Daniel T. Bregante

Massachusetts Institute of Technology
Cambridge, MA

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Education and Training

University of Illinois at Urbana-Champaign; Urbana, IL — 2015 – 2020
Ph.D. in Chemical and Biomolecular Engineering
Ph.D. Advisor: David W. Flaherty, Ph.D.

University of California, Berkeley; Berkeley, CA — 2011 – 2015
B.S. in Chemical and Biomolecular Engineering
Concentration in Applied Physical Sciences; Minor in Chemistry

Professional Experience

Postdoctoral Researcher — Aug. 2020 – Present
Massachusetts Institute of Technology; Cambridge, MA
Advisor: Professor *Yogesh Surendranath*, Department of Chemistry

Graduate Researcher — Sept. 2015 – Aug. 2020
University of Illinois at Urbana-Champaign; Urbana, IL
Advisor: Professor *David W. Flaherty*, Department of Chemical Engineering

Analytical Operations Intern — June 2015 – Aug. 2015
Genentech; San Francisco, CA
Manager: *Wayman Chan*, Analytical Operations Division

Undergraduate Researcher — Jan. 2014 – May 2015
University of California, Berkeley; Berkeley, CA
Advisor: Professor *Clayton J. Radke*, Department of Chemical Engineering

Undergraduate Researcher — Jan. 2013 – Dec. 2013
University of California, Berkeley; Berkeley, CA
Advisor: Professor *Thomas J. Maimone*, Department of Chemistry

Chemistry Demonstrations Laboratory — Jan. 2012 – May 2015
University of California, Berkeley; Berkeley, CA
Manager: *Karen Chan*, Department of Chemistry

Awards & Honors

2019 – 2020	University of Illinois Dissertation Completion Fellowship
2019 – 2020	ARCS Foundation Scholar
2020	International Congress on Catalysis Travel Award (Postponed due to COVID-19)
2020	Schmidt Science Fellows Finalist
2020	University of Washington DYSS Semi-Finalist
2016 – 2019	National Defense Science and Engineering Graduate Fellowship
2019	Gordon Research Conference Travel Award
2019	Graduate College Travel Award
2018	ACS Graduate Student Award in Environmental Chemistry
2018	AIChE Catalysis and Reaction Engineering Travel Award
2017 – 2018	Frederic and Edith Mavis Future Faculty Fellowship
2017 – 2018	School of Chemical Sciences Graduate Teaching Award

2017 – 2018	Twice on List of Teachers Ranked as Outstanding/Excellent
2017	Richard J. Kokes Graduate Fellowship
2017	Thomas J. Hanratty Travel Award
2016	1st Place Award for Oral Presentations at 15th Annual ChBE Symposium
2015 – 2016	Samuel W. Parr Graduate Fellowship
2014	College of Chemistry Summer Research Fellowship
2013 – 2014	Melvin J. Heger-Horst Undergraduate Fellowship
2013 – 2014	Engineering Undergraduate Scholarship
2013	Frank Delfino Chemical Engineering Summer Research Fellowship
2011	James Logan High School Mathematics Department Citation
2011	John Philip Sousa Award

Publications

‡*Denotes co-first authorship;* §*Denotes undergraduate mentee; Manuscript drafts available upon reasonable request*

21. **Bregante, D.T.;** Chan, M,; Tan, J.Z.;§ Ayla, E.Z.; Nicholas, C.P.; Shukla, D.; Flaherty, D.W.; "The Shape of Water in Zeolites and Its Impact on Oxidation Catalysis" *In review. (ChemRxiv)*
20. Yun, D.; Ayla, E.Z.; **Bregante D.T.;** Flaherty, D.W.; "Reactive Species and Reaction Pathways for the Oxidative Cleavage of 4-Octene and Oleic Acid with H_2O_2 over Tungsten Oxide Catalysts" *In review.*
19. Noh, G.; Lam, E.; **Bregante, D.T.;** Meyet, J.; Sot, P.; Flaherty, D.W.; Copéret, C.; "Lewis Acid Strength of Interfacial Metal Sites Drives CH_3OH Selectivity and Formation Rates on Cu-based CO_2 Hydrogenation Catalysts" *Angewandte Chemie, In revision.*
18. Ayla, E.Z.; Potts, D.S.; **Bregante, D.T.;** Flaherty, D.W.; "Linear Free Energy Relationships Describe Alkene Oxidations with H_2O_2 over Groups 4-6 Metal-Substituted Zeolites" *ACS Catalysis, Accepted.*
17. Ardagh, M.A.; **Bregante, D.T.;** Flaherty, D.W.; Notestein, J.M.; "Controlled Deposition of Silica on Titania-Silica to Alter the Active Site Surroundings on Epoxidation Catalysts" *ACS Catalysis,* **2020***, 10*, 13008-13018.
16. **Bregante, D.T.;** Potts, D.S.; Kwon, O.; Ayla, E.Z.; Tan, J.Z.;§ Flaherty, D.W.; "Effects of Hydrofluoric Acid Concentration on the Density of Silanol Groups and Water Adsorption in Hydrothermally Synthesized Transition Metal Substituted Silicalite-1" *Chemistry of Materials,* **2020,** *32*, 7425-7437.
15. **Bregante, D.T.;** Tan, J.Z.;§ Schultz, R.L.;§ Potts, D.S.; Ayla, E.Z.; Torres, C.; Flaherty, D.W.; "Catalytic Consequences of Oxidant, Alkene, and Pore Structure on Alkene Epoxidations within Titanium Silicates" *ACS Catalysis,* **2020,** *10*, 10169-10184.
14. **Bregante, D.T.;** Tan, J.Z.;§ Sustrino, A.; Flaherty, D.W.; "Heteroatom Substituted Zeolite FAU with Ultralow Al Contents for Liquid-Phase Oxidation Catalysis" *Catalysis Science & Technology,* **2020**, *10*, 635-647.
Featured on the cover of Catalysis Science & Technology
13. Hong, Y.T.; **Bregante, D.T.;** Lee, C.W.; Seo, Y.; Flaherty, D.W.; Rogers, S.A.; Schook L.G.; Kong, H.; "Catalytic Microgelators for Decoupled Control of Gelation Rate and Rigidity of the Biological Gels" *Journal of Controlled Release,* **2020**, *317*, 166-180.
12. **Bregante, D.T.;** Flaherty, D.W.; "Impact of Specific Interactions Among Reactive Surface Intermediates and Confined Water on Epoxidation Catalysis and Adsorption in Lewis Acid Zeolites" *ACS Catalysis,* **2019**, *9*, 10951-10962.
11. **Bregante, D.T.;** Johnson, A.M.;§ Patel, A.Y.;§ Ayla, E.Z.; Cordon, M.J.; Bukowski, B.C.; Greeley, J.; Gounder, R.; Flaherty, D.W.; "Cooperative Effects between Hydrophilic Pores and Solvents: Catalytic

Consequences of Hydrogen Bonding on Alkene Epoxidation in Zeolites" *Journal of the American Chemical Society* **2019**, *141*, 7302-7319.

10. **Bregante, D.T.;** Thornburg, N.E.; Notestein, J.M.; Flaherty, D.W.; "Consequences of Confinement on Highly Dispersed Group IV and V Metal Oxide Catalysts for Olefin Epoxidation with Hydrogen Peroxide" *ACS Catalysis* **2018**, *8*, 2995-3010.
Featured on the cover of ACS Catalysis and Mass Transfer Newsletter

9. **Bregante, D.T.;** Patel, A.Y.;[§] Johnson, A.M.;[§] Flaherty, D.W.; "Catalytic Thiophene Oxidation by Groups 4 and 5 Framework-Substituted Zeolites with Hydrogen Peroxide: Mechanistic and Spectroscopic Evidence for the Effects of Metal Lewis Acidity and Solvent Lewis Basicity" *Journal of Catalysis* **2018**, *364*, 415-425.

8. Wilson, N.M.; Schröder, J., Priyadarshini, P; **Bregante, D.T.;** Kunz, S.; Flaherty, D.W.; "Direct Synthesis of H_2O_2 on PdZn Nanoparticles: The Impact of Electronic Modifications and Heterogeneity of Active Sites" *Journal of Catalysis* **2018**, *368*, 261-274.

7. Dion, M.Z.; Wang, Y.J.; **Bregante, D.T.;** Chan, W.; Andersen, N.; Hilderbrand, A.; Leiske, D.; Salisbury, C.M.; "The use of a 2,2'azobis (2-amidinopropane) dihydrochloride (AAPH) stress model as an indicator of oxidation susceptibility for monoclonal antibodies" *Journal of Pharmaceutical Science* **2018**, *107*, 550-558.

6. **Bregante, D.T.;** Flaherty, D.W.; "Periodic Trends in Olefin Epoxidation over Group IV and V Framework-Substituted Zeolite Catalysts: A Kinetic and Spectroscopic Study" *Journal of the American Chemical Society* **2017**, *139*, 6888-6898.
Highlighted in Illinois News Bureau, Science Daily, Science Newsline, Phys.org, etc.

5. **Bregante, D.T.;** Priyadarshini, P.; Flaherty, D.W.; "Kinetic and Spectroscopic Evidence for Reaction Pathways and Intermediates for Olefin Epoxidation on Nb in *BEA" *Journal of Catalysis,* **2017**, *348*, 75-89.

4. Wilson, N.M.;[‡] **Bregante, D.T.;**[‡] Priyadarshini, P.; Flaherty, D.W.; "Production and use of H_2O_2 for atom-efficient functionalization of hydrocarbons and small molecules" *Catalysis*, **2017**, *29*, 122-212.

3. Moteki, T.; Rowley, A.T.; **Bregante, D.T.;** Flaherty, D.W.; "Formation Pathways toward 2- and 4-Methylbenzaldehyde via Sequential Reactions from Acetaldehyde over Hydroxyapatite Catalysts" *ChemCatChem,* **2017**, *9*, 1921-1929.

2. Dursch, T.J.; Liu, D.E.; Taylor, N.O.; Chan, S.Y.; **Bregante, D.T.;** Radke, C.J.; "Diffusion of Water-Soluble Sorptive Drugs in HEMA/MAA Hydrogels" *Journal of Controlled Release* **2016**, *239*, 242-248.

1. Dursch, T.J.; Liu, D.E.; Oh, Y.; **Bregante, D.T.;** Chan, S.Y.; Radke, C.J.; "Equilibrium water and solute uptake in silicone hydrogels" *Acta Biomaterialia* **2015**, *18*, 112-117.

Patent Applications

2. Flaherty, D.W.; **Bregante, D.T.;** "Synthesis of Zeolite or Zeotype" U.S. Patent Application No. 63/032,320 (2020)
1. Flaherty, D.W.; **Bregante, D.T.;** "Heteroatom Substituted Zeolites" U.S. Patent Application No. 62/944,412 (2019)

Oral Presentations

16. **Bregante, D.T.;** Tan, J.Z.;[§] Chan, M.; Shukla, D.; Flaherty, D.W.; "The Shape of Water in Zeolites and Its Impact on Alkene Epoxidations" 2020 AIChE National Meeting, November 20th, 2020; Virtual

15. **Bregante, D.T.;** Tan, J.Z.;[§] Schultz, R.L.;[§] Potts, D.S.; Ayla, E.Z.; Torres, C.; Flaherty, D.W.; "Micropore-Mediated Interactions among Surface Intermediates: Role of Oxidant Structure and Pore Size on Alkene Epoxidation in Titanium Silicates" 2020 AIChE National Meeting, November 20th, 2020; Virtual

14. **Bregante, D.T.** "The Shape of Water (in Zeolites): Consequences for Epoxidation Catalysis" CEMS Department Seminar at the University of Minnesota; February 20th, 2020; Minneapolis, MN ***(Invited)***

13. **Bregante, D.T.;** Schultz, R.L.;[§] Ayla, E.Z.; Tan, J.Z.;[§] Torres, C.; Flaherty, D.W. "Influence of Oxidant Chemical Functionality on Alkene Epoxidation over Lewis Acid Zeolites: Intermediate Stabilization through Inner- and Outer-Sphere Interactions" 2019 AIChE National Meeting; November 13th, 2019; Orlando, FL

12. **Bregante, D.T.;** Tan, J.Z.;[§] Patel, A.Y.;[§] Flaherty, D.W. "Catalysis in Tight Spaces: Confined Solvent Structures Influence Stability of Surface Intermediates during Alkene Epoxidation within Lewis Acid Zeolites" 2019 AIChE National Meeting; November 11th, 2019; Orlando, FL

11. **Bregante, D.T.;** Tan, J.Z.;[§] Schultz, R.L.;[§] Patel, A.Y.;[§] Torres, C.; Ayla, E.Z.; Flaherty, D.W. "Interactions between Surface Species and Confined Solvent Structures within Lewis Acid Zeolites: The (De)Stabilization of Catalytically-Relevant Intermediates" ACS Fall 2019 National Meeting; Aug. 25th, 2019; San Diego, CA

10. **Bregante, D.T.;** Tan, J.Z.;[§] Patel, A.Y.;[§] Ayla, E.Z.; Flaherty, D.W. "Confined Solvent Structures within Lewis Acid Zeolites Influence the Stability of Surface Species at the Liquid-Solid Interface" 2019 Gordon Research Conference: Nanoporous Materials and Their Applications; August 5th, 2019; New London, NH ***(Invited from GRS speakers)***

9. **Bregante, D.T.;** Tan, J.Z.;[§] Patel, A.Y.;[§] Ayla, E.Z.; Flaherty, D.W. "Confined Solvent Structures within Lewis Acid Zeolites Influence the Stability of Surface Species at the Liquid-Solid Interface" 2019 Gordon Research Seminar: Nanoporous Materials and Their Applications; August 4th, 2019; New London, NH ***(Invited)***

8. **Bregante, D.T.;** Flaherty, D.W. "Solvent Effects in Confined Spaces: Catalytic Consequences of Hydrophilicity on Alkene Epoxidation in Titanium Zeolites" Army Research Office Chemical Sciences Program Review; June 27th, 2019; Durham, NC – *PI Invitation; Presented in place*

7. **Bregante, D.T.;** Cordon, M.J.; Gounder, R.; Flaherty, D.W. "Solvent Effects in Confined Spaces: Catalytic Consequences of Hydrophilicity on Alkene Epoxidation in Titanium Zeolites" 26th North American Meeting of the Catalysis Society (NAM 26); June 24th, 2019; Chicago, IL

6. **Bregante, D.T.;** Johnson, A.M.;[§] Patel, A.Y.;[§] Ayla, Z.; Flaherty, D.W. "The Catalytic Consequences of Silanol Densities within Titanium BEA on Alkene Epoxidation with Hydrogen Peroxide" 2018 AIChE National Meeting; November 1st, 2018; Pittsburgh, PA

5. **Bregante, D.T.;** Flaherty, D.W. "Structure-Function Relationships for Dispersed Early Transition Metals on Porous Oxides" Army Research Office Chemical Sciences Program Review; August 2nd, 2018; Durham, NC – *PI Invitation; Presented in place*

4. **Bregante, D.T.;** Johnson, A.M.;[§] Patel, A.Y.;[§] Ayla, Z.; Thornburg, N.E.; Cordon, M.J.; Gounder, R.; Notestein, J.M.; Flaherty, D.W. "The Catalytic Consequences of Active Intermediate Polarization,

Transition State Confinement, and Silanol Density on Alkene Epoxidation with Hydrogen Peroxide over Highly Disperse Group 4 and 5 Metal Oxides" Catalysis Club of Chicago Symposium; May 11th, 2018; Naperville, IL

3. **Bregante, D.T.;** Thornburg, N.E.; Notestein, J.M.; Flaherty, D.W. "Group IV and V Periodic Trends in Olefin Epoxidation: Effects of Local Environment and Electronic Structure" 2017 AIChE National Meeting; November 1st, 2017; Minneapolis, MN

2. **Bregante, D.T.;** Flaherty, D.W.; "Kinetic and Spectroscopic Evidence for Periodic Trends in Olefin Epoxidation over Group IV and V *BEA" 25th North American Meeting of the Catalysis Society (NAM 25); June 6th, 2017; Denver, CO

1. **Bregante, D.T.**; Flaherty, D.W.; "Periodic Trends in Olefin Epoxidation over Group IV and V Zeolite Catalysts" 253rd ACS National Meeting; Apr. 6th, 2017; San Francisco, CA

Poster Presentations

14. **Bregante, D.T.;** Wilcox, L.N.; Paolucci, C.; Gounder, R.; Flaherty, D.W. "Kinetics of O_2 Activation over Cu-exchanged Zeolites: Implications for Partial Methane Oxidation" 2019 AIChE National Meeting; November 13th, 2019; Orlando, FL

13. **Bregante, D.T.;** Wilcox, L.N.; Paolucci, C.; Gounder, R.; Flaherty, D.W. "Kinetics of O_2 Activation over Cu-exchanged Zeolites: Implications for Partial Methane Oxidation" 2019 AIChE National Meeting; November 12th, 2019; Orlando, FL – *Exxon Mobil Poster Presentation* ***(Invited)***

12. **Bregante, D.T.;** "Engineering the Catalytic Environment: Synthetic, Mechanistic, Spectroscopic Approaches for Developing Design Principles" 2019 AIChE National Meeting; November 10th, 2019; Orlando, FL – *Meet the Faculty Candidate Poster Session*

11. **Bregante, D.T.;** "Molecular Interactions at Solid-Liquid Interfaces for Oxidation Catalysis" ARCS Annual Reception; Oct. 16th, 2019; Chicago, IL ***(Invited)***

10. **Bregante, D.T.;** Tan, J.Z.;[§] Schultz, R.L.;[§] Patel, A.Y.;[§] Torres, C.; Ayla, E.Z.; Flaherty, D.W. "Interactions between Surface Species and Confined Solvent Structures within Lewis Acid Zeolites: The (De)Stabilization of Catalytically-Relevant Intermediates" ACS Fall 2019 National Meeting; Aug. 25th, 2019; San Diego, CA – *Sci-Mix* ***(Invited)***

9. **Bregante, D.T.;** Tan, J.Z.;[§] Patel, A.Y.;[§] Ayla, E.Z.; Flaherty, D.W. "Confined Solvent Structures within Lewis Acid Zeolites Influence the Stability of Surface Species at the Liquid-Solid Interface" 2019 Gordon Research Conference: Nanoporous Materials and Their Applications; August 5th, 2019; New London, NH

8. **Bregante, D.T.;** Flaherty, D.W. "Confined Chaos: Disruption of Hydrogen-Bonded Water by Hydrophobic Surface Intermediates within Lewis Acid Zeolites" Catalysis Club of Chicago Symposium; April 16th, 2019; Naperville, IL

7. **Bregante, D.T.;** Patel, A.Y.;[§] Johnson, A.M.;[§] Flaherty, D.W. "Catalytic Thiophene Oxidation by Groups 4 and 5 Zeolite BEA with H_2O_2: Mechanistic and Spectroscopic Evidence for the Effects of Metal Lewis Acidity and Solvent Lewis Basicity" 2018 AIChE National Meeting; October 31st, 2018; Pittsburgh, PA

6. **Bregante, D.T.;** Thornburg, N.E.; Notestein, J.M.; Flaherty, D.W.; "Group IV and V Periodic Trends in Olefin Epoxidation: Effects of Electronic Structure and Local Environment" 2017 AIChE National Meeting; November 1st, 2017; Minneapolis, MN

5. **Bregante, D.T.;** Flaherty, D.W.; "Periodic Trends in Olefin Epoxidation over Group IV and V Zeolite Catalysts" Catalysis Club of Chicago Symposium; May 16th, 2017; Naperville, IL

4. **Bregante, D.T.;** Flaherty, D.W.; "Reaction Pathways and Intermediates for Epoxidation on Nb-*BEA" Catalysis Club of Chicago Symposium; May 17th, 2016; Naperville, IL

3. **Bregante, D.T.;** Chan, W.; Xu, A.; "Automation of a high-throughput assay to quantify peptide modification in mAbs by UHPLC-HRMS" Genentech Internship Poster Presentation; Aug. 15th, 2015; South San Francisco, CA

2. **Bregante, D.T.;** Dursch, T.J.; Peng, C.C.; Radke, C.J.; "Sliding Friction Coefficient of Soft Surface-Gel Coatings for Soft Contact Lenses" Saegebarth Undergraduate Research Fair; Apr. 24, 2015; Berkeley, CA

1. **Bregante, D.T.;** Dursch, T.J.; Peng, C.C.; Radke, C.J.; "Surface Gel Coatings for Soft Contact Lenses" Saegebarth Undergraduate Research Fair; Apr. 25, 2014; Berkeley, CA

Teaching Experience

Kinetics and Reactor Design (ENGR 462) — Olivet Nazarene University
Role: *Ad hoc* Instructor — Spring 2019

Chemical Kinetics and Catalysis (ChBE 551) — University of Illinois
Role: Teaching Assistant and Guest Lecturer — Fall 2018
Instructor: Prof. David W. Flaherty

Mass Transfer and Operations (ChBE 422) — University of Illinois
Role: Teaching Assistant and Guest Lecturer — Fall 2017
Instructor: Prof. David W. Flaherty

Chemical Structure and Reactivity (Chem 3A) — UC Berkeley
Role: Teaching Assistant — Summer 2014
Instructor: Prof. Steven Pedersen

Organic Chemistry I (Chem 112A) — UC Berkeley
Role: Teaching Assistant — Fall 2013
Instructor: Prof. Anne Baranger

Undergraduate Mentees (with awards won while mentored; [last known location])

At the *University of Illinois*

- **Ami Y. Patel** [Exxon Mobil] — Jan. 2017 – May 2020
  - 2018 R.J. Van Mynen Chemical Engineering Scholarship
  - 2017 National Science Foundation Research Experience for Undergraduates
- **Jun Zhi Tan** [Ph.D. Student at Princeton ChemE] — Sept. 2018 – May 2020
  - 2020 Princeton Graduate Student Fellowship
  - 2020 Chemical Engineering Alumni Scholarship
  - 2019 Finalist for Outstanding Poster Award at Undergraduate ChBE Research Symposium
- **Rebecca L. Schultz** [UIUC] — Feb. 2018 – May 2019
  - 2018 National Science Foundation Research Experience for Undergraduates
- **Alayna M. Johnson** [Ph.D. Student at MIT Chemistry] — Jan. 2017 – May 2018
  - 2018 Barry M. Goldwater Scholarship
  - 2017 Outstanding Researcher award at the Summer Research Symposium
  - 2017 Best Oral Presentation at the Eastern Central Illinois ACS Conference
  - 2017 National Science Foundation Research Experience for Undergraduates

- **Katherine E. Nagode** [Corning Inc.] May – Nov. 2016
  2016 National Science Foundation Research Experience for Undergraduates

Professional Service and Synergistic Activities

- **Conference Abstract Peer Reviewer:** AIChE National Meeting (2019, 2020, 2021); Catalysis Club of Chicago (2019)
- **Conference Session Chair:** AIChE National Meeting (2019, 2020, 2021); Catalysis Club of Chicago (2019)
- **Manuscript Reviewer:** Applied Catalysis B: Environmental; Catalysis Science & Technology; Microporous and Mesoporous Materials; Catalysis Communications; Chemical Engineering Science
- **Membership:** American Chemical Society (ACS); American Institute of Chemical Engineers (AIChE); Catalysis Club of Chicago (CCC); The Electrochemical Society (ECS); International Zeolite Association (IZA); North American Catalysis Society (NACS); Tau Beta Pi (TBP)
- **Outreach and Service Activities (University):** MIT Women in Chemistry Postdoctoral Mentor (2020 – Present); Cal Alumni Association Scholarship Reviewer (2016 – Present); Summer Pre-doctoral Institute Mentor (2018 – 2020); Eastern Central Illinois ACS Undergraduate Conference Judge (2017 – 2020); Summer Research Opportunities Program Mentor (2017 – 2018); Omega Chi Epsilon Chemical Engineering Student Panel (2016 – 2020); Engineering Prospective Graduate School Panel (2016 – 2020); Undergraduate Research Symposium Judge (2018 – 2020); Mentees and Mentors Relationships in Research (NSF-REU, 2016 – 2019); Vice President of Graduate Student Advisory Committee (2016 – 2017)
- **Outreach Activities (K-12):** Catalyzing your Interest in Engineering at Illinois (CURIE, 2019); Girls Adventures in Mathematics, Engineering, and Science (GAMES, 2016 – 2018); Berkeley Engineers and Mentors (BEAM, 2014 – 2015)