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ZACHARY P. SMITH

Professional Appointments

- 2017- Assistant Professor, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA.
Robert N. Noyce Career Development Chair (2021-)
Joseph R. Mares Career Development Chair (2017-2019)
- 2014-2016 Postdoctoral Scholar, Department of Chemistry, University of California, Berkeley, Berkeley, CA.

Education

- 2008-2014 *Ph.D.*, Chemical Engineering, University of Texas at Austin, Austin, TX. Advisors Donald R. Paul and Benny D. Freeman.
- 2008-2011 *M.S.*, Chemical Engineering, University of Texas at Austin, Austin, TX. Advisors Donald R. Paul and Benny D. Freeman.
- 2004-2008 *B.S. with Honors and Distinction*, Chemical Engineering, Pennsylvania State University, University Park, PA.

Founded Companies

- 2021 Osmoses Inc., Co-Founder and Chief Science Officer
- 2017 Flux Technology, Co-Founder and Advisor

Honors and Awards

- 2021 Frank E. Perkins Award for Excellence in Graduate Advising – MIT
- 2021 Office of Naval Research (ONR) Young Investigator Award
- 2020 American Institute of Chemical Engineers (AIChE) 35 Under 35 Award
- 2018 Department of Energy (DOE) Early Career Award
- 2017 North American Membrane Society Young Membrane Scientist Award
- 2013 U.S. Delegate to the Lindau Nobel Laureate Meeting on Chemistry
- 2013 American Chemical Society Excellence in Graduate Polymer Research
- 2010 Department of Energy Office of Science Graduate Fellow

Teaching

- 2017-2021 *10.32 – Separations*. Undergraduate course on theory and processes for molecular separations.
- 10.40 – Chemical Engineering Thermodynamics*. Graduate course covering the principles, concepts, and laws/postulates of classical and statistical thermodynamics.

10.467 – *Polymer Science Lab*. Undergraduate laboratory course covering chemistry, physics, and application of polymers.

10.569 – *Synthesis of Polymers*. Interdisciplinary graduate level course on polymer synthesis methods and applications.

Supervised Graduate Students

- 2020- Pablo Dean, Chemical Engineering, MIT, *Ph.D.*
- 2020- Eric Hahnert, Chemical Engineering, MIT, *Ph.D.*
- 2020- Jing Ying Yeo, Chemical Engineering, MIT, *Ph.D.*
- 2019- Aristotle Grosz, Chemical Engineering, MIT, *Ph.D.*
- 2019- Wan-Ni Wu, Chemical Engineering, MIT, *Ph.D.*
- 2019- Kayla Storme, Chemistry, MIT, *Ph.D.* (Co-advised with Tim Swager)
- 2018- Taigyu Joo, Chemical Engineering, MIT, *Ph.D.*
- 2018- Hyunhee Lee, Chemical Engineering, MIT, *Ph.D.*
- 2017- Katherine Mizrahi Rodriguez, Materials Science and Engineering, MIT, *Ph.D.*
- 2017-2019 Patrick Asinger, Chemical Engineering, MIT, *M.S. CEP*
- 2016-2021 Sharon Lin, Chemical Engineering, MIT, *Ph.D.*
- 2016-2021 Qihui Qian, Chemical Engineering, MIT, *Ph.D.*
- 2016-2021 Albert Wu, Chemical Engineering, MIT, *Ph.D.*

Supervised Postdoctoral Associates/Fellows

- 2020- Stephen DeWitt, *Ph.D. in Chemical & Biomolecular Engineering*
- 2020- Fatima Edhaim, *Ph.D. in Chemistry Science*
- 2019- Justin Teesdale, *Ph.D. in Chemistry*
- 2019- Francesco Benedetti, *Ph.D. in Chemical Engineering*
- 2019- Moonjoo Lee, *Ph.D. in Chemical Engineering*
- 2019-2020 Shaofei Wang, *Ph.D. in Chemical Engineering*
- 2018-2021 Gang (Andy) Han, *Ph.D. in Chemical Engineering*
- 2017-2019 Won Seok (Lucas) Chi, *Ph.D. in Chemical Engineering*

Visiting Researchers

- 2020 Robin Studer, ETH Zürich, *M.S. Candidate in Chemical Engineering*
- 2018 Holden Lai, Stanford University, *Ph.D. Candidate in Chemistry*
- 2017-2018 Francesco Maria Benedetti, University of Bologna, *Ph.D. Candidate in Chemical Engineering*

Undergraduate Researchers

- 2021- Sherrie Qian, Materials Science and Engineering, MIT, *B.S.*

- 2021- Ruoxin Lu, Chemical Engineering, MIT, *B.S.*
- 2020- Evan Gwozdz, Chemical Engineering, MIT, *B.S.*
- 2020- Naksha Roy, Chemical Engineering, MIT, *B.S.*
- 2020- Duha Syar, Chemical Engineering, MIT, *B.S.*
- 2019-2020 Laura Chen, Chemical Engineering, MIT, *B.S.*
- 2019-2020 Alexander Liu, Chemical Engineering, MIT, *B.S.*
- 2018-2019 James Drayton, Chemical Engineering, MIT, *B.S.*
- 2018-2019 Asia Hypsher, Chemical Engineering, MIT, *B.S.*
- 2018 Shiqi Zhao, Chemistry and Chemical Engineering, Tianjin University and Nankai University, *B.S.*

Department and Institute Service

- 2019- Chemical Engineering Seminar Coordinator
- 2019- Chemical Engineering Undergraduate Advisor
- 2018-2019 MIT Committee on Toxic Chemicals
- 2018-2019 Chemical Engineering Representative for the Program in Polymers and Soft Matter (PPSM)
- 2018-2019 Chemical Engineering Undergraduate Curriculum Task Force, Chair for Separations (10.32)
- 2017- MIT Faculty Member for PPSM
- 2017- Chemical Engineering Graduate Admissions Committee

Professional Service

- 2020- Editorial Advisory Board for *Polymer*
- 2020- Board of Directors, North American Membrane Society
- 2018- Session Chair, North American Membrane Society National Meeting
- 2018-2019 Committee Member, National Academies of Sciences, Engineering, and Medicine Report on *A Research Agenda for Transforming Separation Science*
- 2017- Session Chair, American Institute of Chemical Engineers National Meeting
- 2013- Member, American Chemical Society
- 2010- Member, American Institute of Chemical Engineers

Peer-Reviewed Publications

- 48. Qian, Q.; Wright, A.; Lee, H.; Dinca, M.; **Smith, Z. P.*** Low-Temperature H₂S/CO₂/CH₄ Separation in Mixed-Matrix Membranes Containing MFU-4 (in press). *Chem. Mater.* **2021**.
- 47. Wu, A. X.; Drayton, J. A.; Ren, X.; Mizrahi Rodriguez, K.; Grosz, A. F.; Lee, J.-W.; **Smith, Z. P.*** Non-Equilibrium Lattice Fluid Modeling of Gas Sorption for Fluorinated Poly(Ether Imide)s. *Macromolecules* **2021**, *54* (14), 6628–6638.

46. Wu, A. X.; Lin, S.; Mizrahi Rodriguez, K.; Benedetti, F. M.; Joo, T.; Grosz, A. F.; Storme, K. R.; Roy, N.; Syar, D.; **Smith, Z. P.*** Revisiting Group Contribution Theory for Estimating Fractional Free Volume of Microporous Polymer Membranes. *J. Membr. Sci.* **2021**, *636*, 119526.
45. Wu, A. X.; Drayton, J. A.; Mizrahi Rodriguez, K.; Benedetti, F. M.; Qian, Q.; Lin, S.; **Smith, Z. P.*** Elucidating the Role of Fluorine Content on Gas Sorption Properties of Fluorinated Polyimides. *Macromolecules* **2021**, *54* (1), 22–34.
44. Lin, S.; Joo, T.; Benedetti, F. M.; Chen, L. C.; Wu, A. X.; Mizrahi Rodriguez, K.; Qian, Q.; Doherty, C. M.; **Smith, Z. P.*** Free Volume Manipulation of a 6FDA-HAB Polyimide Using a Solid-State Protection/Deprotection Strategy. *Polymer* **2021**, *212*, 123121.
43. Mizrahi Rodriguez, K.; Lin, S.; Wu, A. X.; Han, G.; Teesdale, J. J.; Doherty, C. M.; **Smith, Z. P.*** Leveraging Free Volume Manipulation to Improve the Membrane Separation Performance of Amine-Functionalized PIM-1. *Angew. Chemie Int. Ed.* **2021**, *60* (12), 6593–6599.
42. Qian, Q.; Asinger, P. A.; Lee, M. J.; Han, G.; Mizrahi Rodriguez, K.; Lin, S.; Benedetti, F. M.; Wu, A. X.; Chi, W. S.; **Smith, Z. P.*** MOF-Based Membranes for Gas Separations. *Chem. Rev.* **2020**, *120* (16), 8161–8266.
41. Wu, A. X.; Drayton, J. A.; Rodriguez, K. M.; Qian, Q.; Lin, S.; **Smith, Z. P.*** Influence of Aliphatic and Aromatic Fluorine Groups on Gas Permeability and Morphology of Fluorinated Polyimide Films. *Macromolecules* **2020**, *53* (13), 5085–5095.
40. Bilchak, C. R.; Jhalaria, M.; Huang, Y.; Abbas, Z.; Midya, J.; Benedetti, F. M.; Parisi, D.; Egger, W.; Dickmann, M.; Minelli, M.; Doghieri, F.; Nikoubashman, A.; Durning, C. J.; Vlassopoulos, D.; Jestin, J.; **Smith, Z. P.***; Benicewicz, B. C.; Rubinstein, M.; Leibler, L.; Kumar, S. K. Tuning Selectivities in Gas Separation Membranes Based on Polymer-Grafted Nanoparticles. *ACS Nano* **2020**, *14* (12), 17174–17183.
39. Han, G.; Rodriguez, K. M.; Qian, Q.; **Smith, Z. P.*** Acid-Modulated Synthesis of High Surface Area Amine-Functionalized MIL-101(Cr) Nanoparticles for CO₂ Separations. *Ind. Eng. Chem. Res.* **2020**, *59* (40), 18139–18150.
38. Han, G.; Qian, Q.; Mizrahi Rodriguez, K.; **Smith, Z. P.*** Hydrothermal Synthesis of Sub-20 nm Amine-Functionalized MIL-101(Cr) Nanoparticles with High Surface Area and Enhanced CO₂ Uptake. *Ind. Eng. Chem. Res.* **2020**, *59* (16), 7888–7900.
37. Mizrahi Rodriguez, K.; Wu, A. X.; Qian, Q.; Han, G.; Lin, S.; Benedetti, F. M.; Lee, H.; Chi, W. S.; Doherty, C. M.; **Smith, Z. P.*** Facile and Time-Efficient Carboxylic Acid Functionalization of PIM-1: Effect on Molecular Packing and Gas Separation Performance. *Macromolecules* **2020**, *53* (15), 6220–6234.
36. Qian, Q.; Chi, W. S.; Han, G.; **Smith, Z. P.*** Impact of Post-Synthetic Modification Routes on Filler Structure and Performance in Metal–Organic Framework-Based Mixed-Matrix Membranes. *Ind. Eng. Chem. Res.* **2020**, *59* (12), 5432–5438.
35. Wu, A. X.; Drayton, J. A.; **Smith, Z. P.*** The Perfluoropolymer Upper Bound. *AIChE J.* **2019**, *65* (12).

34. Lai, H. W. H.; Benedetti, F. M.; Jin, Z.; Teo, Y. C.; Wu, A. X.; Angelis, M. G. De; **Smith, Z. P.***; Xia, Y. Tuning the Molecular Weights, Chain Packing, and Gas-Transport Properties of CANAL Ladder Polymers by Short Alkyl Substitutions. *Macromolecules* **2019**, *52* (16), 6294–6302.
33. Qian, Q.; Wu, A. X.; Chi, W. S.; Asinger, P. A.; Lin, S.; Hypsher, A.; **Smith, Z. P.*** Mixed-Matrix Membranes Formed from Imide-Functionalized UiO-66-NH₂ for Improved Interfacial Compatibility. *ACS Appl. Mater. Interfaces* **2019**, *11* (34), 31257–31269.
32. Chi, W. S.; Sundell, B. J.; Zhang, K.; Harrigan, D. J.; Hayden, S. C.; **Smith, Z. P.*** Mixed-Matrix Membranes Formed from Multi-Dimensional Metal–Organic Frameworks for Enhanced Gas Transport and Plasticization Resistance. *ChemSusChem* **2019**, *12* (11), 2355–2360.
31. He, Y.; Benedetti, F. M.; Lin, S.; Liu, C.; Zhao, Y.; Ye, H.; Van Voorhis, T.; De Angelis, M. G.; Swager, T. M.; **Smith, Z. P.*** Polymers with Side Chain Porosity for Ultraporous and Plasticization Resistant Materials for Gas Separations. *Adv. Mater.* **2019**, *31* (21), 1807871.
30. **Smith, Z. P.**; Bachman, J. E.; Li, T.; Gludovatz, B.; Kusuma, V. A.; Xu, T.; Hopkinson, D. P.; Ritchie, R. O.; Long, J. R. Increasing M₂(dobdc) Loading in Selective Mixed-Matrix Membranes: A Rubber Toughening Approach. *Chem. Mater.* **2018**, *30* (5), 1484–1495.
29. Shete, M.; Kumar, P.; Bachman, J. E.; Ma, X.; **Smith, Z. P.**; Xu, W.; Mkhoyan, K. A.; Long, J. R.; Tsapatsis, M. On the Direct Synthesis of Cu(BDC) MOF Nanosheets and Their Performance in Mixed Matrix Membranes. *J. Membr. Sci.* **2018**, *549*, 312–320.
28. Li, C.; Meckler, S. M.; **Smith, Z. P.**; Bachman, J. E.; Maserati, L.; Long, J. R.; Helms, B. A. Engineered Transport in Microporous Materials and Membranes for Clean Energy Technologies. *Adv. Mater.* **2018**, *30* (8), 1704953.
27. Galizia, M.; Chi, W. S.; **Smith, Z. P.**; Merkel, T. C.; Baker, R. W.; Freeman, B. D. 50th Anniversary Perspective: Polymers and Mixed Matrix Membranes for Gas and Vapor Separation: A Review and Prospective Opportunities. *Macromolecules* **2017**, *50* (20), 7809–7843.
26. Stevens, K. A.; **Smith, Z. P.**; Gleason, K. L.; Galizia, M.; Paul, D. R.; Freeman, B. D. Influence of Temperature on Gas Solubility in Thermally Rearranged (TR) Polymers. *J. Membr. Sci.* **2017**, *533*, 75–83.
25. Galizia, M.; Stevens, K. A.; **Smith, Z. P.**; Paul, D. R.; Freeman, B. D. Nonequilibrium Lattice Fluid Modeling of Gas Solubility in HAB-6FDA Polyimide and Its Thermally Rearranged Analogues. *Macromolecules* **2016**, *49* (22), 8768–8779.
24. Bachman, J. E.; **Smith, Z. P.**; Li, T.; Xu, T.; Long, J. R. Enhanced Ethylene Separation and Plasticization Resistance in Polymer Membranes Incorporating Metal–Organic Framework Nanocrystals. *Nat. Mater.* **2016**, *15* (8), 845–849.
23. Kushwaha, A.; Dose, M. E.; **Smith, Z. P.**; Luo, S.; Freeman, B. D.; Guo, R. Preparation and Properties of Polybenzoxazole-Based Gas Separation Membranes: A Comparative Study

- between Thermal Rearrangement (TR) of Poly(Hydroxyimide) and Thermal Cyclodehydration of Poly(Hydroxyamide). *Polymer* **2015**, *78*, 81–93.
22. **Smith, Z. P.**; Hernández, G.; Gleason, K. L.; Anand, A.; Doherty, C. M.; Konstas, K.; Alvarez, C.; Hill, A. J.; Lozano, A. E.; Paul, D. R.; Freeman, B. D. Effect of Polymer Structure on Gas Transport Properties of Selected Aromatic Polyimides, Polyamides and TR Polymers. *J. Membr. Sci.* **2015**, *493*, 766–781.
 21. Tiwari, R. R.; **Smith, Z. P.**; Lin, H.; Freeman, B. D.; Paul, D. R. Gas Permeation in Thin Films of “High Free-Volume” Glassy Perfluoropolymers: Part II. CO₂ Plasticization and Sorption. *Polymer* **2015**, *61*, 1–14.
 20. Su, N. C.; **Smith, Z. P.**; Freeman, B. D.; Urban, J. J. Size-Dependent Permeability Deviations from Maxwells Model in Hybrid Cross-Linked Poly(Ethylene Glycol)/Silica Nanoparticle Membranes. *Chem. Mater.* **2015**, *27* (7), 2421–2429.
 19. Gleason, K. L.; **Smith, Z. P.**; Liu, Q.; Paul, D. R.; Freeman, B. D. Pure- and Mixed-Gas Permeation of CO₂ and CH₄ in Thermally Rearranged Polymers Based on 3,3'-Dihydroxy-4,4'-Diamino-Biphenyl (HAB) and 2,2'-Bis-(3,4-Dicarboxyphenyl) Hexafluoropropane Dianhydride (6FDA). *J. Membr. Sci.* **2015**, *475*, 204–214.
 18. Galizia, M.; **Smith, Z. P.**; Sarti, G. C.; Freeman, B. D.; Paul, D. R. Predictive Calculation of Hydrogen and Helium Solubility in Glassy and Rubbery Polymers. *J. Membr. Sci.* **2015**, *475*, 110–121.
 17. **Smith, Z. P.**; Freeman, B. D. Graphene Oxide: A New Platform for High-Performance Gas- and Liquid-Separation Membranes. *Angew. Chemie Int. Ed.* **2014**, *53* (39), 10286–10288.
 16. Tiwari, R. R.; **Smith, Z. P.**; Lin, H.; Freeman, B. D.; Paul, D. R. Gas Permeation in Thin Films of “High Free-Volume” Glassy Perfluoropolymers: Part I. Physical Aging. *Polymer* **2014**, *55* (22), 5788–5800.
 15. **Smith, Z. P.**; Czenkusch, K.; Wi, S.; Gleason, K. L.; Hernández, G.; Doherty, C. M.; Konstas, K.; Bastow, T. J.; Álvarez, C.; Hill, A. J.; Lozano, A. E.; Paul, D. R.; Freeman, B. D. Investigation of the Chemical and Morphological Structure of Thermally Rearranged Polymers. *Polymer* **2014**, *55* (26), 6649–6657.
 14. Wiegand, J. R.; **Smith, Z. P.**; Liu, Q.; Patterson, C. T.; Freeman, B. D.; Guo, R. Synthesis and Characterization of Triptycene-Based Polyimides with Tunable High Fractional Free Volume for Gas Separation Membranes. *J. Mater. Chem. A* **2014**, *2* (33), 13309–13320.
 13. **Smith, Z. P.**; Tiwari, R. R.; Dose, M. E.; Gleason, K. L.; Murphy, T. M.; Sanders, D. F.; Gunawan, G.; Robeson, L. M.; Paul, D. R.; Freeman, B. D. Influence of Diffusivity and Sorption on Helium and Hydrogen Separations in Hydrocarbon, Silicon, and Fluorocarbon-Based Polymers. *Macromolecules* **2014**, *47* (9), 3170–3184.
 12. Sanders, D. F.; Guo, R.; **Smith, Z. P.**; Stevens, K. A.; Liu, Q.; McGrath, J. E.; Paul, D. R.; Freeman, B. D. Influence of Polyimide Precursor Synthesis Route and Ortho-Position Functional Group on Thermally Rearranged (TR) Polymer Properties: Pure Gas Permeability and Selectivity. *J. Membr. Sci.* **2014**, *463*, 73–81.

11. Sanders, D. F.; Guo, R.; **Smith, Z. P.**; Liu, Q.; Stevens, K. A.; McGrath, J. E.; Paul, D. R.; Freeman, B. D. Influence of Polyimide Precursor Synthesis Route and Ortho-Position Functional Group on Thermally Rearranged (TR) Polymer Properties: Conversion and Free Volume. *Polymer* **2014**, *55* (7), 1636–1647.
10. Robeson, L. M.; **Smith, Z. P.**; Freeman, B. D.; Paul, D. R. Contributions of Diffusion and Solubility Selectivity to the Upper Bound Analysis for Glassy Gas Separation Membranes. *J. Membr. Sci.* **2014**, *453*, 71–83.
9. Sanders, D. F.; **Smith, Z. P.**; Guo, R.; Robeson, L. M.; McGrath, J. E.; Paul, D. R.; Freeman, B. D. Energy-Efficient Polymeric Gas Separation Membranes for a Sustainable Future: A Review. *Polymer* **2013**, *54* (18), 4729–4761.
8. Guo, R.; Sanders, D. F.; **Smith, Z. P.**; Freeman, B. D.; Paul, D. R.; McGrath, J. E. Synthesis and Characterization of Thermally Rearranged (TR) Polymers: Influence of Ortho-Positioned Functional Groups of Polyimide Precursors on TR Process and Gas Transport Properties. *J. Mater. Chem. A* **2013**, *1* (2), 262–272.
7. **Smith, Z. P.**; Tiwari, R. R.; Murphy, T. M.; Sanders, D. F.; Gleason, K. L.; Paul, D. R.; Freeman, B. D. Hydrogen Sorption in Polymers for Membrane Applications. *Polymer* **2013**, *54* (12), 3026–3037.
6. Guo, R.; Sanders, D. F.; **Smith, Z. P.**; Freeman, B. D.; Paul, D. R.; McGrath, J. E. Synthesis and Characterization of Thermally Rearranged (TR) Polymers: Effect of Glass Transition Temperature of Aromatic Poly(Hydroxyimide) Precursors on TR Process and Gas Permeation Properties. *J. Mater. Chem. A* **2013**, *1* (19), 6063–6072.
5. **Smith, Z. P.**; Sanders, D. F.; Ribeiro, C. P.; Guo, R.; Freeman, B. D.; Paul, D. R.; McGrath, J. E.; Swinnea, S. Gas Sorption and Characterization of Thermally Rearranged Polyimides Based on 3,3'-Dihydroxy-4,4'-Diamino-Biphenyl (HAB) and 2,2'-Bis-(3,4-Dicarboxyphenyl) Hexafluoropropane Dianhydride (6FDA). *J. Membr. Sci.* **2012**, *415–416*, 558–567.
4. Sanders, D. F.; **Smith, Z. P.**; Ribeiro, C. P.; Guo, R.; McGrath, J. E.; Paul, D. R.; Freeman, B. D. Gas Permeability, Diffusivity, and Free Volume of Thermally Rearranged Polymers Based on 3,3'-Dihydroxy-4,4'-Diamino-Biphenyl (HAB) and 2,2'-Bis-(3,4-Dicarboxyphenyl) Hexafluoropropane Dianhydride (6FDA). *J. Membr. Sci.* **2012**, *409–410*, 232–241.
3. Jiang, Y.; Willmore, F. T.; Sanders, D.; **Smith, Z. P.**; Ribeiro, C. P.; Doherty, C. M.; Thornton, A.; Hill, A. J.; Freeman, B. D.; Sanchez, I. C. Cavity Size, Sorption and Transport Characteristics of Thermally Rearranged (TR) Polymers. *Polymer* **2011**, *52* (10), 2244–2254.
2. Kusuma, V. A.; Gunawan, G.; **Smith, Z. P.**; Freeman, B. D. Gas Permeability of Cross-Linked Poly(Ethylene-Oxide) Based on Poly(Ethylene Glycol) Dimethacrylate and a Miscible Siloxane Co-Monomer. *Polymer* **2010**, *51* (24), 5734–5743.
1. Matters, G. L.; Harms, J. F.; McGovern, C. O.; Jayakumar, C.; Crepin, K.; **Smith, Z. P.**; Nelson, M. C.; Stock, H.; Fenn, C. W.; Kaiser, J.; Kester, M.; Smith, J. P. Growth of Human Pancreatic Cancer Is Inhibited by Down-Regulation of Gastrin Gene Expression. *Pancreas*

2009, 38 (5), e151.

Additional Publications

2. Z. P. Smith, *Fundamentals of gas sorption and transport in thermally rearranged polyimides*, Ph.D. Dissertation in Chemical Engineering. 2014, The University of Texas at Austin.
1. Z. P. Smith, *The fabrication of selective coal tar pitch membranes and their application in air separations*, B.S. Honors Thesis in Chemical Engineering. 2008, The Pennsylvania State University.

Invited Talks and Award Presentations

45. Z. P. Smith, "Upper bound theory and membranes for gas separations", North American Membrane Society Webinar, Dec. 2020.
44. Z. P. Smith, F. M. Benedetti, S. Lin, and K. Mizrahi Rodriguez, "Processable porous materials for membrane-based gas separations", Network Young Membranes Plenary Lecture (Virtual Conference), Manchester, UK, Dec. 2020.
43. A. X. Wu, J. Drayton, and Z. P. Smith, "The perfluoropolymer upper bound", AIChE Futures: New Directions in Chemical Engineering Research (Virtual Conference), San Francisco, CA, Nov. 2020.
40. Z. P. Smith, F. M. Benedetti, S. Lin, and Q. Qian, "Engineering polymer microstructure and MOF-polymer interfaces for membrane-based separations", Purdue University Soft Matter Seminar Series (Virtual Visit), West Lafayette, IN, Oct. 2020.
41. Z. P. Smith, F. M. Benedetti, S. Lin, and Q. Qian, "Designing polymers and MOFs for efficient and productive gas separations", University of Alabama Departmental Seminar, (Virtual Visit) Tuscaloosa, AL, Sept. 2020.
40. Z. P. Smith, F. M. Benedetti, S. Lin, and Q. Qian, "Designing polymers for energy-efficient gas separation membranes", Stanford University Student Polymer Collective, (Virtual Visit) Palo Alto, CA, April 2020.
39. Z. P. Smith, F. M. Benedetti, S. Lin, and Q. Qian, "Designing Polymers for Molecular Separations", Georgia Tech Student Polymer Network Seminar, Atlanta, GA, Oct. 2019.
38. W. S. Chi, B. J. Sundell, K. Zhang, D. J. Harrigan, S. C. Hayden, Z. P. Smith, "Mixed-matrix membranes for natural gas purification", NanoTech 2019, Boston, MA, June 2019.
37. F. M. Benedetti, Y. He, S. Lin, C. Liu, Y. Zhao, H. Ye, T. A. Van Voorhis, M. G. de Angelis, T. M. Swager, Z. P. Smith, "Solution-processable porous polymers for membrane-based separations", NanoTech 2019, Boston, MA, June 2019.
36. Y. He, F. M. Benedetti, S. Lin, C. Liu, Y. Zhao, H. Ye, T. A. Van Voorhis, M. G. De Angelis, T. M. Swager, Z. P. Smith, "Membrane-based gas separations with a new class of ultrapermeable porous polymers", American Chemical Society National Meeting, Orlando, FL, April 2019.
35. Q. Qian, and Z. P. Smith, "Creating an ideal interface to form defect-free mixed-matrix membranes with UiO-66-NH₂", American Chemical Society National Meeting, Orlando, FL, March 2019.

34. Z. P. Smith, F. M. Benedetti, S. Lin, T. M. Swager, T. A. Van Voorhis, Y. He, Q. Qian, A. Wu, W. S. Chi, P. Asinger, A. Hypsher, "Designing new materials for energy-efficient membrane separations", Auburn University Departmental Seminar, Jan. 2019.
33. Z. P. Smith, F. M. Benedetti, S. Lin, T. M. Swager, T. A. Van Voorhis, Y. He, Q. Qian, A. Wu, W. S. Chi, P. Asinger, A. Hypsher, "Molecular design of materials for membrane-based separations", University of Connecticut Polymer Program Departmental Seminar, Nov. 2018.
32. Z. P. Smith, J. E. Bachman, T. Li, B. Gludovatz, V. Kusuma, T. Xu, D. P. Hopkinson, R. O. Ritchie, J. R. Long, "Evaluating an open metal site MOF for mixed-matrix membranes", American Chemical Society National Meeting, PMSE-NAMS Symposium, New Orleans, LA, March 2018.
31. Z. P. Smith, "Polymers and metal-organic frameworks for energy-efficient separations", Tianjin University, Department of Chemical Engineering, Departmental Seminar, Jan. 2018.
30. Z. P. Smith, "Hybrid polymer and MOF materials for membrane-based separations", Tianjin Polytechnic University, Department of Materials Science, Departmental Seminar, Jan. 2018.
29. Z. P. Smith, "Membranes for energy-efficient separations", ShanghaiTech University, School of Physical Science and Technology, School Seminar, Jan. 2018.
28. Z. P. Smith, "From fundamentals to application: Taking Don Paul's guidance to develop new membrane materials", University of Texas at Austin, Department of Chemical Engineering, 50 Year Symposium and Celebration Honoring Don Paul, Sept. 2017.
27. Z. P. Smith, "Polymers and MOFs for gas-phase separations", University of Queensland, Department of Chemical Engineering, Departmental Seminar, Sept. 2017.
26. Z. P. Smith, "Molecular level design of polymers and MOFs for energy-efficient separations", University of New South Wales, Department of Chemical Engineering, Departmental Seminar, Sept. 2017.
25. Z. P. Smith, "Rational design of polymers and MOFs for membrane separations", University of Sydney, Department of Chemistry, Departmental Seminar, Sept. 2017.
24. Z. P. Smith, "Transport of small molecules in amorphous and crystalline membrane materials", University of Adelaide, Department of Chemistry, Departmental Seminar, Sept. 2017.
23. Z. P. Smith, "Designing polymers and MOFs for small molecule diffusion and (ad)sorption selectivity", University of Melbourne, Department of Chemical Engineering, Departmental Seminar, Sept. 2017.
22. Z. P. Smith, "Molecular level design of polymers and MOFs for energy-efficient separations", Monash University and Commonwealth Industrial Research Organization (CSIRO), Joint Seminar, Sept. 2017.

21. Z. P. Smith, "Controlled transport in polymers and MOFs for molecular separations", University of Copenhagen, Department of Chemistry, Departmental Seminar, Aug. 2017.
20. Z. P. Smith, J. E. Bachman, T. Li, B. Gludovatz, V. A. Kusuma, T. Xu, D. P. Hopkinson, R. O. Ritchie, J. R. Long, "Transport and mechanical properties of mixed-matrix membranes containing $M_2(\text{dobdc})$ nanoparticles", International Congress of Membranes Young Membrane Scientist Award, San Francisco, CA, July 2017.
19. Z. P. Smith, J. E. Bachman, T. Li, T. Xu, B. Gludovatz, R. O. Ritchie, J. R. Long, "Gas transport and mechanical properties of mixed-matrix membranes formed with $M_2(\text{dobdc})$ nanoparticles", Gordon Research Conference, New London, NH, August 2016.
18. Z. P. Smith, "Polymer and mixed-matrix membranes for gas separations", Golden Gate Polymer Forum, Mountain View, CA, May 2016.
17. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" University of Colorado, Boulder, Department of Chemical and Biological Engineering, Departmental Seminar, March 2016.
16. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" Rensselaer Polytechnic Institute, Department of Chemical and Biological Engineering, March 2016.
15. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" Massachusetts Institute of Technology, Department of Chemical Engineering, Departmental Seminar, February 2016.
14. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" Virginia Polytechnic Institute and State University, Department of Chemical Engineering, Departmental Seminar, February 2016.
13. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" University of Florida, Department of Chemical Engineering, Departmental Seminar, February 2016.
12. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" University of Houston, Department of Chemical and Biomolecular Engineering, Departmental Seminar, February 2016.
11. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" Stanford University, Department of Chemical Engineering, Departmental Seminar, February 2016
10. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" Penn State University, Department of Chemical Engineering, Departmental Seminar, February 2016.
9. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" University of Minnesota, Department of Chemical Engineering and Materials Science, Departmental Seminar, January 2016.

8. Z. P. Smith, "Molecular scale engineering of new materials for energy-efficient separations" University of Illinois Urbana-Champaign, Department of Chemical and Biomolecular Engineering, Departmental Seminar, January 2016.
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