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ZACHARY P. SMITH

Professional Appointments

2025–2026	Visiting Professor in Membrane Separations, Adsorption, Catalysis, and Spectroscopy for the Department of Microbial and Molecular Systems (M²S), KU Leuven, Belgium.
2024–present	Associate Professor with Tenure, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA. Edwin G. Roos (1944) Chair (2025–present)
2022–2024	Associate Professor, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA.
2017–2022	Assistant Professor, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA. Robert N. Noyce Career Development Chair (2021–2023) 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.
2004–2008	*B.S. with Honors and Distinction*, Chemical Engineering, Pennsylvania State University, University Park, PA.

Founded Companies

2021	Osmoses Inc., Co-Founder (Winner of MIT $100k Competition)
2017	Flux Technology, Co-Founder

Patents

Granted Patents

8. Lai, H. W. H.; Ahn, J. M.; Xia, Y.; Smith, Z. P.; Benedetti, F. M. *High-performance ladder polymers for membrane gas separation.* **US Patent 12,384,875 B2**, granted 2025.

7. Swager, T. M.; Guo, S.; Smith, Z. P.; Benedetti, F. M. *Poly(aryl ether)-based polymers and associated gas separation membranes.* **US Patent 11,891,481 B2**, granted 2024.

6. Smith, Z. P.; Chi, L.; Lee, H. *Branched metal–organic framework nanoparticles and associated methods.* **US Patent 11,884,684 B2**, granted 2024.

5. Smith, Z. P.; Chi, L.; Sundell, B. J.; Zhang, K.; Hayden, S. C.; Harrigan, D. J.; Lee, H. *Branched metal–organic framework nanoparticles in mixed-matrix membranes and associated methods.* **US Patent 11,827,647 B2**, granted 2023.

4. Swager, T. M.; He, Y.; Smith, Z. P.; Lin, S.; Benedetti, F. M. *Porous compositions and related methods.* **US Patent 11,472,915 B2**, granted 2022.

3. Long, J. R.; Bachman, J.; Smith, Z. P. *Adsorption-enhanced and plasticization-resistant composite membranes.* **US Patent 11,110,405 B2**, granted 2021.

Published Patent Applications

2. Smith, Z. P.; Lee, T. *Highly microporous polymer nanofilms by interfacial polymerization of rigid units for ultrafast organic solvent nanofiltration.* **PCT Patent Application WO 2024/163517 A2**, published 2024 (from **PCT/US2024/013607**).
1. Smith, Z. P.; Han, G. *Membranes with functionalized particles containing metal-organic frameworks.* **PCT Patent Application WO 2023/224868 A1**, published 2023.

Honors and Awards

2025	Elected Vice President, North American Membrane Society (NAMS)
2022	American Institute of Chemical Engineers (AIChE) Kunesh Award
2022	National Science Foundation (NSF) CAREER Award
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 35 Under 35 Award
2018	Department of Energy (DOE) Early Career Award
2017	NAMS Young Membrane Scientist Award
2013	U.S. Delegate to the Lindau Nobel Laureate Meeting on Chemistry
2013	American Chemical Society (ACS) Excellence in Graduate Polymer Research
2010	Department of Energy Office of Science Graduate Fellow

Teaching

2017–2025

10.32 – Separation Processes. 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

2025–	Clara Kim, Chemical Engineering, MIT, *Ph.D.*
2025–	Jaatani Abdi, Chemical Engineering, MIT, *Ph.D.*
2024–	Brandon Tapia, Chemical Engineering, MIT, *Ph.D.*
2024–	Olivia Wilkinson, Chemical Engineering, MIT, *Ph.D.*
2023–	Megan Herrington, Chemical Engineering, MIT, *Ph.D.*
2023–	Tom Goodwin, Chemical Engineering, MIT, *Ph.D.* (Co-advised with Fikile Brushett)
2023–	Yein Yoon, Chemical Engineering, MIT, *Ph.D.*
2023–	Brenda Zhao, Chemical Engineering, MIT, *Ph.D.*
2022–	Erin Sturd, Chemical Engineering, MIT, *Ph.D.*
2020–	Simar Mattewal, Chemical Engineering, MIT, *Ph.D.* (Co-advised with Rohit Karnik)
2020–	John Vergados, Chemical Engineering, MIT, *Ph.D.* (Co-advised with Fikile Brushett)
2020–	Eric Hahnert, Chemical Engineering, MIT, *Ph.D.*
2019–	Aristotle Grosz, Chemical Engineering, MIT, *Ph.D.*

2021–2026 Philippe Jean-Baptiste, Chemical Engineering, MIT, *Ph.D.*
2023–2025 Lauren Burton, Chemical Engineering, MIT, *M.S.*
2020–2025 Pablo Dean, Chemical Engineering, MIT, *Ph.D.*
2020–2025 Jing Ying Yeo, Chemical Engineering, MIT, *Ph.D.*
2019–2024 Wan-Ni Wu, Chemical Engineering, MIT, *Ph.D.*
2019–2024 Samuel Kaser, Chemistry, MIT, *Ph.D.*
2019–2023 Kayla Storme, Chemistry, MIT, *Ph.D.* (Co-advised with Tim Swager)
2018–2024 Taigyu Joo, Chemical Engineering, MIT, *Ph.D.*
2018–2023 Hyunhee Lee, Chemical Engineering, MIT, *Ph.D.*
2017–2022 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

2026– Luca Fois, *Ph.D. in Chemical Engineering*
2025– Sean Bannon, *Ph.D. in Chemical Engineering*
2025– Daniel Krajovic, *Ph.D. in Chemical Engineering*
2025– Ji Wu, *Ph.D. in Chemical Engineering*
2023–2025 Benjamin Pedretti, *Ph.D. in Chemical Engineering*
2023–2024 Sohum Patel, *Ph.D. in Chemical & Environmental Engineering*
2022–2025 Taehoon Lee, *Ph.D. in Energy Engineering*
2022–2024 Matthew Rivera, *Ph.D. in Chemical & Biomolecular Engineering*
2021–2022 Maha Aljuhani, *Ph.D. in Chemical Science*
2020–2022 Stephen DeWitt, *Ph.D. in Chemical & Biomolecular Engineering*
2020–2021 Fatima Edhaim, *Ph.D. in Chemical Science*
2019–2021 Justin Teesdale, *Ph.D. in Chemistry*
2019–2021 Francesco Benedetti, *Ph.D. in Chemical Engineering*
2019–2021 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

2025– Cassiano Aimoli, Petrobras, *Visiting Scientist (Industrial Sabbatical)*
2025 Thibo Nicolas, KU Leuven, *M.S. Candidate in Chemical Engineering*
2025 Lore Hannes, KU Leuven, *Ph.D. Candidate in Chemical Engineering*
2025 Andrea Giovanelli, University of Pisa, *Ph.D. Candidate in Chemistry*
2025 Colleen Lonfat, EPFL, *M.S. Candidate in Chemistry*
2024–2025 Anna Binnemans, KU Leuven, *M.S. Candidate in Bioengineering*
2024–2025 Luca Fois, University of Milan, *Ph.D. Candidate in Chemical Engineering*
2024 Jose Alled, University of Zaragoza, *Research Fellow*
2022 Anand Ayyar, University of Copenhagen, *Ph.D. Candidate in Chemistry*
2022 Mostafa Lotfy, ETH Zürich, *M.S. Candidate in Chemical Engineering*
2022 Tai Xuan Tan, Imperial College London, *M.S. in Chemical Engineering*
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/High School Researchers

2026– Raed F. Tulbah, Chemical Engineering, MIT, *B.S.*
2026– Ethan C. Cardenas, Chemical Engineering, MIT, *B.S.*
2024– Corinne De La Mora, Materials Science and Engineering, MIT, *B.S.*
2024– Tony Jimenez, Chemical Engineering, MIT, *B.S.*
2024 Wesley Smith, Chemical Engineering, MIT, *B.S.*
2024 Veer Garad, Summer Intern, Malden Catholic High School
2024 An Nguyen, Summer Intern, Malden Catholic High School
2024 Dhruv Vasishta, Summer Intern, Malden Catholic High School
2024 Mia Waldron, Summer Intern, Malden Catholic High School
2023 Gozel Dovranova, Chemical Engineering, MIT, *B.S.*
2023 Carlos Martinez, Chemical Engineering, MIT, *B.S.*
2022–2023 Gabrielle Moore, Chemical Engineering, MIT, *B.S.*
2022 Alondra Hernandez, Chemical Engineering, MIT, *B.S.*
2022 Iselle Barrios, Chemical Engineering, MIT, *B.S.*
2021–2023 Sherrie Qian, Materials Science and Engineering, MIT, *B.S.*
2021–2023 Ruoxin Lu, Chemical Engineering, MIT, *B.S.*
2021 Nicholas Aiello, Chemical Engineering, MIT, *B.S.*
2020–2023 Duha Syar, Chemical Engineering, MIT, *B.S.*
2020–2022 Naksha Roy, Chemical Engineering, MIT, *B.S.*
2020–2021 Nnedi Okoye, Chemical Engineering, MIT, *B.S.*
2020–2021 Evan Gwozdz, 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

2022–2025 Member of the Safety Committee, Co-Chair from 2024–2025
2022–2025 First-year Academic Advisor
2019–2021 Chemical Engineering Seminar Coordinator
2019–2025 Chemical Engineering Undergraduate Advisor
2018–2019 MIT Committee on Toxic Chemicals
2018–2019, 2023–2025 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)
2017–2025 MIT Faculty Member for PPSM
2017–2025 Chemical Engineering Graduate Admissions Committee

Professional Service

2024– Associate Editor, *ACS Industrial & Engineering Chemistry Research*
2021– Editorial Advisory Board for *Macromolecules*
2020– Board of Directors, North American Membrane Society

2020–2025	Editorial Advisory Board for *Polymer*
2018–2023	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*
2017–2022	Session Chair, American Institute of Chemical Engineers National Meeting
2013–	Member, American Chemical Society
2010–	Member, American Institute of Chemical Engineers

Peer-Reviewed Publications

(h-index 46, citations 10,176, Source Google Scholar)

93. P. Jean-Baptiste, J. R. Pierre-Louis, J. Y. Yeo, S. Guo, Y. Wu, P. A. Dean, T. M. Swager, Z. P. Smith. Spinning of defect-free poly(arylene ether) asymmetric hollow fiber membranes for gas separations. *J. Membr. Sci.* 746, 125268 (**2026**).

92. A. F. Grosz, J. Richardson, T. X. Tan, G. Moore, C. G. Aimoli, B. D. Freeman, Z. P. Smith. CO_2 dilation and transport characterization of incrementally fluorinated poly(ether imide) membranes. *Macromolecules* 59 (4), 2193−2205 (**2026**) (in press)

91. B. C. Tapia, J. Y Yeo, Z. P. Smith. Computational and experimental insights into variable temperature propylene (C_3H_6), propane (C_3H_8), and hydrogen sulfide (H_2S) sorption in ultra-high permselectivity CANAL ladder polymers. *J. Mater. Chem. A* 14, 7179–7195 (**2026**).

90. J. Y. Yeo, B. C. Tapia, F. M. Benedetti, A. M. Robinson, J. Richardson, B. J. Pedretti, T. H. Lee, B. D. Freeman, Y. Xia, Z. P. Smith. Ultra-selective CANAL polymers for hydrogen-based membrane separations after long-term aging. *J. Membr. Sci.* 742, 125038 (**2026**).

89. T. H. Lee, P. A. Dean, J. Y. Yeo, Z. P. Smith. Solution-processable, ladder-branched polyimides of intrinsic microporosity by [4+4] cycloaddition for membrane gas separation. *Adv. Mater.* 38 (4), e13892 (**2026**).

88. H. Noh, T. H. Lee, S. H. Ahn, J. T. Davis, D. Jeong, R. Gounder, Z. P. Smith, B. W. Boudouris, B. M. Tackett. Structural tuning of self-conductive polymer as gas diffusion layer for electrocatalytic reactions at high current. *Adv. Energy Mater.* 16 (1), e02788 (**2026**).

87. M. Baldea, L. J. Broadbelt, M. G. Ierapetritou, T. A. Kwan, C. Li, Z.-H. Luo, X. Ma, M. Morbidelli, K. C. Sahu, A. M. Scurto, Z. P. Smith, H. Wang, F.-S. Xiao, V. M. Zavala, D. Zhao. 2024 in Retrospective: Trends in Chemical Engineering. *Ind. Eng. Chem. Res.* 64, 11615–11623 (**2025**).

86. P. A. Dean, K. L. Gleason, Z. P. Smith. Investigating the effect of water vapor on CO_2/CH_4 separations in primary- and hindered-amine-functional microporous polymers. *J. Membr. Sci.* 733, 124336 (**2025**).

85. T. H. Lee, M. Balcik, Z. Ali, T. Joo, M. P. Rivera, I. Pinnau, Z. P. Smith. Microporous polyimine membranes for efficient separation of liquid hydrocarbon mixtures. *Science* 388 (6749), 839–844 (**2025**).

84. W.-N. Wu, O. Boloki, S. Vasenkov, Z. P. Smith. Macroscopic and microscopic gas diffusivity measurements for PIM-COOH/UiO-66-NH_2 composite membranes. *J. Membr. Sci.* 732, 124246 (**2025**).

83. W.-N. Wu, T. H. Lee, A. Hernandez, G. Dovranova, Z. P. Smith. MOF instability and polymer infiltration in amine-functionalized UiO MOFs/PIM-COOH-based MMMs for solvent-based separations. *Ind. Eng. Chem. Res.* 64 (20), 10012–10021 (**2025**).

82. J. Y. Yeo, F. M. Benedetti, B. J. Pedretti, A. M. Robinson, R. Yin, H. W. H. Lai, T. H. Lee, Y. Xia, Z. P. Smith. Investigation of competitive sorption and plasticization of hyperaged CANAL ladder polymers for acid gas purification. *J. Membr. Sci.* 726, 123973 (**2025**).

81. P. Jean-Baptiste, A. S. Ayyar, S. Mattewal, P. A. Dean, T. Joo, J.-W. Lee, Z. P. Smith. Physical aging of defect-free asymmetric functionalized PIM hollow fiber membranes. *J. Membr. Sci.* 722, 123875 (**2025**).

80. T. Joo, Y. Wu, T. H. Lee, P. A. Dean, W.-N. Wu, T. M. Swager, Z. P. Smith. Enhancing acid-gas separations using free-volume manipulation for microporous poly(arylene ether)s. *J. Mater. Chem. A* 13, 5707–5722 (**2025**).

79. L. Zhang, R. Xiao, T. Jin, X. Pan, K. A. Fransen, S. K. Alsaiari, A. Lau, R. He, J. Han, B. J. Pedretti, J. Y. Yeo, X. Yang, B. D. Olsen, A. Alexander-Katz, Z. P. Smith, R. Langer, A. Jaklenec. Degradable poly(β-amino ester) microparticles for cleansing products and food fortification. *Nat. Chem. Eng.* 2, 77–89 (**2025**).

78. T. H. Lee, J. K. Jang, B. K. Lee, W.-N. Wu, Z. P. Smith, H. B. Park, Anomalous structural changes and gas transport properties in ultrathin films of polymers of intrinsic microporosity. *Macromolecules* 57, 11242–11250 (**2024**).

77. M. P. Rivera, G. G. Terrones, T. H. Lee, Z. P. Smith, H. J. Kulik, Data-driven screening and discovery of metal–organic frameworks as C2 adsorbents from over 900 experimental isotherms. *ACS Appl. Mater. Interfaces*. 16, 64759–64773 (**2024**).

76. T. H. Lee, M. Balcik, W.-N. Wu, I. Pinnau, Z. P. Smith, Dual-phase microporous polymer nanofilms by interfacial polymerization for ultrafast molecular separation. *Sci. Adv.* 10, eadp6666 (**2024**).

75. T. H. Lee, T. Joo, P. Jean-Baptiste, P. A. Dean, J. Y. Yeo, Z. P. Smith, Fine-tuning ultramicroporosity in PIM-1 membranes by aldehyde functionalization for efficient hydrogen separation. *J. Mater. Chem. A* 12, 24519–24529 (**2024**).

74. O. Boloki, S. J. A. DeWitt, E. T. Hahnert, Z. P. Smith, S. Vasenkov, Gas self-diffusion in different local environments of mixed-matrix membranes as a function of UiO-66-NH_2 metal–organic framework loading. *Microporous Mesoporous Mater.* 378, 113249 (**2024**).

73. S. J. Kaser, P. A. Dean, P. Jean-Baptiste, S. K. Mattewal, T. Joo, J. Y. Yeo, Z. P. Smith, High-selectivity CO_2 mixture separations by a guanylated polymer of intrinsic microporosity (PIM-G) membrane. *Macromolecules* 57, 10023–10031 (**2024**).

72. P. A. Dean, Y. Wu, S. Guo, T. M. Swager, Z. P. Smith, Tertiary-amine-functional poly(arylene ether)s for acid-gas separations. *JACS Au* 4, 3848–3856 (**2024**).

71. K. R. Storme, B. S. Schreib, Z. P. Smith, T. M. Swager, Tuning porosity in triptycene-poly(arylene ether)s. *Macromolecules* 57, 7065–7073 (**2024**).

70. G. Han, R. M. Studer, M. Lee, K. Mizrahi Rodriguez, J. J. Teesdale, Z. P. Smith, Engineering interfacial structure and channels of polyamide thin-film nanocomposite membranes to enhance permselectivity for water purification. *Chem. Mater.* 36, 7005–7015 (**2024**).

69. T. Joo, T. H. Lee, S. J. Kaser, W.-N. Wu, S. Wi, J. Y. Yeo, Z. P. Smith, Free volume manipulation and in situ oxidative crosslinking of amine-functionalized microporous polymer membranes. *Chem. Mater.* 36, 4275–4290 (**2024**).

68. G. H. Yang, J. Lin, H. Cheung, G. Rui, Y. Zhao, L. Balachander, T. Joo, H. Lee, Z. P. Smith, L. Zhu, C. Ma, Y. Fink, Single layer silk and cotton woven fabrics for acoustic emission and active sound suppression. *Adv. Mater.* 36, 2313328 (**2024**).

67. K. R. Storme, S. Lin, Y. C. M. Wu, S. X. Qian, T. M. Swager, Z. P. Smith, Role of grafting density and nitrile functionalization on gas transport in polymers with side-chain porosity. *Macromolecules* 57, 2458–2467 (**2024**).

66. P. A. Dean, K. Mizrahi Rodriguez, S. Guo, N. Roy, T. M. Swager, Z. P. Smith, Elucidating the role of micropore-generating backbone motifs and amine functionality on H_2S, CO_2, CH_4 and N_2 sorption. *J. Membr. Sci.* 696, 122465 (**2024**).

65. K. Mizrahi Rodriguez, P. A. Dean, S. Guo, N. Roy, T. M. Swager, Z. P. Smith, Elucidating the role of micropore-generating backbone motifs and amine functionality on membrane separation performance in complex mixtures. *J. Membr. Sci.* 696, 122464 (**2024**).

64. K. Mizrahi Rodriguez, S. Lin, A. X. Wu, K. R. Storme, T. Joo, A. F. Grosz, N. Roy, D. Syar, F. M. Benedetti, Z. P. Smith, Penetrant-induced plasticization in microporous polymer membranes. *Chem. Soc. Rev.* 53, 2435–2529 (**2024**).

63. S. Guo, J. Y. Yeo, F. M. Benedetti, D. Syar, T. M. Swager, Z. P. Smith, A microporous poly(arylene ether) platform for membrane-based gas separation. *Angew. Chem. Int. Ed.* 136, e202315611 (**2024**).

62. T. H. Lee, Z. P. Smith, Better standards are needed for membrane materials. *Nat. Mater.* 23, 11–12 (**2024**).

61. T. H. Lee, B. K. Lee, S. Y. Yoo, H. Lee, W.-N. Wu, Z. P. Smith, H. B. Park, PolyMOF nanoparticles constructed from intrinsically microporous polymer ligand towards scalable composite membranes for CO_2 separation. *Nat. Commun.* 14, 1–13 (**2023**).

60. W.-N. Wu, K. Mizrahi Rodriguez, N. Roy, J. J. Teesdale, G. Han, A. Liu, Z. P. Smith, Engineering the polymer–MOF interface in microporous composites to address complex mixture separations. *ACS Appl. Mater. Interfaces* 15, 52893–52907 (**2023**).

59. R. J. Tannenbaum, N. Cislo, E. Ruzicka, P. A. Dean, Z. P. Smith, B. C. Benicewicz, S. K. Kumar, Activated gas transport in polymer-grafted nanoparticle membranes. *Macromolecules* 56, 3954–3961 (**2023**).

58. T. Joo, K. Mizrahi Rodriguez, H. Lee, D. Acharya, C. M. Doherty, Z. P. Smith, The role of free volume, hydrogen bonds, and crosslinks on physical aging in polymers of intrinsic microporosity (PIMs). *J. Mater. Chem. A* 11, 15943–15957 (**2023**).

57. J. J. Teesdale, M. Lee, R. Lu, Z. P. Smith, Uncertainty in composite membranes: From defect engineering to film processing. *J. Am. Chem. Soc.* 145, 830–840 (**2023**).

56. G. Han, R. M. Studer, M. Lee, K. Mizrahi Rodriguez, J. J. Teesdale, Z. P. Smith, Post-synthetic modification of MOFs to enhance interfacial compatibility and selectivity of thin-film nanocomposite (TFN) membranes for water purification. *J. Membr. Sci.* 666, 121133 (**2023**).

55. S. Lin, K. R. Storme, Y.-C. M. Wu, F. M. Benedetti, T. M. Swager, Z. P. Smith, Role of side-chain length on gas transport of CO_2/CH_4 mixtures in polymers with side-chain porosity. *J. Membr. Sci.* 668, 121194 (**2023**).

54. H. Lee, W. S. Chi, M. J. Lee, K. Zhang, F. Edhaim, K. Mizrahi Rodriguez, S. J. A. DeWitt, Z. P. Smith, Network-nanostructured ZIF-8 to enable percolation for enhanced gas transport. *Adv. Funct. Mater.* 32, 2207775 (**2022**).

53. K. Mizrahi Rodriguez, W.-N. Wu, T. Alebrahim, Y. Cao, B. D. Freeman, D. Harrigan, M. Jhalaria, A. Kratochvil, S. Kumar, W. H. Lee, Y. M. Lee, H. Lin, J. M. Richardson, Q. Song, B. Sundell, R. Thür, I. Vankelecom, A. Wang, L. Wang, C. Wiscount, Z. P. Smith, Multi-lab study on the pure-gas permeation of commercial polysulfone (PSf) membranes: Measurement standards and best practices. *J. Membr. Sci.* 659, 120746 (**2022**).

52. F. M. Benedetti, Y.-C. M. Wu, S. Lin, Y. He, E. Flear, K. R. Storme, C. Liu, Y. Zhao, T. M. Swager, Z. P. Smith, Side-chain length and dispersity in ROMP polymers with pore-generating side chains for gas separations. *JACS Au* 2, 1610–1615 (**2022**).

51. H. W. H. Lai, F. M. Benedetti, J. M. Ahn, A. M. Robinson, Y. Wang, I. Pinnau, Z. P. Smith, Y. Xia, Hydrocarbon ladder polymers with ultrahigh permselectivity for membrane gas separations. *Science* 375, 1390–1392 (**2022**).

50. X. Qian, M. Ostwal, A. Asatekin, G. M. Geise, Z. P. Smith, W. A. Phillip, R. P. Lively, J. R. McCutcheon, A critical review and commentary on recent progress of additive manufacturing and its impact on membrane technology. *J. Membr. Sci.* 645, 120041 (**2022**).

49. K. Mizrahi Rodriguez, F. M. Benedetti, N. Roy, A. X. Wu, Z. P. Smith, Sorption-enhanced mixed-gas transport in amine functionalized polymers of intrinsic microporosity (PIMs). *J. Mater. Chem. A*. 9, 23631–23642 (**2021**).

48. Q. Qian, A. M. Wright, H. Lee, M. Dincă, Z. P. Smith, Low-temperature $H_2S/CO_2/CH_4$ separation in mixed-matrix membranes containing MFU-4. *Chem. Mater.* 33, 6825–6831 (**2021**).

47. A. X. Wu, J. A. Drayton, X. Ren, K. Mizrahi Rodriguez, A. F. Grosz, J.-W. Lee, Z. P. Smith, Non-equilibrium lattice fluid modeling of gas sorption for fluorinated poly(ether imide)s. *Macromolecules* 54, 6628–6638 (**2021**).

46. A. X. Wu, S. Lin, K. Mizrahi Rodriguez, F. M. Benedetti, T. Joo, A. F. Grosz, K. R. Storme, N. Roy, D. Syar, Z. P. Smith, Revisiting group contribution theory for estimating fractional free volume of microporous polymer membranes. *J. Membr. Sci.* 636, 119526 (**2021**).

45. A. X. Wu, J. A. Drayton, K. Mizrahi Rodriguez, F. M. Benedetti, Q. Qian, S. Lin, Z. P. Smith, Elucidating the role of fluorine content on gas sorption properties of fluorinated polyimides. *Macromolecules* 54, 22–34 (**2021**).

44. S. Lin, T. Joo, F. M. Benedetti, L. C. Chen, A. X. Wu, K. Mizrahi Rodriguez, Q. Qian, C. M. Doherty, Z. P. Smith, Free volume manipulation of a 6FDA-HAB polyimide using a solid-state protection/deprotection strategy. *Polymer* 212, 123121 (**2021**).

43. K. Mizrahi Rodriguez, S. Lin, A. X. Wu, G. Han, J. J. Teesdale, C. M. Doherty, Z. P. Smith, Leveraging free volume manipulation to improve the membrane separation performance of amine-functionalized PIM-1. *Angew. Chem. Int. Ed.* 60, 6593–6599 (**2021**).

42. Q. Qian, W. S. Chi, G. Han, Z. P. Smith, Impact of post-synthetic modification routes on filler structure and performance in metal–organic framework-based mixed-matrix membranes. *Ind. Eng. Chem. Res.* 59, 5432–5438 (**2020**).

41. K. Mizrahi Rodriguez, A. X. Wu, Q. Qian, G. Han, S. Lin, F. M. Benedetti, H. Lee, W. S. Chi, C. M. Doherty, Z. P. Smith, Facile and time-efficient carboxylic acid functionalization of PIM-1: Effect on molecular packing and gas separation performance. *Macromolecules* 53, 6220–6234 (**2020**).

40. G. Han, Q. Qian, K. Mizrahi Rodriguez, Z. P. Smith, Hydrothermal synthesis of sub-20 nm amine-functionalized MIL-101(Cr) nanoparticles with high surface area and enhanced CO_2 uptake. *Ind. Eng. Chem. Res.* 59, 7888–7900 (**2020**).

39. G. Han, K. Mizrahi Rodriguez, Q. Qian, Z. P. Smith, Acid-modulated synthesis of high surface area amine-functionalized MIL-101(Cr) nanoparticles for CO_2 separations. *Ind. Eng. Chem. Res.* 59, 18139–18150 (**2020**).

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6. D. F. Sanders, Z. P. Smith, R. Guo, L. M. Robeson, J. E. McGrath, D. R. Paul, B. D. Freeman, Energy-efficient polymeric gas separation membranes for a sustainable future: A review. *Polymer* 54, 4729–4761 (**2013**).

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3. Y. Jiang, F. T. Willmore, D. Sanders, Z. P. Smith, C. P. Ribeiro, C. M. Doherty, A. Thornton, A. J. Hill, B. D. Freeman, I. C. Sanchez, Cavity size, sorption and transport characteristics of thermally rearranged (TR) polymers. *Polymer* 52, 2244–2254 (**2011**).

2. V. A. Kusuma, G. Gunawan, Z. P. Smith, B. D. Freeman, Gas permeability of cross-linked poly(ethylene-oxide) based on poly(ethylene glycol) dimethacrylate and a miscible siloxane co-monomer. *Polymer* 51, 5734–5743 (**2010**).

1. G. L. Matters, J. F. Harms, C. O. McGovern, C. Jayakumar, K. Crepin, Z. P. Smith, M. C. Nelson, H. Stock, C. W. Fenn, J. Kaiser, M. Kester, J. P. Smith, Growth of human pancreatic cancer is inhibited by down-regulation of gastrin gene expression. *Pancreas* 38, e151 (**2009**).

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

81. **Z. P. Smith**, "Gas and solvent separations with ultra-glassy and high free volume polymers" Department of Chemical Engineering, Queen Mary University of London, London, UK, April **2026**.

80. **Z. P. Smith**, "Polymer membranes with excess free volume for molecular separations" Department of Chemical Engineering, Imperial College London, London, UK, April **2026**.

79. **Z. P. Smith**, "How PIMs are resetting the benchmark for molecular separations" Department of Chemistry and Department of Chemical Engineering, University of Edinburgh, Edinburgh, Scotland, April **2026**.

78. **Z. P. Smith**, "Emerging membrane materials for gas and solvent separations" Department of Chemical Engineering, University College London, London, UK, March **2026**.

77. **Z. P. Smith**, "Shape-persistent polymer architectures for molecular separations" Department of Chemical Engineering, Universidade NOVA de Lisboa, Lisbon, Portugal, Feb. **2026**.

76. **Z. P. Smith**, F. M. Benedetti, K. Mizrahi Rodriguez, T. H. Lee, P. A. Dean, "Gas separations with microporous polymer membranes" Department of Chemical Engineering, RWTH Aachen University, Aachen, Germany, Dec. **2025**.

75. **Z. P. Smith**, "Leveraging the PIM concept for gas separation membranes" Department of Chemistry, University of Manchester, Manchester, UK, Nov. **2025**.

74. **Z. P. Smith**, "Gas and solvent separations using glassy polymer membranes" Department of Chemical Engineering, National Technical University of Athens, Athens, Greece, Oct. **2025**.

73. **Z. P. Smith**, Q. Qian, H. Lee, T. H. Lee, T. Joo, J. D. Howe, et al., "Applying MOFs and microporous polymers to gas- and solvent-based separations" Department of Bioscience Engineering, KU Leuven, Leuven, Belgium, Oct. **2025**.

72. **Z. P. Smith**, "Challenges and opportunities with polymer membranes" Imagine Membranes Conference, Terceira, Portugal, Sept. **2025**.

70. **Z. P. Smith**, "Ultra-glassy polymers for gas and solvent separations" Institute of Chemical Sciences and Engineering (ISIC), École Polytechnique Fédérale de Lausanne (EPFL), Sion, Switzerland, Sept. **2025**.

67. **Z. P. Smith**, F. M. Benedetti, K. Mizrahi Rodriguez, T. H. Lee, P. A. Dean, "Engineering microporous polymers for molecular separations" Department of Chemistry, University of Copenhagen, Copenhagen, Denmark, Aug. **2025**.

66. **Z. P. Smith**, "Designing microporous polymers for gas and solvent separations" Department of Chemical Engineering, Politecnico di Milano, Milan, Italy, June **2025**.

65. **Z. P. Smith**, T. H. Lee, F. M. Benedetti, H. Lai, Y. Xia, M. Balcik, I. Pinnau, J. Y. Yeo, P. Dean, P. Jean-Baptiste, T. M. Swager, "Installing ladder motifs in polymers for gas and solvent separations" AIChE Annual Meeting, San Diego, CA, Nov. **2024**.

64. **Z. P. Smith**, "Separations reimagined: A membrane approach" MIT-San Diego Alumni Association Meeting, San Diego, CA, Nov. **2024**.

63. **Z. P. Smith**, F. Benedetti, P. Dean, K. Mizrahi Rodriguez, J. Y. Yeo, J. Teesdale, "Emerging opportunities in membrane design for molecular separations" Department of Chemical Engineering, University of Michigan, Nov. **2024**.

62. **Z. P. Smith**, F. Benedetti, P. Dean, K. Mizrahi Rodriguez, J. Y. Yeo, J. Teesdale, "MIT-MISTI: Gas separations with new membrane materials" Department of Bioscience Engineering, KU Leuven, Leuven, Belgium, Aug. **2024**.

61. **Z. P. Smith**, H. Lee, T. H. Lee, T. Joo, J. D. Howe, M. Hajian, "Network MOF structures to access percolation for mixed-matrix membranes" MOF 2024, Singapore, July **2024**.

60. **Z. P. Smith**, F. Benedetti, P. Dean, K. Mizrahi Rodriguez, J. Y. Yeo, T. Joo, P. Jean-Baptiste, "Chasing a moving target: Time and composition dependent gas separation membranes" Gordon Research Conference on Polymer Physics, Mount Holyoke, MA, July **2024**.

59. **Z. P. Smith**, F. Benedetti, P. Dean, K. Mizrahi Rodriguez, J. Y. Yeo, J. Teesdale, "Designing microporous materials for membrane separations" Department of Chemical Engineering, National University of Singapore, July **2024**.

58. **Z. P. Smith**, F. Benedetti, P. Dean, K. Mizrahi Rodriguez, J. Y. Yeo, J. Teesdale, "Gas separation membranes for a sustainable future" Department of Energy Engineering, Kentech University, Nanju, South Korea (Virtual Presentation), July **2024**.

57. H. Lee, M. Hajian, T. Joo, T. H. Lee, W.-N. Wu, J. D. Howe, **Z. P. Smith**, "Facet-specific gas transport properties for metal–organic framework mixed-matrix membranes" ACS National Meeting, New Orleans, LA, April **2024**.

56. **Z. P. Smith**, "Opportunities and challenges for direct air capture of CH_4" National Academies of Sciences, Engineering, and Medicine, Washington D.C., Oct. **2023**.

55. **Z. P. Smith**, P. Dean, F. M. Benedetti, S. Lin, A. X. Wu, K. Mizrahi Rodriguez, "Gas Separation Membranes for a Sustainable Future" 3M Tech Forum, St. Paul, MN, Sept. **2023**.

54. **Z. P. Smith**, P. Dean, F. M. Benedetti, S. Lin, K. Mizrahi Rodriguez, "Designing microporous materials for membrane separations" Department of Chemical Engineering, Penn State University, Aug. **2023**.

53. **Z. P. Smith**, P. Dean, J. Y. Yeo, F. M. Benedetti, K. Mizrahi Rodriguez, J. J. Teesdale, "Engineering membrane materials for complex molecular separations" Department of Chemical Engineering, University of Texas at Austin, April **2023**.

52. **Z. P. Smith**, "Developing membrane materials for a sustainable future" MIT Japan Conference, Tokyo, Japan, Jan. **2023**.

51. **Z. P. Smith**, P. Dean, F. M. Benedetti, S. Lin, K. Mizrahi Rodriguez, "Membrane materials under complex conditions" AIChE National Meeting, Phoenix, AZ, Nov. **2022**. *Kunesh Award Presentation.*

50. **Z. P. Smith**, F. M. Benedetti, S. Lin, K. Mizrahi Rodriguez, J. J. Teesdale, "Microporous materials for gas separations" Department of Chemical Engineering, University of California, Berkeley, Oct. **2022**.

49. **Z. P. Smith**, F. M. Benedetti, S. Lin, T. Joo, K. Mizrahi Rodriguez, "Designing polymers and MOFs for membrane-based gas separations" Gordon Research Conference on Chemical Separations, Ventura, CA, Oct. **2022**.

48. **Z. P. Smith**, F. M. Benedetti, S. Lin, K. Mizrahi Rodriguez, "Leveraging microporous materials for gas separations" Gordon Research Conference on Membranes: Materials and Processes, New London, NH, Aug. **2022**.

47. **Z. P. Smith**, F. M. Benedetti, S. Lin, K. Mizrahi Rodriguez, "Intrinsically porous polymers for gas separations" Scheme for Promotion of Academic and Research Collaborations (SPARC) Conference (Virtual Visit), Bangalore, India, Jan. **2022**.

46. **Z. P. Smith**, F. M. Benedetti, S. Lin, K. Mizrahi Rodriguez, "Top-down and bottom-up strategies to engineer microporous materials for membrane-based gas separations" Department of Chemical Engineering, KAUST (Virtual Visit), Thuwal, Saudi Arabia, Nov. **2021**.

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, K. Mizrahi Rodriguez, "Processable porous materials for membrane-based gas separations" Network Young Membranes Plenary Lecture (Virtual Conference), Manchester, United Kingdom, Dec. **2020**.

43. A. X. Wu, J. Drayton, **Z. P. Smith**, "The perfluoropolymer upper bound" AIChE National Meeting (Virtual Conference), San Francisco, CA, Nov. **2020**. *Futures: New Directions in Chemical Engineering Research Presentation*

42. **Z. P. Smith**, F. M. Benedetti, S. Lin, Q. Qian, "Engineering polymer microstructure and MOF–polymer interfaces for membrane-based separations" Soft Matter Seminar Series, Purdue University (Virtual Visit), Oct. **2020**.

41. **Z. P. Smith**, F. M. Benedetti, S. Lin, Q. Qian, "Designing polymers and MOFs for efficient and productive gas separations" Department of Chemical and Biological Engineering, University of Alabama (Virtual Visit), Sept. **2020**.

40. **Z. P. Smith**, F. M. Benedetti, S. Lin, Q. Qian, "Designing polymers for energy-efficient gas separation membranes" Student Polymer Collective, Stanford University (Virtual Visit), April **2020**.

39. **Z. P. Smith**, F. M. Benedetti, S. Lin, Q. Qian, "Designing polymers for molecular separations" Student Polymer Network, Georgia Tech, 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" ACS National Meeting, Orlando, FL, April **2019**.

35. Q. Qian, **Z. P. Smith**, "Creating an ideal interface to form defect-free mixed-matrix membranes with UiO-66-NH_2" ACS 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. X. Wu, W. S. Chi, P. Asinger, A. Hypsher, "Designing new materials for energy-efficient membrane separations" Department of Chemical Engineering, Auburn University, Jan. **2019**.

33. **Z. P. Smith**, F. M. Benedetti, S. Lin, T. M. Swager, T. A. Van Voorhis, Y. He, Q. Qian, A. X. Wu, W. S. Chi, P. Asinger, A. Hypsher, "Molecular design of materials for membrane-based separations" Polymer Program, University of Connecticut, 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" ACS National Meeting, PMSE-NAMS Symposium, New Orleans, LA, March **2018**.

31. **Z. P. Smith**, "Polymers and metal–organic frameworks for energy-efficient separations" Department of Chemical Engineering, Tianjin University, Tianjin, China, Jan. **2018**.

30. **Z. P. Smith**, "Hybrid polymer and MOF materials for membrane-based separations" Department of Materials Science, Tianjin Polytechnic University, Tianjin, China, Jan. **2018**.

29. **Z. P. Smith**, "Membranes for energy-efficient separations" School of Physical Science and Technology, ShanghaiTech University, Shanghai, China, Jan. **2018**.

28. **Z. P. Smith**, "From fundamentals to application: Taking Don Paul's guidance to develop new membrane materials" Department of Chemical Engineering, 50 Year Symposium and Celebration Honoring Don Paul, University of Texas at Austin, Sept. **2017**.

27. **Z. P. Smith**, "Polymers and MOFs for gas-phase separations" Department of Chemical Engineering, University of Queensland, Brisbane, Australia, Sept. **2017**.

26. **Z. P. Smith**, "Molecular level design of polymers and MOFs for energy-efficient separations" Department of Chemical Engineering, University of New South Wales, Kensington, Australia, Sept. **2017**.

25. **Z. P. Smith**, "Rational design of polymers and MOFs for membrane separations" Department of Chemistry, University of Sydney, Sydney, Australia, Sept. **2017**.

24. **Z. P. Smith**, "Transport of small molecules in amorphous and crystalline membrane materials" Department of Chemistry, University of Adelaide, Adelaide, Australia, Sept. **2017**.

23. **Z. P. Smith**, "Designing polymers and MOFs for small molecule diffusion and (ad)sorption selectivity" Department of Chemical Engineering, University of Melbourne, Melbourne, Australia, Sept. **2017**.

22. **Z. P. Smith**, "Molecular level design of polymers and MOFs for energy-efficient separations" Joint, Monash University and Commonwealth Industrial Research Organization (CSIRO), Clayton, Australia, Sept. **2017**.

21. **Z. P. Smith**, "Controlled transport in polymers and MOFs for molecular separations" Department of Chemistry, University of Copenhagen, Copenhagen, Denmark, 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(dobdc) nanoparticles" International Congress of Membranes, San Francisco, CA, July **2017**. *Young Membrane Scientist Award Presentation.*

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(dobdc) nanoparticles" Gordon Research Conference on Membranes: Materials and Processes, New London, NH, Aug. **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" Department of Chemical and Biological Engineering, University of Colorado, Boulder, March **2016**.

16. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical and Biological Engineering, Rensselaer Polytechnic Institute, March **2016**.

15. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical Engineering, Massachusetts Institute of Technology, Feb. **2016**.

14. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical Engineering, Virginia Polytechnic Institute and State University, Feb. **2016**.

13. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical Engineering, University of Florida, Feb. **2016**.

12. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical and Biomolecular Engineering, University of Houston, Feb. **2016**.

11. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical Engineering, Stanford University, Feb. **2016**.

10. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical Engineering, Penn State University, Feb. **2016**.

9. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical Engineering and Materials Science, University of Minnesota, Jan. **2016**.

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

7. **Z. P. Smith**, "Molecular scale engineering of new materials for energy-efficient separations" Department of Chemical and Biological Engineering, Northwestern University, Jan. **2016**.

6. **Z. P. Smith**, J. E. Bachman, T. Li, T. Xu, J. R. Long, "Mixed-matrix membranes formed from M_2(dobdc) nanocrystals and polyimide-based copolymers" National Energy Technology Laboratory (NETL), Pittsburgh, PA, July **2015**.

5. **Z. P. Smith**, G. Hernández, Á. E. Lozano, K. M. Czenkusch, D. F. Sanders, K. L. Gleason, R. Guo, J. E. McGrath, B. D. Freeman, D. R. Paul, "Gas sorption and transport in thermally rearranged polymers for membrane applications" Universidad de Valladolid, Valladolid, Spain, July **2013**.

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