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Date of Birth: 12.23.1984



Research Interest

Scalable material chemistry & engineering at the Å length-scale for high-performance inorganic & hybrid membranes for energy-efficient molecular separation and manipulation

Education

Ph.D., Chemical Engineering, University of Minnesota, Minneapolis, MN, USA 2008-2013
Advisors: Prof. Michael Tsapatsis, Prof. Lorraine F. Francis

B. Tech., Chemical Engineering, IIT Bombay, Mumbai, India 2001-2005
(Institute Silver Medal (department rank 1))

Professional Experience

Associate Professor, GAZNAT Chair for Advanced Separations 2023 onwards
École Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Co-founder, Board Member, and Chief Scientific Officer
Divea (A startup on graphene membrane for carbon capture) 2023 onwards

Assistant Professor, GAZNAT Chair for Advanced Separations 2016- 2022
École Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Postdoctoral Research Assistant 2014 –2016
Massachusetts Institute of Technology (MIT), Department of Chemical Engineering, USA
Advisor: Prof. Michael S. Strano

Postdoctoral Research Assistant 2013 - 2014
University of Minnesota, Department of Chemical Engineering & Material Science, USA
Advisor: Prof. Michael Tsapatsis

Engineer 2005 - 2008
Procter & Gamble, Global Hair Care R&D, Kobe, Japan

Publications

Google Scholar: <https://scholar.google.com/citations?user=uBT9VEEAAAAJ&hl=en&oi=ao>

Publications at EPFL

1. L. Bondaz, A. Ronghe, K. G. Ayappa*, K. V. Agrawal*, "Gated CO₂ Permeation across Dynamic Graphene Pores", **Preprint at ChemRxiv**. doi: 10.26434/chemrxiv-2025-1pjgf.
2. K.-J. Hsu, H.-Y. Chi, Y. Shen, S. Huang, R. Goswami, K. V. Agrawal*, "Modulation of Graphene Oxidation Using Substrate-Induced Electron-Hole Puddles Advancing Molecular Separation", **Advanced Functional Materials**, In Press (2025). doi: 10.1002/adfm.202503121
3. J. Hao, P. Gebolis, P. Gach, M. Chevalir, L. S. Bondaz, C. Kocaman, K.-J. Hsu, K. Bhorkar, D. J. Babu, K. V. Agrawal*, "Scalable Synthesis of CO₂-Selective Porous Single-Layer Graphene Membranes", **Nature Chemical Engineering**, In Press (2025). doi: 10.1038/s44286-025-00203-z.

4. K. V. Agrawal*, G. Liu*, S. Zhang*, "Advancing membrane science via two-dimensional materials", **Journal of Membrane Science**, In Press (2025), doi: 10.1016/j.memsci.2025.124012.
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5. W. O. Silva*, A. Mabillard, M. Soutrenon, G. Gschwend, Y. Ligen, S. Joris, L. Bondaz, K. V. Agrawal, H. H. Girault, "Print-Light-Synthesis of Electrocatalytically Active Gas Diffusion Electrodes for Fuel Cell Applications" **Journal of Material Chemistry A**, 13, 7403–7412, 2025.
6. M. Lenaerts, F. Scavone, C. V. Goethem, K. V. Agrawal, I. Vankelecom, G. Koeckelberghs*, "Stereochemical tuning, post-synthesis crosslinking and quaternizing to tune the membrane performance of ultra-stable polyamine nanofiltration membranes", **Journal of Membrane Science**, 717, 123531, 2025.
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8. S. Song, Q. Liu, S. Swathilakshmi, H.-Y. Chi, Z. Zhou, R. Goswami, D. Chernyshov, K. V. Agrawal*, "High-performance H₂/CO₂ separation from 4-nm-thick oriented Zn₂(benzimidazole)₄ film", **Science Advances**. In Press, 2024.
9. R. Bautz; G. Verdan, N. Gallandat; L. Zhong, A. Züttel; K. V. Agrawal, "Greengas - project gazier innovant", **Aqua & Gas**, 11 (31 October), 36–44, 2024.
Available at <https://www.aquaetgas.ch/fr/energie/gaz/20241031-greengas-projet-gazier-innovant/>
10. T. Emmerich, N. Ronceray, K.V. Agrawal*, S. Garaj*, M. Kumar*, A. Noy*, A. Radenovic*, "Nanofluidics". **Nature Review Methods Primers** 4, 69, 2024.
11. M. Micari*, K. V. Agrawal, "Optimization of High-Performance Membrane Processes for Post-Combustion Carbon Capture", **Computer Aided Chemical Engineering** 53, 997, 2024.
12. K.-J. Hsu, S. Li, M. Micari, H.-Y. Chi, L. Zhong, L. F. Villalobos, S. Huang, X. Duan, A. Züttel, K. V. Agrawal*, "Graphene membranes with pyridinic nitrogen at pore edges for high-performance CO₂ capture". **Nature Energy**, 9, 964–974, 2024.
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 - Invited article for Membranes Special Issue
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89. K. V. Agrawal, X. Zhang, L. F. Francis, M. Tsapatsis, "Fabrication of thin zeolite membranes using exfoliated zeolite nanosheets", **Procedia Engineering**, 44, 198-199, 2012.
90. K. V. Agrawal, X. Zhang, B. Elyassi, D. D. Brewer, M. Gettel, S. Kumar, J. A. Lee, S. Maheshwari, A. Mittal, C. Y. Sung, M. Cococcioni, L. F. Francis, A. V. McCormick, K. A. Mkhoyan, M. Tsapatsis*, "Dispersible Exfoliated Zeolite Nanosheets and Their Application as a Selective Membrane", **Science**, 334, 72, 2011.
 - Featured in runner-up in **breakthrough of the year, 2011** by the Science Magazine.
91. K. Kahali, K. Varoon (Agrawal), J. Bellare*, "Preparation of Lacey Polymer Film as Efficient Specimen Supports for TEM and Cryo-Transmission Electron Microscope (Cryo-TEM)", Proceedings of XXVII Annual Meeting of EMSI and Conference on Electron Microscopy and

Allied Fields, April 1-3, 150-151, 2004.

Book Chapter

L. Bondaz, S. Huang, M. Rezaei, S. Li, K. V. Agrawal, “Nanoporous Single Layer Graphene Membranes for Gas Separation”, in Liu, Jin (Eds.): Two-Dimensional-Materials-Based Membranes. Preparation, Characterization, and Applications. Wiley. 2022.

Patent and Patent Applications

1. "New 2D zeolitic imidazolate frameworks, methods of preparation & uses thereof", K. V. Agrawal, X. Duan, European Patent Application EP25164521 (2025).
2. “Method of preparing CO₂ selective pores in graphene & uses thereof”, K. V. Agrawal, J. Hao, European Patent Application EP24207662.8 (2024).
3. “Method for producing a gas separation membrane containing a single-layer porous graphene film”, K. V. Agrawal, M. Chevalier, C. Kocaman, European Patent Application EP24174361.6 (2024).
4. “Method of functionalizing graphene nanopores”, K. V. Agrawal and K.-J. Hsu, European Patent Application EP22206687 (2022).
5. “Method of preparing two-dimensional metal-organic frameworks films”, K. V. Agrawal, M. Tsapatsis, Q. Liu, US Patent Application 63/425025 (2022).
6. “Method of preparation of porous polymeric support layer and uses thereof”, K. V. Agrawal, D. J. Babu, and L. F. Villalobos, European Patent Application EP20174809 (2021).
7. "New process for graphene membranes lattice engineering and uses thereof", K. V. Agrawal, S. Huang, K.-J. Hsu, European Patent Application EP20166877 (2021).
8. “Hybrid membranes for energy-efficient carbon capture”, K. V. Agrawal and G. He, International Patent Application WO/2020/011892.
9. “Graphene membrane filter for gas separation”, K. V. Agrawal, S. Huang, US Patent 11559772B2 (2023)
10. “Ultrahigh flux gas-selective nanoporous carbon membrane and manufacturing method thereof”, K. V. Agrawal, M. Dakhchoune, S. Huang, G. He, N. Dudani, International Patent Application WO2018177533A1.
11. “Crystalline poly(triazine imide) membranes and uses thereof”, K. V. Agrawal, L. F. Villalobos, International Patent Application WO/2021/074401.
12. “Silica Support Structure for a Zeolite Membrane”, M. Tsapatsis, K. V. Agrawal, L. F. Francis, US Patent US10005674 (2018).
13. “Zeolite Nanosheet Membrane”, US Patent US10005077 (2018).
14. “Method for Assessment of Friction Properties of Fibers or Substrates upon Mechanical Treatment”, C. K. Yagnik, K. Varoon (Agrawal), US8429963 (2013).
15. “Method for Assessment of Electrostatic Properties of Fibers or Substrates”, K. Varoon (Agrawal), US Patent US8198901 (2012).

Invited Lectures at International Conferences

1. Keynote lecture (scheduled), 2nd International Conference on Sustainable Nanomaterials Integration and Organization for Energy and Environment (2nd-iSNIOE2), India, 2026
2. Keynote lecture (scheduled), Carbon Capture Science and Technology (CCST) Conference, Online, 2025
3. Invited talk (scheduled), World Chemical Engineering Congress, China, 2025.

4. Keynote lecture (scheduled), MedPore 2, Marrakech-UM6P campus, Morocco, 2025.
5. Invited talk, Interdisciplinary Perspectives on Transport Mechanisms in Membranes and Nanopores, France, 2025.
6. Keynote lecture, International Conference on Carbon Capture and Utilization 2024 (ICCCU24), India, 2024.
7. Invited talk in 9th International Conference on Metal-Organic Frameworks and Open Framework Compounds (MOF2024), Singapore, 2024.
8. Invited Lecture at the international conference From Solid-state to Biophysics XI, Croatia, 2024.
9. Invited talk in Materials Research Society (MRS) Spring Meeting, Nanoscale Mass Transport Through 2D and 1D Nanomaterials, USA, 2024.
10. Invited talk in Gordon Research Conference (GRC) on Nanoporous Materials and Their Applications, Proctor Academy, USA, 2023.
11. Keynote talk in 9th International Zeolite Membrane Meeting (IZMM), China, 2023.
12. Keynote talk in GBT-SPT 2023 and 2nd GBA-MMP Symposium, 2023.
13. Invited talk at International Nanofluidic Symposium, Singapore, 2023.
14. Invited talk at 16th International Conference on Inorganic Membranes (ICIM 16), Taiwan, 2022.
15. Invited talk in MRS Spring Meeting, Nanoscale Mass Transport Through 2D and 1D Nanomaterials, USA, 2022.
16. Plenary talk (FRI/John G. Kunesh Award), Separation Division, AIChE Annual Meeting 2021, USA.
17. Invited talk in KAUST Research Conference: Advanced materials for energy-efficient separations, Addressing Vision 2030 and beyond, Saudi Arabia, 2020.
18. Invited talk in Summer School by European Membrane Society, University of Edinburgh, Scotland, 2019.
19. Invited talk in GRC on “Membranes: Materials and Processes”, USA, 2018.
20. Invited talk in Young Membrane Scientist Award lecture, North American Membrane Society (NAMS), USA, 2018.

Invited Seminars and research talks

21. Research Talk, Center for Enhanced Nanofluidic Transport (CENT), August 2024.
22. Seminar, NTU Material Science Department, July 2024.
23. Research Talk, ETH Board, Lausanne, Switzerland June 2024.
24. Seminar, Yonsei University, Jan 2024.
25. Seminar, Tianjin University, Fall 2023.
26. Seminar, Suzhou University, Fall 2023.
27. Seminar, University of Texas at Austin, Fall 2023.
28. Seminar, Ohio State University, Fall 2023.
29. Seminar, IISc Bangalore, 2023.
30. Seminar, Shell, June 2023.
31. Seminar, Yonsei University, Jan 2023.
32. Invited talk in the thematic session, “Membranes for Gas Separation” in the workshop “Thin Film Nanostructured Membranes for Gas Separation, Storage and Water Desalination” IISc Bangalore, India, Jan 2022.
33. Seminar, University of Minnesota, Jan 2022.
34. Seminar, ETH Zurich, 2021.
35. Seminar, Georgia Institute of Technology, 2021.
36. Seminar, John Hopkins University, 2021.
37. Seminar, University of Texas at Austin, 2021.
38. Research Talk, Swiss Parliament Committee for Science, Education and Research, Sion, Switzerland, 2021.
39. Research Talk, ETH Board, Sion, Switzerland 2021.
40. Young Faculty Meeting, Swiss Chemical Society, Bern, Switzerland, 2021.
41. EuroTech Seminar Series, 2021.

42. Seminar, Indian Institute of Sciences, Bangalore, 2021.
43. Research Talk, Extended EPFL Energy Event: Carbon capture, utilization and storage, 2021.
44. Seminar, National Graphene Institute, Manchester, UK, 2021.
45. Seminar, IBM Research Center, Brazil, 2021.
46. Seminar, Graphene Center, Cambridge University, 2021.
47. Seminar, Separation Technology Workshop, Yonsei University, 2021.
48. Research Talk, EPFL Alumni Day, 2020.
49. Seminar, ExxonMobil Research and Engineering, Clinton, USA, 2019.
50. Seminar, Stockholm University, Sweden, 2019.
51. Seminar, Eidgenössische Materialprüfungs- und Forschungsanstalt (EMPA), Switzerland, 2019.
52. Seminar, Imperial College London, UK, 2018.
53. Seminar, Massachusetts Institute of Technology, Boston, USA, 2018.
54. GAZNAT Global gas conference, EPFL, Lausanne, 2018.
55. Seminar, Indian Institute of Technology, Bombay, India, 2018.
56. Raman Microscopy Workshop, ETH Zurich, Switzerland, 2017.
57. Seminar, Czech Academy of Sciences, Czech Republic, 2017.
58. Inorganic Chemistry Seminar, University of Bayreuth, Germany, 2017.
59. Chemical Engineering Seminar, Indian Institute of Science, Bangalore, India, 2016.
60. Chemical and Biological Engineering seminar, University of Wisconsin-Madison, USA, 2015.
61. Chemical & Biological Engineering seminar, Northwestern University, Evanston, USA, 2015.
62. Special Chemical Engineering Seminar, Purdue University, West Lafayette, USA, 2015.
63. Chemical & Biochemical Seminar, Rutgers University, New Jersey, USA, 2015.
64. Memento ISIC Seminar, EPFL, Switzerland, 2014.
65. Seminar, Massachusetts Institute of Technology, Boston, USA, 2014.
66. CEMS Advanced Doctoral Student Seminar, University of Minnesota, Minneapolis, USA, 2013.

Funding (raised ~21 million CHF for the following projects)

- Bridge Discovery Project with Prof. Vivek Subramanian (2025-2028)
- Swiss National Science Foundation Project (with National Science Foundation of USA, 2024-2027).
- Interinstitutional project grant (with HES-SO), Canton of Valais (2024).
- AIChE Inorganic Materials Graduate Student Award funding through Chevron (since 2020).
- EPFL Solutions4Sustainability Grant on CCUS (2023).
- EPFL-UNIL Climact Starting Grant (2023).
- Bridge Proof of Concept Grant with Dr. Mojtaba Rezaei (2022-2023).
- 2022 EPFL FSB Science Seed Grant (2022-2023).
- GAZNAT Project - Phase III (2021-2024).
- Postcombustion carbon capture demonstration project (funded by GAZNAT and Swiss Federal Office of Energy; 2020-2025).
- Advanced in situ TEM for atomic-scale material chemistry and engineering (2020).
- District demonstrator project (funded by Valais administration, Switzerland; 2020-2025).
- Shell postcombustion carbon capture project (2020-2023).
- Swiss National Science Foundation Project (2020-2024).
- Swiss National Supercomputing Center (2019-2020).
- ABB research grant (2019).
- GAZNAT Project - Phase II (2019-2023).
- Swiss National Supercomputing Center (2018-2019).
- European Research Council (ERC) Starting grant (2019-2023).
- Cooperation and Development Center (CODEV) seed grant (2018).
- Swiss National Science Foundation Assistant Professor Energy grant (2017- 2020).
- GAZNAT Project – Phase I (2017-2020).
- Swiss Competence Center of Energy Research – Efficiency in Industrial Processes (SCCER-EIP),

Phase II (2017 – 2020).

- EPFL Valais funding on exfoliation chemistry (2017-2020).
- ETH-Board funding on collaborative energy research (2016-2017).

Awards and Academic Honors

1. Journal of Membrane Science Oral Presentation award at International Congress on Membranes and Membrane Processes (ICOM 2023).
2. Member of the Editorial Board of the Journal of Membrane Science (2023 onwards).
3. Member of the Editorial Board of the Separation & Purification Technology (2025 onwards).
4. Member of the Early Career Editorial Board of the Separation & Purification Technology (2023 onwards).
5. FRI/John G. Kunes Award, AIChE Separation Division, 2021.
6. Member of the Early Career Editorial Board of the Journal of Membrane Science (2020-2023).
7. Young Membrane Scientist Award, North American Membrane Society (NAMS), 2018.
8. European Research Council (ERC) Starting Grant, 2018.
9. Swiss National Science Foundation Assistant Professor Energy Grant (Career Grant, 2017).
10. Best Poster Award, Gordon Research Conference on Nanoporous Materials and Their Applications, 2015.
11. Graduate Student Research Award, AIChE Separations Division, 2013.
12. Doctoral Dissertation Fellowship (2012-2013), University of Minnesota.
13. Sigma Xi Award for best student poster presentation during DDF showcase.
14. Best Poster Award, Gordon Research Conference on Nanoporous Materials and Their Applications, 2011.
15. CEMS Outstanding Teaching Assistant Award (2009-2010), University of Minnesota.
16. Procter & Gamble R&D Vice President Power of You Gold Award.
17. Institute Silver Medal for securing 1st rank in Department of Chemical Engineering at IIT Bombay.
18. Manudhane Best Undergraduate Student Award for overall excellence at IIT Bombay.
19. IIT Bombay Merit Scholarship (2003-2005).

Professional Activities outside EPFL

1. Co-founder, Board Member, and Chief Scientific Officer, Divea.
2. Editorial Board Member of Journal of Membrane Science (2023 onwards).
3. Editorial Board Member of Separations & Purification Technology (2025 onwards).
4. Early Career Editorial Board Member of Separations & Purification Technology (2023-24).
5. Early Career Editorial Board Member of Journal of Membrane Science (2020-2022).
6. Member of the GAZNAT Steering Committee for Carbon Capture (2020 onwards).
7. Executive Guest Editor of Journal of Membrane Science for the special issue on “2D Membranes for Molecular Separation” (2024).
8. Guest Editor of Separation and Purification Technology for the special issue on “Two Dimensional Membranes”
9. Member of the Swiss Steering Committee for Swiss-Norwegian Beamlines (SNBL, 2021-2022).

Professional Activities within EPFL

1. Member of the Science and Technology Committee, Coalition for Green Energy and Storage (CGES, 2025 onwards).
2. Vice President, EPFL Teachers Council (CCE, 2025).
3. Student Exchange Coordinator (Chemical Engineering, 2024 onwards).
4. Member of the Doctoral School Committee (EDCH, 2024, two-year mandate).
5. Elected member of EPFL Teachers Council (CCE, 2023, two-year mandate).
6. Member of the EPFL Valais Wallis Campus Committee (2021 onwards).
7. Scientific Advisor to the EPFL Student MAKE Team (Carbon Team, 2021 onwards).
8. Member of the EPFL Vision Committee for CO₂ Sequestration (2022).

9. Member of the ISIC Physical Chemistry Faculty Hiring Committee (2021-2023).
10. Member of the Doctoral School Committee (EDCH) of EPFL (2020-2022).
11. Chair of the EPFL Valais Faculty Committee (2018-2020).
12. Member of the ISIC Vision Panel (2019).
13. Member of several ISIC Hiring Committees for NMR Platform Scientist (2019).
14. Member of the SCGC Teaching Committee (2016-2017).

Organization of Conferences

1. Symposium (Selective Separations in Nanomaterials) at the 2025 MRS Fall Meeting with Zhongwu Li, Rahul Prasanna Misra and Qian Yang.
2. International Nanofluidics Conference 2024 with Aleksandra Radenovic and Alex Noy.
3. Conceptualized, organized, and raised funding through sponsor (Chevron) for the Graduate Student Award Session in AIChE Material Engineering and Sciences Division, Inorganic Materials.
4. *Area Chair* (Inorganic Materials, Material Engineering and Sciences Division, MESD), AIChE Annual Meeting, Pittsburgh, USA, 2018
5. Chair for multiple sessions at AIChE annual meeting since 2015.
6. Session Chair, 12th International Congress on Membranes and Membrane Processes (ICOM 2020).
7. Chair, Synthesis and Application of Inorganic Materials II: Application/Separations, AIChE Annual Meeting 2020 (online).
8. Co-chair, Inorganic Materials Graduate student award session, AIChE Annual Meeting, 2020 (online).
9. Co-chair, Two-Dimensional Materials and Thin Films, AIChE Annual Meeting, 2020 (online).
10. Chair, Inorganic Materials, North American Membrane Society 2020 (online).
11. Chair, Graduate student award session (area: MESD Inorganic Materials), AIChE Annual Meeting, Orlando, USA 2019
12. Chair, Graduate student award session (area: MESD Inorganic Materials), AIChE Annual Meeting, Pittsburgh, USA 2018
13. Chair, MOFs, COFs, and Porous Polymer Materials I: Synthesis, AIChE Annual Meeting, Minneapolis, USA, 2017
14. Chair, MOFs, COFs, and Porous Polymer Materials II: Applications, AIChE Annual Meeting, Minneapolis, USA, 2017
15. Chair, Nanostructured Thin Films, AIChE Annual Meeting, San Francisco, USA, 2016
16. Co-Chair, Advances in the Synthesis and Application of Porous Materials I, AIChE Annual Meeting, San Francisco, USA, 2016
17. Chair, Advances in the Synthesis and Application of Porous Materials II, AIChE Annual Meeting, Salt Lake City, USA, 2015
18. Participant, Department of Energy's Advance Manufacturing Office Workshop on Membrane Technology, Chicago, USA, 2012

Professional Affiliations

Member of Royal Society of Chemistry (MRSC), Swiss Chemical Society, Swiss Process & Chemical Engineers, European Federation of Chemical Engineering, American Institute of Chemical Engineers, American Chemical Society, Material Research Society, European Membrane Society, North American Membrane Society, American Association for The Advancement of Science

Reviewer

Grant proposals: Horizon 2020 (European Research Council (ERC) Grants), ACS PRF

Journal Articles (~40 per year)

Science, Nature, Nature Materials, Nature Nanotechnology, Nature Energy, Advanced Materials, Science Advances, Proceedings of National Academy of Sciences, Nature Communications, Journal of American Chemical Society, Angewandte Chemie, Advanced Functional Materials, Nano Letters, ACS Nano, ACS Applied Materials and Interfaces, Carbon, ACS Applied Nano Materials, ACS Applied Polymer Materials,

Chemistry-A European Journal, Chemical Reviews, ACS Sensors, The Journal of Physical Chemistry Letters, Journal of Membrane Science, Journal of Materials Science, Nano Research, The Journal of Physical Chemistry-C, Microporous and Mesoporous Materials, Industrial and Engineering Chemistry Research, ChemPhysChem, Journal of Chemical Technology & Biotechnology, AIChE Journal, Chemical Engineering Science.

Teaching Experience

At EPFL

Lecturer, "ChE 413: Chemical Product Design", 2025 - onwards

Lecturer ChE 310: Fundamentals of Separation Processes, 2018- onwards

Lecturer ChE 402: Diffusion and Mass Transfer, 2018 - onwards

Project Coach, "ChE 413: Chemical Product Design", 2016 – 2024

Guest Lecturer, " MSE-433: towards sustainable materials", 2025

Kaufman Teaching Certificate Program, MIT, 2016

Guest Lectures

Fall 2009 'Absorption, Adsorption and Extraction', CHEN 2001, University of Minnesota

Spring 2012 'Structure of Zeolites', CHEN 8501, University of Minnesota

Fall 2015 'Nanoporous Membranes: Zeolite and Graphene', 10.585, Massachusetts Institute of Technology