen, B. D.
  2020
- **Molecular anisotropy and rearrangement as mechanisms of toughness and extensibility in entangled physical gels** *PHYSICAL REVIEW MATERIALS*
  Edwards, C. E. R., Mai, D. J., Tang, S., Olsen, B. D.
  2020; 4 (1)
- **Nucleopore-Inspired Polymer Hydrogels for Selective Biomolecular Transport.** *Biomacromolecules*
  Yang, Y. J., Mai, D. J., Dursch, T. J., Olsen, B. D.
  2018; 19 (10): 3905-3916
- **Stretching Dynamics of Single Comb Polymers in Extensional Flow** *MACROMOLECULES*
  Mai, D. J., Saadat, A., Khomami, B., Schroeder, C. M.
  2018; 51 (4): 1507–17
- **Single polymer dynamics of topologically complex DNA** *CURRENT OPINION IN COLLOID & INTERFACE SCIENCE*
  Mai, D. J., Schroeder, C. M.
  2016; 26: 28–40
- **Topology-Controlled Relaxation Dynamics of Single Branched Polymers.** *ACS macro letters*
  Mai, D. J., Marciel, A. B., Sing, C. E., Schroeder, C. M.
  2015; 4 (4): 446-452
- **Template-Directed Synthesis of Structurally Defined Branched Polymers** *MACROMOLECULES*
  Marciel, A. B., Mai, D. J., Schroeder, C. M.

2015; 48 (5): 1296–1303

- **Microfluidic systems for single DNA dynamics** *SOFT MATTER*
  Mai, D. J., Brockman, C., Schroeder, C. M.
  2012; 8 (41): 10560–72
- **Influence of Polyethyleneimine Graftings of Multi-Walled Carbon Nanotubes on their Accumulation and Elimination by and Toxicity to Daphnia magna** *ENVIRONMENTAL SCIENCE & TECHNOLOGY*
  Petersen, E. J., Pinto, R. A., Mai, D. J., Landrum, P. F., Weber, W. J.
  2011; 45 (3): 1133–38
- **Response of Sinorhizobium meliloti to elevated concentrations of cadmium and zinc** *APPLIED AND ENVIRONMENTAL MICROBIOLOGY*
  Rossbach, S., Mai, D. J., Carter, E. L., Sauviac, L., Capela, D., Bruand, C., de Bruijn, F. J.
  2008; 74 (13): 4218–21