

NORTH AMERICAN MEMBRANE SOCIETY

33rd ANNUAL MEETING

2024

MAY 11TH – 15TH

SANTA FE COMMUNITY CONVENTION CENTER, SANTA FE, NM
MEMBRANES FOR DECARBONIZATION



[NAMS 2024 – The North American Membrane Society](#)

Program Book

Conference chairs

Mahdi Malmali
Michele Galizia
Nitish Mittal
Benny D. Freeman



WIFI: CONVENTION CENTER
Password: no password

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Welcome to NAMS 2024

Fellow NAMS Members,

I want to personally welcome you to the 2024 NAMS annual meeting.

The organizers have put together an incredible program for all the members to enjoy. As you know, the NAMS meeting is NO VACATION!! Weekend workshops are given by the best professors in the field, six sessions in parallel, social hours, evening poster sessions, and the Banquet!

We hope that during that busy week, you will also enjoy the fabulous historic city of Santa Fe.

As I mentioned in the previous Membrane Quarterly, the year was quite busy, and the board of directors worked hard to put together multiple services for the members, such as the student mentoring program, online webinars, award preparedness meetings, etc. Keep an eye on what is available to the members in the members section of our new website.

Remember that, due to the change in secretary this year, all communications will be sent via nams@membranes.org.

Now, just make sure you stay hydrated (Santa Fe is at an elevation of 7,199 feet - third highest city in America), get ready to learn a lot and have fun!!!

Best regards,

Marie-Eve Langevin

NAMS President

President@membranes.com

Message from the 2024 NAMS Conference Chairs

It is our pleasure to welcome you to Santa Fe for the 33rd Annual Meeting of the North American Membrane Society. It has been our honor to serve as co-chairs for this year's NAMS meeting.

We will use Whova as a platform for program information, message distribution, and networking, so please make sure you download the app on your phone and bookmark it on your computer. We will have 160 posters and 195 talks on a wide range of membrane-related topics. These contributions are of the highest quality, and we are sure to have an engaging conference.

We thank our dedicated oral and poster session chairs, and the NAMS Board. We would like to acknowledge especially our sponsors who have provided substantial funds to support the conference and related events, such as the Membrane Workshop and the traditional Lunch with Legends.

We are truly excited to host you in Santa Fe and look forward to seeing many old friends and meeting new ones. We hope you have a great time at NAMS 2024!

Mahdi Malmali, Texas Tech University, Lubbock
Michele Galizia, University of Oklahoma, Norman
Nitish Mittal, Exxon Mobil, Houston
Benny D. Freeman, The University of Texas at Austin, Austin
NAMS 2024 Conference Co-Chairs

NAMS 2024 Anti-Harassment Policy

NAMS 2024 is dedicated to providing a harassment-free conference experience for everyone. We will not tolerate harassment of conference participants (including sexual harassment and assault) in any form. Conference participants violating these rules may be sanctioned or expelled from the conference without a refund at the discretion of the conference organizers. Harassment includes but is not limited to: comments related to gender, gender identity, and expression, sexual orientation, physical appearance, race, or religion; unwanted sexual attention; unwanted physical contact; threats of violence; intimidation; and stalking.

Reporting: If someone makes you or anyone else feel unsafe or unwelcome, please report it as soon as possible to one of the conference co-chairs. If you are being harassed by someone, notice that someone else is being harassed, or have any other concerns, please contact one of the conference co-chairs through the Whova App or in person.

Enforcement: If a participant engages in harassing behavior, event organizers retain the right to take any actions to keep the event a welcoming environment for all participants. This includes warning the offender or expulsion from the conference with no refund. Event organizers may take action to redress anything designed to, or with the clear impact of, disrupting the event or creating a hostile environment for attendees. We expect participants to follow these rules at all event venues and event-related social activities.

This award supports innovators in membrane education, and educational initiatives that introduce membranes into the science curriculum at colleges and universities.

Stephanie G. Wettstein

Dr. Stephanie G. Wettstein is an Associate Professor in the Chemical and Biological Engineering department at **Montana State University (MSU)** where she joined the department in 2012. She received her B.S. in Paper Science at the University of Wisconsin (UW)– Stevens Point and worked as a Process Engineer for three years at Kimberly-Clark after graduation. Dr. Wettstein then obtained her Ph.D. from the University of Colorado in the area of zeolite membrane separations under Profs. John Falconer and Rich Noble and then completed a two-year post-doc at the UW – Madison in the area of catalysis and separations extractions under the guidance of Prof. James Dumesic. Her technical research is a combination of her past experience and is focused on catalysis and separations to produce products from renewable resources. Dr. Wettstein has over 12 years of experience teaching mass transfer unit operations including the junior-level separations course and the senior-level unit operations laboratory. In both classes, she has incorporated industry-based experiences from her time at Kimberly-Clark including redesigning the senior lab course to make it more industrially relevant.



Heather C.S. Chenette

Dr. Heather Chenette is an Associate Professor of Chemical Engineering at **Rose-Hulman Institute of Technology**. Her professional interests include leveraging qualitative methods to understand and enhance student learning in the classroom and creating opportunities for students to learn about polymers, membrane materials, and bioseparation processes through research experiences. She graduated with a B.S. in Engineering (Harvey Mudd College) and worked as a chemical engineer for a NanoH₂O, Inc., developing and testing membranes for desalination before earning her PhD in Chemical Engineering from Clemson University, developing membranes for chromatographic bioprocessing applications while also obtaining a Certificate in Engineering and Science Education. She has been on the faculty at Rose-Hulman since 2014. Heather attended her first NAMS Annual meeting in 2010 and presented at the NAMS Student Workshop in 2015. The NAMS Education Innovation Fellowship supported project will assess the current state of membrane education in higher education, identify areas of greatest need of educational resources, and develop and promote appropriate educational resources. She is also an active member of ASEE and AIChE, where she currently serves as a Director for the Separations Division, and regularly presents scholarly work and engages in the Education Division.



NAMS Fellows are recognized members of NAMS who have demonstrated ongoing excellence in membrane engineering and practice. Election as Fellow is in recognition of both “service to NAMS” and “highly significant professional accomplishment in the membrane field.”

John Pellegrino

Dr. John Pellegrino spent 16 years on the NAMS Board of Directors between 1997 and 2023, during which he was NAMS President in 2004; co-founded the Alan S. Michaels Award and founded the Elias Klein Travel Award. He also served and variously chaired the Finance, Awards, Workshops, Annual Meeting and Fellows Committees. In 1995, he created the first NAMS website (www.membranes.org). John also co-chaired two NAMS Annual Meetings (Boulder in 2000 & Estes Park, CO in 2021) and founded and co-instructed the Measurement Methods for Membranes workshop that has been often presented at NAMS and ICOM meetings between 1995-2024. Recently, he has been helping to produce the Member and Membrane News feature for the Membrane Quarterly.



John is currently a Research Professor in the Department of Mechanical Engineering at the University of Colorado-Boulder. Prior to joining the research faculty at CU, he was vice-president of engineering for Santa Fe Science and Technology, Inc., a defense contract research company trying to commercialize polyaniline hollow fibers. He also spent 14 years as a member of the National Institute of Standards and Technology (NIST) where he led the membrane science and technology program and co-chaired and managed the NIST–Advanced Technology Program Focused Competition on Selective Membrane Platforms. He also spent 7 years as a chemical engineer with duPont and Rohm & Haas. His career technical highlights include recently co-developing submicron surface patterning of membranes. This work has stimulated a broad swath of current academic and industrial researchers. He was also co-PI on a team providing the first experimental evidence for molecular sieving through single angstrom-sized pores in the 2-d carbon allotrope, graphene. This work has been cited ~1200 times. He was also a co-PI on team providing the first systematic study of how membrane systems should be used to effectively to remove natural organic matter from municipal water treatment systems and minimize impacts on water's taste, odor, and potential disinfection byproducts. This work has been cited ~1150 times. His earliest efforts was as co-PI on a team providing the first systematic study of structure-property relationships in mass transfer through perfluorosulfonated ionomer (Nafion®) which was emerging as the "gold standard" in polymer electrolyte membranes.

Uwe Beuscher

Dr. Uwe Beuscher is a Technical Leader at W.L. Gore & Associates, Inc., the world leader in fluoropolymer materials for a wide variety of applications. Dr. Beuscher received his Diplom-Engineer degree in Mechanical Engineering from RWTH Aachen (Germany) and his Ph.D. in Chemical Engineering from Clemson University. After joining W.L. Gore & Associates, Dr. Beuscher contributed for over 25 years to developments in a wide variety of membrane and separation applications including polymer fuel cells, gas-liquid contactors, barrier materials, gas separation, liquid purification, advanced microfiltration, adsorption, catalysis, and chromatography. Currently, Dr. Beuscher is developing new product ideas and applications for improved sustainability and environmental remediation. He is also leading the Modeling and Simulation Team for the Performance Solutions Division, which develops multiscale mathematical models and simulation/analysis tools to understand and optimize the performance of Gore's materials, products, and manufacturing processes. Dr. Beuscher has authored or co-authored more than thirty technical papers and book chapters and has presented frequently at international meetings. He was a member of the NAMS board of directors for 8 years, chaired the Awards committee during that time, and served as the NAMS president in 2015. Dr. Beuscher co-chaired the 2021 NAMS annual meeting in Estes Park, CO, and has co-taught the Measurement Methods for Membranes for the last several years. He is a founding member of the World Association of Membrane Societies (WA-MS) and has been active on its Steering Committee since its inception in 2017.



Winston Ho

Dr. W.S. Winston Ho is a Distinguished Professor of Engineering in the William G. Lowrie Department of Chemical and Biomolecular Engineering and the Department of Materials Science and Engineering at The Ohio State University. Winston has been a member of NAMS since its formation. He served as Director of NAMS, 2005 – 2011. Currently, he has served as Separation Engineering Section Editor, Current Opinion in Chemical Engineering and on several advisory boards including the Journal of Membrane Science. He has chaired many membrane and separations sessions at NAMS and AIChE meetings. Moreover, he gave an invited plenary lecture at the NAMS 2016 Annual Meeting, and he has developed a membrane course and taught it every year since 1999 for educating next-generation membranologists and wide-spreading membrane knowledge. Before teaching for 25 years in 2024, he had 28 years of industrial R&D experience in membranes and separation processes. He was elected to the National Academy of Engineering, USA in 2002 in recognition of his distinguished contributions to engineering including the commercialization of gas treating technologies and the development of supported liquid membrane technology and membrane separation models. A New Jersey Inventor of the Year (1991), Winston holds more than 60 U.S. patents, generally with foreign counterparts, in membranes and separation processes. He is an AIChE Fellow and has received several AIChE awards.



Student Fellowship Award

The NAMS Student Fellowship Awards are presented annually to outstanding graduate students in the area of membrane science and technology.

David Kitto works with Professor Jovan Kamcev as a 5th year Ph.D. candidate in the Department of Chemical Engineering at the **University of Michigan**. He performed his bachelor studies in Chemical Engineering and Chemistry at the University of Minnesota - Twin Cities. David's research interests include the modeling, characterization, design, and preparation of polymeric ion-exchange membranes for both water and energy applications. His thesis work has integrated a comprehensive approach to membrane synthesis with large data sets to realize high-performing new materials possessing uniquely high charge densities. His work has been recently recognized with awards by WAMS at ICOM 2023 and by the ACS Division of Polymer Chemistry at ACS-Spring 2024.



Jianan Gao is a Ph.D. candidate working with Dr. Wen Zhang in the Department of Civil and Environmental Engineering at the **New Jersey Institute of Technology**. He received an M.S. degree in Municipal Engineering and a B.S. degree in Water Supply and Drainage Science and Engineering from Qingdao University of Technology, China. His research focused on developing an innovative electrochemical membrane technology for wastewater treatment. His work achieved remarkable efficiency in nitrate reduction and ammonia recovery and gained over 900 citations. His work was recognized with the 2024 NAMS Student Fellowship Awards, the 2023 CAPEES Founding President Best Paper Award, the 2023 Kenneth S. Stoller Award, the 2023 The C. Ellen Gonter Environmental Chemistry Award, the 2022 Heh-Won Chang PhD Fellowship in Green Chemistry Award, and the 2021 Graduate Student Award in ACS Division of Environmental Chemistry (ENVR).



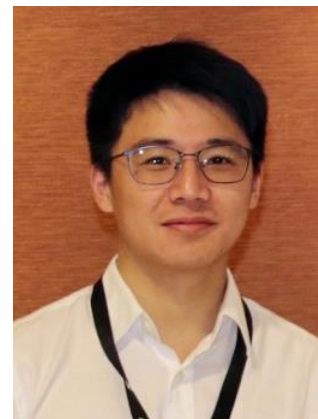
Matthew Webb is a 4th year Ph.D. candidate in the Department of Sustainable, Chemical, Biological and Materials Engineering at the **University of Oklahoma**, where he is co-advised by Dr. Michele Galizia and Dr. Sepideh Razavi. Matthew received his Bachelor of Science in Chemical Engineering from the University of Oklahoma in 2020, with special distinction. His primary research focuses are currently geared towards the development of next generation polymer-based gas separation membrane materials exhibiting enhanced selectivity and stability. Matthew has received the NAMS Elias Klein Founders' Award in 2023, and has co-authored several scholarly papers. His thesis work revolves around the investigation and optimization of the design and characterization of selective and stable facilitated transport films, for applications such as natural gas purification or olefin/paraffin separation.



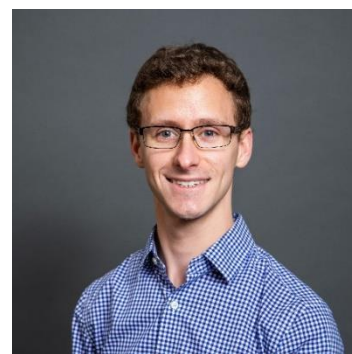
Young Membrane Scientist Award

The NAMS Young Membrane Scientist Award is for outstanding individuals who are starting their professional careers in membrane science and technology (≤ 5 yr from terminal degree).

Dr. Kecheng Guan is an Assistant Professor of the Research Center for Membrane and Film Technology at **Kobe University**, Japan. He obtained his Ph.D. in Chemical Engineering from Nanjing Tech University in 2019 and joined Kobe University as a postdoctoral researcher in the group of Prof. Hideto Matsuyama that same year. In 2020, he was promoted to Assistant Professor. Kecheng's research primarily involves developing membrane materials and processes for water treatment, organic solvent separation, and resource recovery. He is also interested in investigating selective transport within confined nanopores. Currently, he leads two research projects funded by the Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Early-Career Scientists and the Sumitomo Foundation Basic Science Research Projects, with a main focus on developing fouling-resistant polymeric membranes for seawater distillation.



Dr. Joshua Moon is an Assistant Professor of Chemical Engineering at the **University of Florida**. Prior to joining UF faculty in 2023, he worked as a postdoctoral researcher at the University of California, Santa Barbara under the guidance of Profs. Craig Hawker and Rachel Segalman as part of the Center for Materials for Water and Energy Systems (M-WET). He received his Ph.D. in Chemical Engineering in 2019 from the University of Texas at Austin where he was an NSF Graduate Research Fellow under the advisement of Profs. Benny Freeman and Donald Paul. His research group aims to tackle Grand Challenges in clean water, energy, and sustainability using chemically-modular design of polymer membranes and adsorbents coupled with a fundamental understanding of molecular transport in polymers informed by polymer physics and thermodynamics. Current applications for his research span across carbon capture, hydrogen and hydrocarbon separations, environmental remediation of water resources, and sustainable use of polymer materials.



Dr. Samuel Louder is a Senior Research Scientist at **ZwitterCo, Inc.** He earned his Ph.D. in Chemical and Biological Engineering in 2022 from Tufts University under the guidance of Professor Ayse Asatekin. His Ph.D. and startup research involve the design/synthesis of functional polymer chemistries to develop self-assembled amphiphilic membranes for various water treatment applications. His work has been recognized by awards such as the Tufts Institute of the Environment (TIE) research fellowship, an International Filtration News (IFN) student spotlight feature, and a first-place prize in the NAMS poster competition. Prior to his graduate studies, Sam received a B.S. in Chemical Engineering from the University of Maine.



Permeance Prize

The Permeance Prize is for outstanding individual who are in the middle of their professional careers in membrane science and technology (≤ 15 yr from terminal degree). The purpose of the Award is to recognize and encourage individual contributions in the field of membrane science and technology, and service to NAMS by a mid-career member of the Society.

Jason Bara

Jason Bara is a Professor at The University of Alabama in the Department of Chemical & Biological Engineering. Jason received a B.S. in Chemical Engineering from Virginia Commonwealth University and a Ph.D. in Chemical Engineering from the University of Colorado at Boulder. He has authored more than 160 peer-reviewed research publications in the areas of gas separations, ionic liquids and green solvents, and polymer membranes. In recent years his research interests have expanded to additive manufacturing, the depolymerization and upcycling of plastic wastes, and liquid-liquid extractions for recovery of critical elements. To date, Jason has been awarded 15 patents for discoveries in these areas. In recognition of his research, he has received awards including the Early Career Fellow from the Industrial & Engineering Chemistry Division of ACS (2021), and the FRI/John G. Kunesh Award from the Separations Division of AIChE (2015).



Jeffrey McCutcheon

Jeffrey McCutcheon is the Centennial Term Professor in the Chemical & Biomolecular Engineering Department at the University of Connecticut. He received a B.S. in Chemical Engineering from the University of Dayton and his Ph.D. in Chemical Engineering from Yale University. For nearly 20 years, he has pioneered work in membrane-based separations, notably in the areas of osmotic processes and membrane formation. He has published over 100 refereed publications and has several patents on membrane technology and has served the separations community as a Director for both the AIChE Separations Division and the North American Membrane Society (NAMS) and recently served as President of NAMS. He currently serves as the Deputy Topic Area lead for Materials & Manufacturing Topic Area in the National Alliance for Water Innovation, the Department of Energy's \$100M "Water Hub" dedicated to supporting the development of desalination technology in the United States. He has received numerous awards including the 3M Nontenured Faculty Award, the Solvay Advanced Polymers Young Faculty Award, The DuPont Young Faculty Award, and the FRI/John G. Kunesh Award from the AIChE Separations Division. He was the winner of the 2019 Global Water Summit Water Technology Idol competition for his work on 3D printed membranes and was inducted into the Connecticut Academy of Science and Engineering in 2021. In 2017, he was named the Executive Director of Fraunhofer USA Center for Energy Innovation and served for 3 years before taking the Center to its now independent status as the Connecticut Center for Applied Separations Technologies (CCAST).



| Date | Time (*MST) | Event | ROOM |
|---------------------|---------------------|---------------------------------------|--------------------------------------|
| Saturday May 11 | 8:00 AM – 5:00 PM | Membranes for Water Treatment & Reuse | Coronado/DeVargas |
| | | Measurement Methods for Membranes | Peralta/Lamy |
| Sunday May 12 | 8:00 AM – 5:00 PM | Membrane Gas Separations | Coronado/DeVargas |
| | | Membranes in Bioprocessing | Peralta/Lamy |
| | 2:00 PM – 5:00 PM | Student Workshop | O’Keeffe/Milagro/Kearny |
| | 7:30 AM – 6:00 PM | Registration | SFCCC Lobby |
| | 6:00 PM – 9:00 PM | Welcome Reception | SFCCC Courtyard |
| Monday May 13 | 7:00 AM – 5:00 PM | Registration | SFCCC Lobby |
| | 8:00 AM – 8:30 AM | Coffee Break | SFCCC Lobby/Corridor |
| | 8:30 AM – 10:50 AM | Parallel Technical Sessions I | Breakout rooms |
| | 11:00 AM – 12:00 PM | Plenary Lecture I | Sweeney E-F |
| | 12:00 PM – 1:45 PM | Lunch with Legends | Hilton S. Fe Historic Plaza Ballroom |
| | 12:00 PM – 1:45 PM | Lunch Break | - |
| | 1:45 PM – 3:45 PM | Parallel Technical Sessions II | Breakout rooms |
| | 3:45 PM – 4:00 PM | Coffee Break | SFCCC Lobby/Corridor |
| | 4:00 PM – 6:00 PM | Parallel Technical Session III | Breakout rooms |
| | 7:30 PM – 10:00 PM | Poster Session | Sweeney A-C |
| Tuesday May 14 | 7:00 AM – 5:00 PM | Registration | |
| | 8:00 AM – 8:30 AM | Coffee Break | SFCCC Lobby/Corridor |
| | 8:30 AM – 10:50 AM | Parallel Technical Sessions IV | Breakout rooms |
| | 11:00 AM – 12:00 PM | Plenary Lecture II | Sweeney E-F |
| | 12:10 PM – 1:00 PM | Lunch Break | - |
| | 1:00 PM – 3:00 PM | Parallel Technical Sessions V | Breakout rooms |
| | 3:00 PM – 3:30 PM | Coffee Break | SFCCC Lobby/Corridor |
| | 3:30 PM – 5:30 PM | Parallel Technical Session VI | Breakout rooms |
| | 5:30 PM – 6:30 PM | NAMS Business Meeting | Nambe (SFCCC upstairs) |
| | 6:30 PM – 7:30 PM | Happy Hour Closing and Award | La Fonda Hotel Ballroom |
| | 7:30 PM – 11:00 PM | Banquet Dinner | La Fonda Hotel Ballroom |
| Wednesday May 15 | 7:00 AM – 5:00 PM | Registration | |
| | 8:00 AM – 8:30 AM | Coffee Break | SFCCC Lobby/Corridor |
| | 8:30 AM – 10:50 AM | Parallel Technical Sessions VII | Breakout rooms |
| | 11:00 AM – 12:00 PM | Plenary Lecture III | Sweeney E-F |
| | 12:00 PM – 1:00 PM | Lunch Break | - |
| | 1:00 PM – 3:00 PM | Parallel Technical Sessions VIII | Breakout rooms |

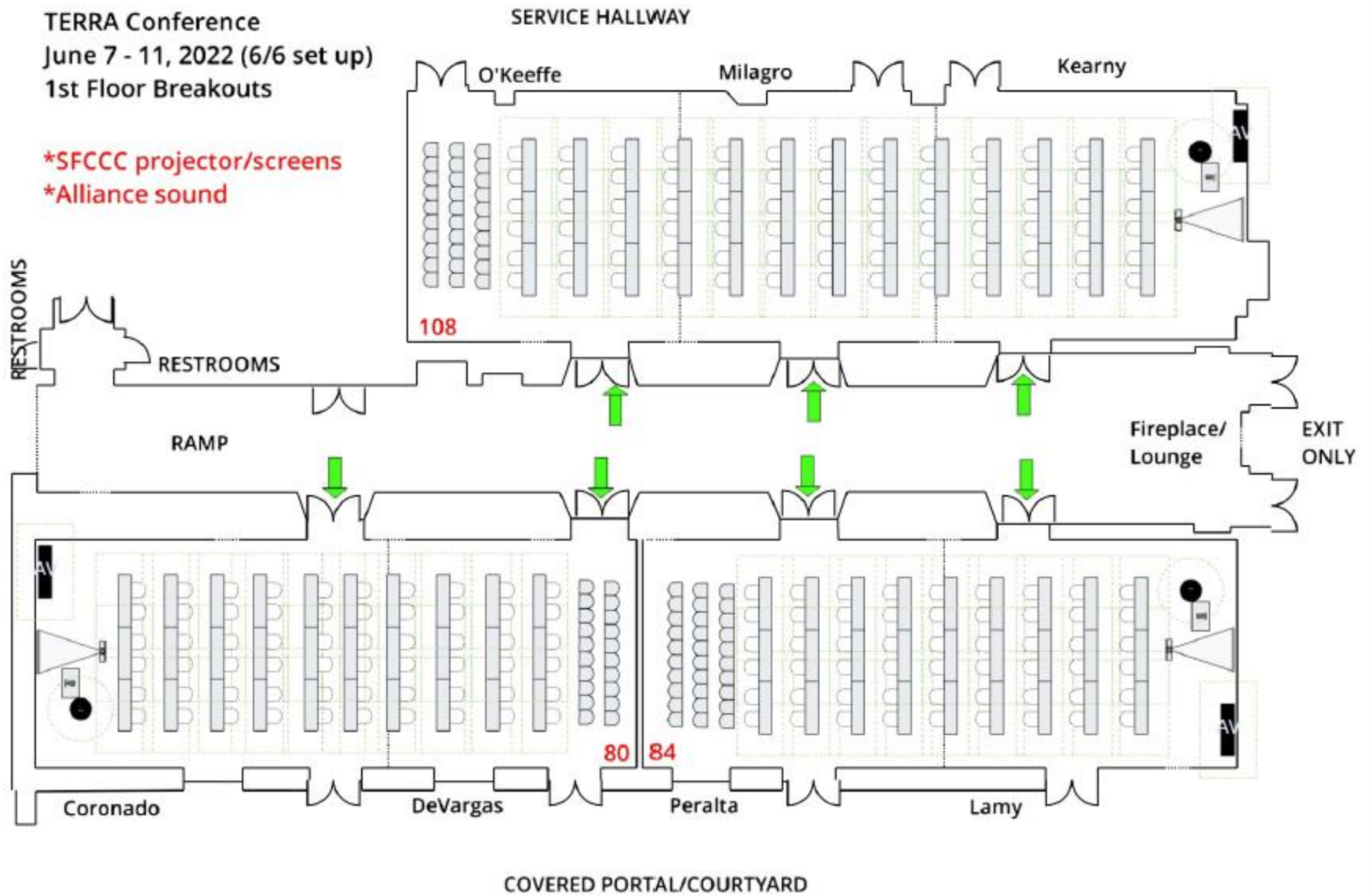
*MT – US Mountain time, UK +7 hrs, Germany +8 hrs, Saudi Arabia (in Riyadh) +9 hrs, India (IST) +11.5 hrs, Singapore +14 hrs, China +14 hrs, South Korea +15 hrs, Japan +15 hrs.

| Date | Time (MST) | Event | Room |
|---|---|--|-------------------|
| Monday May 13 | 8:30 AM – 10:50 AM (Parallel oral sessions) | Electrochemical Separations | Coronado/DeVargas |
| | | Advanced Membranes for gas and vapor separation I | Milagro/Kearny |
| | | Functional membr. Fabrication and environmental sustainability | O'Keefe |
| | | Process intensification and decarbonization | Peralta/Lamy |
| | 11:00 AM – 12:00 PM | Plenary Lecture I | Sweeney E-F |
| | 12:00 PM – 1:45 PM | Lunch with Legends | Hilton S.Fe |
| | 1:45 PM – 3:45 PM (Parallel Oral Sessions) | Water treatment and desalination processes | Coronado/DeVargas |
| Adv. Membr. For gas and vapor separation II | | Milagro/Kearny | |
| Hollow fiber membranes | | O'Keefe | |
| Liquid extraction and contaminant separation | | Peralta/Lamy | |
| 3:45 PM – 4:00 PM | | Coffee Breakexc | SFCCC Lobby |
| 4:00 PM – 6:00 PM (Parallel oral sessions) | | Desalination and osmotic processes I | Coronado/DeVargas |
| | Novel synthetic strategies for gas separation | Milagro/Kearny | |
| | Tailored membrane formation | O'Keefe | |
| | Lithium separation | Peralta/Lamy | |
| 7:30 PM – 10:00 PM | Poster Session | Sweeney A-C | |
| Tuesday May 14 | 8:30 AM – 10:50 AM (Parallel oral sessions) | Membranes for carbon capture I | Milagro/Kearny |
| | | Membrane fouling | Coronado/DeVargas |
| | | Organic molecule and solute selective separations | Peralta/Lamy |
| | | Membrane distillation and pervaporation | O'Keefe |
| | 11:00 AM – 12:00 PM | Plenary Lecture II | Sweeney E-F |
| | 12:00 PM – 1:00 PM | Lunch Break | |
| | 1:00 PM – 3:00 PM (Parallel Oral Sessions) | Desalination and osmotic processes II | Coronado/DeVargas |
| | | NAMS awards session | O'Keefe |
| | | Advanced understanding and synthetic efforts in solute selective sep. | Peralta/Lamy |
| | Biochemical applications | Milagro/Kearny | |
| 3:00 PM – 3:30 PM | Coffee Break | SFCCC Lobby | |
| 3:30 PM – 5:30 PM (Parallel Oral Sessions) | Desalination and osmotic processes III | Coronado/DeVargas | |
| | NAMS keynote session I | Peralta/Lamy | |
| | 2D membrane materials and processes | Milagro/Kearny | |
| | Viral and antibody filtration | O'Keefe | |
| 5:30 PM – 6:30 PM | NAMS business meeting | Nambe | |
| 6:30 PM – 7:30 PM | Happy Hour + Closing and awards | La Fonda Hotel Ballroom | |
| 7:30 PM – 11:00 PM | Banquet dinner | La Fonda Hotel Ballr | |
| Wednesday May 15 | 8:30 AM – 10:50 AM (Parallel oral sessions) | Membranes for carbon capture II | Milagro/Kearny |
| | | Specific ion separations | Peralta/Lamy |
| | | Scaling up: bridging the gap between labs and industry | O'Keefe |
| | | Contaminants removal from water I | Coronado/DeVargas |
| 11:00 AM – 12:00 PM | Plenary Lecture III | Sweeney E-F | |
| 12:00 PM – 1:00 PM | Lunch Break | | |
| 1:00 PM – 3:00 PM (Parallel Oral Sessions) | Mixed matrix and composite membr. for gas separation | Milagro/Kearny | |
| | Solute selective separation modeling | O'Keefe | |
| | NAMS keynote session II | Peralta/Lamy | |
| | Contaminants removal from water II | Coronado/DeVargas | |



TERRA Conference
June 7 - 11, 2022 (6/6 set up)
1st Floor Breakouts

- *SFCCC projector/screens
- *Alliance sound



Monday Morning

| Parallel Sessions | Room: Coronado/DeVargas Electrochemical separations | Room: Milagro-Kearny Advanced membranes for gas and vapor separation I | Room: O’Keeffe Functional membrane fabrication and environmental sustainability | Room: Peralta-Lamy Process intensification and decarbonization |
|-------------------|---|---|---|---|
| Chairs | Caleb Funk caleb.funk@dupont.com Abhishek Narayan Mondal abhishek.mondal@donaldson.com | Nitesh Bhuwania nbhuwania@chevron.com Chen Zhang czhang71@umd.edu Simona Liguori sliguori@clarkson.edu | Margaret Lee margaret_lee@pall.com Priyesh Wagh priyesh.wagh@gmail.com | Albert Kim albertsk@hawaii.edu Syed Islam islamsz@oml.gov |
| 8:30 AM | Oral 1 - Understanding Polyfluoroalkyl Substance Selectivity in Anion Exchange Membrane Systems Sam Thompson (Univ. of Kentucky) | Oral 8 - Enhanced H ₂ transport in polybenzimidazole by blending with a highly permeable polyimide Narjes Esmaili (Univ. of Buffalo) | Oral 15 - Scaled Manufacturing of Supported Loose-NF Membranes with Eco-Friendly Solvents for Water Treatment Applications David Lu (Univ. of Kentucky) | Oral 22 - Zeolite Membrane Reactor for CO ₂ Hydrogenation to Methanol: A Simulation Study on Comparison of Water and Methanol Selective Membranes Jerry Lin (ASU) |
| 8:50 AM | Oral 2 – Nanofiltration membranes with thermo- and pH-responsive behavior from lyotropic liquid crystal templating Reza Foudazi (University of Oklahoma) | Oral 9- Machine learning enables interpretable discovery of innovative polymers for gas separation membranes Ying Li (Univ. of Wisconsin) | Oral 16 - Sustainable additive manufacturing of polysulfone membranes for liquid separations Brian Leonard (West Virginia University) | Oral 23 - Catalytic Membrane Reactors for combined separation and contaminant degradation Charles F. De Lennoy (McMaster Univ.) |
| 9:10 AM | Oral 3 - Performance of Commercial Bipolar Membranes for Ocean Alkalinity Enhancement Application Bassel Abdelkader (McMaster University) | Oral 10 - Computer vision-based measurement of pure- and mixed-gas swelling in polymer membranes exhibiting configurational free volume Will Box (Univ. of Oklahoma) | Oral 17 - An alternative application of 2D carbon-based membranes for efficient air-separation and H ₂ purification from gas mixtures Dániel Gardenő (University of Chemistry and Technology in Prague) | Oral 24- Computational Fluid Dynamics and Systems Engineering to minimize membrane-based carbon capture costs Alejandro Pedrozo (CMU) |
| 9:30 AM | Oral 4 – Charge-patterned nanofiltration membranes with immobilized polystyrene sulfonate particles and polyethylene imine Ali Benhboudi (PSU) | Oral 11 - Hydrogen- and acetylene-stable silver ion facilitated transport membranes: the effect of salt content on fractional free volume and gas permeability Matt Davenport (UT Austin) | Oral 18 - Understanding the mechanism of additive-assisted isoporous membrane formation through X-ray scattering Noah Wamble (UT Austin) | Oral 25 - Innovating Membranes for Carbon Capture: From Material Synthesis to Process Prototype Yang Han (OSU) |
| 9:50 AM | Oral 5 - Treating Acidic Metal Wastewaters with Ceramic Ion Exchange Membranes Emily Rabe (Membrion) | Oral 12 - Exploring the separation efficiency of ultra-selective 3D CANAL hydrocarbon polymeric membranes for hydrogen-based separations after long-term aging Jing Ying Yeo (MIT) | Oral 19 - Polymer membrane morphologies as explored by laser scanning confocal microscopy (LSCM) during thermally induced phase separation (TIPS) Charaf Eddine Merzougui (DRF) | Oral 26 - Advancements of Responsive and Catalytic Membrane Reactor for Water and Halo-Organics Remediation Dibakar Bhattacharyya (Univ. of Kentucky) |
| 10:10 AM | Oral 6 - Synthesis and Testing of Electrochemical Activity in a Polyether Sulfone-Based Ultrafiltration Membrane for Contaminant Removal Utkarsh Misra (IITB, India) | Oral 13 - Evaluation of air addition into methane dry reforming reaction in Pd/YSZ membrane reactor for syngas production Omid Jazani (Clarkson) | Oral 20- Elucidating the Structure-Property-Performance Relationship of Incorporating Waste Polymethyl Methacrylate in Polyvinylidene Fluoride Membrane Fabrication Joseph Danner (Univ. of Alabama) | Oral 27 - Intensified propane dehydrogenation in carbon molecular sieve hollow fiber membrane reactors Chen Zhang (Univ. of Maryland) |
| 10:30 AM | Oral 7 - Electroconductive Filters and Membranes for Desalination and Wastewater Treatment Swatantra Pratap Singh (IITB, India) | Oral 14-Carbon Membranes derived from UV-irradiated Polyimides with Enhanced Separation Performance and Aging Resistance Jaesung Park (KRICT) | Oral 21- Enhanced bipolar membrane water disassociation reaction with layer-by-layer assembled clay composite junctions Nadia Boulif (TUE) | Oral 28- Mathematical Modeling & Optimization of a Water-Gas Shift Membrane Reactor for Low-Cost H ₂ Production with CO ₂ Capture Hani Hawa (Precision Combustion) |

Monday Afternoon

| Parallel Sessions | Room: Coronado/DeVargas Water treatment and desalination processes | Room: Milagro-Kearny Advanced materials for gas and vapor separation II | Room: O’Keeffe Hollow fiber membranes | Room: Peralta-Lamy Liquid extraction and contaminant separation |
|-------------------|---|---|--|--|
| Chairs | <p style="text-align: center;">Ngai Yin Yip n.y.yip@columbia.edu Yian Chen yian.chen@nrel.gov</p> | <p style="text-align: center;">Nitesh Bhuwania nbhuwania@chevron.com Chen Zhang czhang71@umd.edu Simona Liguori sliguori@clarkson.edu</p> | <p style="text-align: center;">Stephen DeWitt stephen.dewitt@arkema.com Jianjia Yu jianjia.yu@nmt.edu</p> | <p style="text-align: center;">Yoram Cohen profyc@gmail.com Isabel Escobar Isabel.escobar@uky.edu</p> |
| 1:45 PM | <p>Oral 29 - Revisiting the value of high-flux seawater reverse osmosis membranes with variable-flow energy recovery Sangsuk Lee (UCLA)</p> | <p>Oral 35- What Membranes Do We Need for Industrial Propylene/Propane Separations? Yang Liu (MTR)</p> | <p>Oral 41 - Experimental and theoretical evaluation of feed flow collar design for shell fed hollow fiber membrane modules Glenn Lipscomb (UToledo)</p> | <p>Oral 47- XpressKleen 1 nm expanded PTFE membrane for harsh chemical filtration Zhefei Li (PALL)</p> |
| 2:05 PM | <p>Oral 30 - Performance and Environmental Evaluation of Biochar-based Membranes Synthesized from Various Petroleum- and Bio-derived Solvents Abelline Fionah (Univ. of Kentucky)</p> | <p>Oral 36 - Scale-up of perfluoro(butenyl vinyl ether) (PBVE) and perfluoro(2,2-dimethyl-1,3-dioxole) (PDD) copolymers for the separation of R-410A Abby Harders (Kansas U)</p> | <p>Oral 42 - Development of a modular device for evaluating hollow fiber membrane permeance Timothy Warner (McMaster Univ.)</p> | <p>Oral 48 - 2,3-Butanediol Separations using Membrane Assisted Liquid-Liquid Extraction Shailesh Singh Dangwal (ORNL)</p> |
| 2:25 PM | <p>Oral 31 - High Recovery Desalination of High Mineral Scaling Source Water via Integrated RO-NF Concentrator, Concentrate Desupersaturation and Second Stage RO-NF Desalting Yoram Cohen (UCLA)</p> | <p>Oral 37 - Selective photonic gasification of strained oxygen clusters on graphene for overcoming the trade-off between pore size and density Luc Bondaz (EPFL)</p> | <p>Oral 43 - Physical Aging of Defect-Free Asymmetric Functionalized PIM Hollow Fiber Membranes Philippe Jean Baptiste (MIT)</p> | <p>Oral 49 - Continuous membrane demulsification for in situ solvent extraction of carboxylic acid Yian Chen (ORNL)</p> |
| 2:45 PM | <p>Oral 32 - Electrifying membrane distillations: Localized Joule heating of laser-induced graphene membranes Md Hasib Al Mahbub (Texas Tech)</p> | <p>Oral 38 – Pall Filtration is Enabling the Energy Transition Amanda Kite (PALL)</p> | <p>Oral 44 - Improved nanofiltration through inverted membrane structures Tjerk R Watt (UTwente)</p> | <p>Oral 50 - Membrane nanoprecipitation enables the continuous production of uniform nanoparticles at higher concentrations of the polymer solution than with a batch system Lidietta Giorno (ITM-CNR)</p> |
| 3:05 PM | <p>Oral 33 - The analytic solution of interfacial concentration with observed rejection ratio during dead-end membrane filtration Albert Kim (Hawaii Univ.)</p> | <p>Oral 39 - A New Microcapillary Film Carbon Molecular Sieve Membrane Jay Liu (DOW)</p> | <p>Oral 45- Tannic acid-coated hollow fiber for dehydration: From material to membrane and module Lakshmeesha Upadhyaya (KAUST)</p> | <p>Oral 51 - High temperature ceramic membrane separations for carbon circularity: From lube oil purification to chemical recycling of plastics Pieter Vandezande (VITO)</p> |
| 3:25 PM | <p>Oral 34- High-Throughput Experimentation for High-Pressure Reverse-Osmosis Membranes Hongchen Wang (Univ. of Toronto)</p> | <p>Oral 40 - Adjustable microstructure design of a polyphthalonitrile precursor and the derived novel carbon molecular sieve membrane for gas separation Chun Po Hu (NTU)</p> | <p>Oral 46 - Developing a Thin Film Composite Facilitated Transport Hollow Fiber Membrane for Post Combustion CO2 capture Oguz Karvan (EMI Twente BV)</p> | <p>Oral 52 – Targeted Separation Scheme of Polyurethane Depolymerization Products Taysha Talenar (ASU)</p> |

Monday Afternoon

| Parallel Sessions | Room: Coronado/DeVargas Desalination and osmotic processes I | Room: Milagro-Kearny Novel synthetic strategies for gas separation | Room: O’Keeffe Tailored membrane formation | Room: Peralta-Lamy Lithium separation |
|-------------------|---|---|--|--|
| Chairs | <p>Jovan Kamcev jkamcev@umich.edu Jonathan Maisonneuve maisonneuve@oakland.edu Muskan Sonker muskan.s@gatech.edu</p> | <p>Victor Kusuma victor.kusuma@netl.doe.gov Ali Rowanaghi ali.rowanaghi@netl.doe.gov Jaason Williams p.j.williams@shell.com</p> | <p>Lakshmeesha Upadhyaya lakshmeesha.upadhyaya@kaust.edu.sa Luis Francisco Villalobos lf.villalobos@usc.edu Varun Vakharia Varun_vakharia@pall.com</p> | <p>Ngoc Bui ngocbui21@ou.edu Harekrushna Behera harekrushna.behera@austin.utexas.edu</p> |
| 4:00 PM | <p>Oral 52 - Compaction of high-pressure water treatment membranes: real-time quantification and support layer contribution Weijian Ding (USC)</p> | <p>Oral 58- Permeance Prize: Utilizing Molecular Design to Integrate Ionic Liquids within High Performance Polymer Gas Separation Membranes: Unprecedented Opportunities for Control over Material Properties and Performance Jason Bara (Univ. of Alabama)</p> | <p>Oral 64 - Sulfonated Polyamide Thin Film Composite Membranes for Electrodialysis Deniz Ipekci (UCONN)</p> | <p>Oral 70- Co-Ion Specific Effect on Li Salt Sorption in Cation Exchange Membranes Rachel Huang (UT Austin)</p> |
| 4:20 PM | <p>Oral 53 - Membrane heterogeneity alters our interpretation of effective energy barriers to transport Nathanael S Schwindt (UC Boulder)</p> | <p>Oral 59 - Few-Cycle Atomic Layer Deposition to Nanoengineer Polymeric Materials for Efficient Gas Separations Leiqing Hu (Univ. at Buffalo)</p> | <p>Oral 65 - Compaction-resistant Thin Film Crosslinked Composite (TFX) Ultra-high Pressure Reverse Osmosis Jishan Wu (UCLA)</p> | <p>Oral 71 - Mixed counter-ion sorption in ion-exchange membranes: understanding the role of membrane water content Harsh Patel (UMich)</p> |
| 4:40 PM | <p>Oral 54 - Evidence for solution-diffusion in pressure-induced transport of solvent through dense polymer membranes Kevin Reimund (UT Austin)</p> | <p>Oral 60 - Amine Modified PIM-1 for Highly Selective Olefin/Paraffin Separation Bo Wei Cynthia Chen (Univ. Of Notre Dame)</p> | <p>Oral 66 - CFD modeling of high-flux plate-and-frame membrane modules for industrial carbon capture Cheick Dosso (CMU)</p> | <p>Oral 72 - Preparation of lithium-ion selective mixed matrix membrane for lithium recovery from real brine solution via diffusion dialysis process Sandip Pal (UCLA)</p> |
| 5:00 PM | <p>Oral 55 - Is the Role of Concentration Polarization Overstressed in Membrane Filtration Processes? Lianfa Song (Texas Teach)</p> | <p>Oral 61 – New class of imidazolium-based ionenes for gas separation membranes Sudhir Ravula (Univ. of Alabama)</p> | <p>Oral 67 - Free Energy Surface Landscape of Interfacial Polymerization for Polyamide Membrane Formation Xianghong Qian (Univ. of Arkansas)</p> | <p>Oral 73 - Mixed binary alkali halide salt transport in PEGDA Aubrey Quigley (UT Austin)</p> |
| 5:20 PM | <p>Oral 56 - Modeling and experimental analysis of pH influence in boron separation in reverse osmosis Fernan Martinez (KAUST)</p> | <p>Oral 62 - Tightening ultramicropores of structurally engineered carbon molecular sieve membranes for precise gas separation Zhongyun Liu (GaTech)</p> | <p>Oral 68- The influence of additives on polystyrene membranes created by temperature-induced phase separation Sulaiman Dhameri (Univ. of Kentucky)</p> | <p>Oral 74 - Tuning ionic selectivity in nanoporous graphene membranes using atomic layer deposition and polyelectrolyte assembly Simar K Mattewal (MIT)</p> |
| 5:40 PM | <p>Oral 57 - Flexible RO-NF System Configuration Operation in the Mode of Partial Concentrate Recycle for Inland Water Desalination Yoram Cohen (UCLA)</p> | <p>Oral 63 – The Effect of Crosslinker Concentration on Competitive Release Kinetics and Physical Characteristics of Thermo-Responsive, Lignin-Based Soft Composites Missoury Wolff (Clemson)</p> | <p>Oral 69 - The dynamics of Interfacial Polymerization: insights on film stability during formation Guy Z Ramon (Technion)</p> | <p>Oral 75 - Lithium Selective Artificial Ion Channels for Lithium Separation Harekrushna Behera (UT Austin)</p> |

Tuesday Morning

| Parallel Sessions | Room: Milagro-Kearny Membranes for Carbon Capture I | Room: Coronado/DeVargas Membrane fouling | Room: Peralta-Lamy Organic molecules and solute selective separations | Room: O'Keeffe Membrane distillation and pervaporation |
|-------------------|---|---|--|--|
| Chairs | David Hopkinson david.hopkinson@netl.doe.gov Joshua D. Moon Joshua.moon@ufl.edu Zhongyun Liu zhongyunliu@gatech.edu | Nima Shahkaramipour nima.shahkaramipour@pentair.com Manish Kumar manish.kumar@utexas.edu | Geoff Geise geise@virginia.edu Ryan Lively ryan.lively@chbe.gatech.edu | Amos Taiswa ataiswa@mtech.edu Allyson McGaughey allysonmcgaughey@unm.edu Lucy-Mar Camacho lucy.camacho@tamuk.edu |
| 8:30 AM | Oral 76- Leveraging competitive sorption in microporous polymer membranes to enhance CO ₂ - and H ₂ S-specific gas separation performance Pablo Dean (MIT) | Oral 83 - Optimizing electrospun composite-fiber patterns on nanofiltration membranes for improved biofouling resistance Amos Taiswa (Mich Tech) | Oral 90 - Organic Solvent Reverse Osmosis Separations of Hydrocarbon-Alcohol Mixtures using Matrimid Membranes Bennett Marshall (Exxon Mobil) | Oral 97 - Long-term Operation of Pilot-scale Membrane Bioreactor – Membrane Distillation for Potable Water Reuse Luke Presson (Univ. of Arizona) |
| 8:50 AM | Oral 77 - Amine Functionalized Supported Ionic Liquid Membranes (SILMs) for CO ₂ /N ₂ Separation Antoine Chamoun-Farah (UT Austin) | Oral 84 - Effect of Pattern Size Relative to Oil Droplet Size on Oil Fouling in Nanofiltration Lauren Ward (Univ. of Alabama) | Oral 91 - Fluorine-Rich Poly(Arylene Amine) Membranes for the Separation of Sustainable Fuels and Hydrocarbons Yi Ren (Gatech) | Oral 98 - Combined chlorine dioxide–membrane distillation for the treatment of produced water Mahdi Malmali (Texas Tech) |
| 9:10 AM | Oral 78 - Effect of Viscosity of Deep Eutectic Solvent on CO ₂ Capture Performance in an Energy Efficient Membrane Contactor Based Process Syed Islam (ORNL) | Oral 85 - The effect of alternating electric fields on membrane colloidal fouling Elina Yachnin (Technion) | Oral 92 - Organic solvent nanofiltration and reverse osmosis performance of carboxylated PIM-1 in neat and inter-crosslinked mixed membrane configurations Lucas Condes (Univ. of Oklahoma) | Oral 99 - Desalination Pervaporation Performance of Zwitterion-Modified Poly(arylene ether sulfone) Copolymer Dense Membranes Husain Mithaiwala (ASU) |
| 9:30 AM | Oral 79 - Incorporating phenyl groups in polyorganosilica membranes to improve hydrothermal Stability for H ₂ /CO ₂ Separation Vinh Bui (Univ. at Buffalo) | Oral 86 - Optimization of Fouling Resistant Polyelectrolyte Coacervate Membranes via Aqueous Phase Separation Shao-Hsiang Hung (UMASS) | Oral 93 - Volatile fatty acid selectivity during electrodialysis: role of solution composition on volatile fatty acid partitioning and mobility in an anion exchange membrane Holly M Haflich (UNC) | Oral 100 - Advances in the Characterization and Digital Reconstruction of 2-D and 3-D Pore Structure Jay Werber (Univ. of Toronto) |
| 9:50 AM | Oral 80 - Effect of Film Thickness and Temperature on the CO ₂ Sorption in Poly(ethyleneimine) Christopher Stafford (NIST) | Oral 87- Antimicrobial nanocellulose-modified microfiltration membranes for pathogen removal and fouling control. Ji Qin (UMN) | Oral 94 - Membrane-based Ultrapurification of Isopropyl Alcohol Kamalesh Sirkar (NJIT) | Oral 101 - Fast and selective desalination using pressure-driven distillation with nanoscale air gaps Anthony Straub (UC Boulder) |
| 10:10 AM | Oral 81 - 100% Carbon Capture from a Carbon Dioxide-Argon Flue Gas using Polaris Membrane Pingjiao Hao (MTR) | Oral 88- Mechanism of crystallization and membrane scaling mitigation via carbon nanotube-containing spacer in membrane process Seongeom Jeong (Univ. of Pusan) | Oral 95 - Co-Transport of Alcohols and Carboxylate Ions in Sulfonated Ion Exchange Membranes with PEGPEA as a Blocking Group Pravin Parasakthi Aravindhan (Auburn) | Oral 102 - Polymers of intrinsic microporosity-based membranes: Promising materials for membrane distillation Mahmoud Abdulhamid (KFUPM) |
| 10:30 PM | Oral 82 - Thin Film Composite Membranes from Polymers of Intrinsic Microporosity for CO ₂ Separation Sunshine Iguodala (Imperial College) | Oral 89 - Atomic layer processes for membrane fabrication and surface modification Tamar Segal-Peretz (Technion) | Oral 96 - Fundamental investigation about the effect of chemical structure of foulant on fouling behavior of polyamide membrane in organic solution Atsushi Matsuoka (Kobe Univ.) | |

Tuesday Afternoon

| Parallel Sessions | Room: Coronado/DeVargas Desalination and osmotic processes II | Room: O'Keeffe NAMS Awards | Room: Peralta-Lamy Advanced understanding and synthetic efforts in solute selective separations | Room: Milagro-Kearny Biochemical applications |
|-------------------|---|---|--|--|
| Chairs | <p>Jovan Kamcev jkamcev@umich.edu Jonathan Maisonneuve maisonneuve@oakland.edu Muskan Sonker muskan.s@gatech.edu</p> | <p>Xiaobo Dong xiaobo.dong@cytiva.com Michele Galizia mgalizia@ou.edu</p> | <p>DB Bhattacharyya db@uky.edu Shashank Kamdar Skamdar@dow.com</p> | <p>Hee Jeung Oh hjoh@psu.edu Cristiana Boi cboi@ncsu.edu</p> |
| 1:00 PM | <p>Oral 103 - Biomimetic membranes incorporating artificial water channels for high-performance water reverse osmosis desalination Mihail Barboiu (Univ. of Montpellier)</p> | <p>Oral 109 - How click chemistry can enable design and investigation of facilitated CO2 separation membranes Joshua D. Moon (UFlorida)</p> | <p>Oral 115 - Microwave dielectric relaxation spectroscopy: A technique to inform ion transport in hydrated polymer membranes Geoffrey Geise (UVA)</p> | <p>Oral 121- Membrane Optimization and Filtration Strategies Using Nanoparticles for Enhanced Efficiency in Gene Therapy Applications Mara Leach (Univ. of Kentucky)</p> |
| 1:20 PM | <p>Oral 104 - Upcycled PVC Support Layer from Waste PVC Pipe for Thin Film Composite Nanofiltration Membranes Atta Ur Razzaq (Univ. of Alabama)</p> | <p>Oral 110 - Rational design, synthesis, and characterization of facilitated transport membranes exhibiting enhanced permeability, selectivity, and stability Matthew Webb (Univ. of Oklahoma)</p> | <p>Oral 116 - Insights into methods of determining selectivity of porous ultrafiltration membranes Suzana Ivandic (UT Austin)</p> | <p>Oral 122 - Combined Hydrocyclone-Tangential Flow Microfiltration for Bioreactor Harvesting Amir Hossein Mostafavi (Univ. of Arkansas)</p> |
| 1:40 PM | <p>Oral 105 - Effect of different manufacturing methods on polyamide reverse-osmosis membranes for desalination Ying Li (Univ. of Wisconsin)</p> | <p>Oral 111 - Surface coatings for fouling-resistant membrane distillation Kecheng Guan (Kobe Univ.)</p> | <p>Oral 117 - Mixing and Matching: Amphiphilic Polyampholytes and Polyelectrolyte Complexes that Mimic Zwitterionic Behavior for Membrane Applications Ayse Asatekin (Tufts)</p> | <p>Oral 123 - Charged biosponge polymers for capturing toxic chemotherapy drugs to minimize chemotherapy Hee Jeung Oh (Pen State University)</p> |
| 2:00 PM | <p>Oral 106 - Low field solid-state NMR methods for quantifying composition and crosslinking in polyamide-based thin film composite reverse osmosis membranes Ryan Nieuwendaal (NIST)</p> | <p>Oral 112 - Ultrahigh Charge Density Ion-Exchange Membranes David Kitto (UMich)</p> | <p>Oral 118 - Highly rigid and microporous polyimine membranes by interfacial polymerization for efficient hydrocarbon separations Taehoon Lee (MIT)</p> | <p>Oral 124 - Mechanisms of Flux Decline in Crossflow Ultrafiltration of Whey Protein: Comparing Different Models to Experimental Data Burcu Ozdemir (UCLA)</p> |
| 2:20 PM | <p>Oral 107 - Direct Membrane Osmometry for Rapid Osmotic Pressure Measurements at High Molality Mi Zhang (UCONN)</p> | <p>Oral 113 -Tuning the selectivity of fouling resistant zwitterionic copolymer membranes Sam Lounder (ZwitterCo)</p> | <p>Oral 119 - Real-Time, Non-Destructive Monitoring of Supported Liquid Membranes for Biochemical Recovery Using Electrochemical Impedance Spectroscopy Jongho Lee (UBC)</p> | <p>Oral 125 - Protocol for purification of circular RNA from a self-splicing reaction by ultrafiltration Scott Husson (Clemson)</p> |
| 2:40 PM | <p>Oral 108 - Maximizing the Wetting Resistance of Fluorine-free Omniphobic Membranes for Hypersaline Wastewater Desalination Yinchuan Yang (UBC)</p> | <p>Oral 114 - Upcycling wastewater nitrate into ammonia fertilizer via electrified membrane Jianan Gao (NJIT)</p> | <p>Oral 120 - Surface Modification of Nanofiltration Membranes for Selective Nutrient Recovery Km Prottoy S. Pias (WVU)</p> | <p>Oral 126 - Patterned anion exchange membrane for improved performance of glucose fuel cells Thomas A Dos Santos (Cuanschutz)</p> |

Tuesday Afternoon

| Parallel Sessions | Room: Coronado/DeVargas Desalination and osmotic processes III | Room: Peralta-Lamy NAMS Keynote I <u>TALKS in this session have a 30 min slot</u> | Room: Milagro-Kearny 2D membrane materials and processes | Room: O'Keeffe Viral and antibody filtration |
|-------------------|---|--|---|--|
| Chairs | <p>Jovan Kamcev jkamcev@umich.edu Jonathan Maisonneuve maisonneuve@oakland.edu Muskan Sonker muskan.s@gatech.edu</p> | <p>Mahdi Malmali mahdi.malmali@ttu.edu Grigorios Panagakos gpanagak@andrew.cmu.edu Shouliang Yi shouliang.yi@hotmail.com</p> | <p>Reza Foudazi rfoudazi@ou.edu Ying Labreche ying_labreche@pall.com</p> | <p>Hee Jeung Oh hjoh@psu.edu Cristiana Boi cboi@ncsu.edu</p> |
| 3:30 PM | <p>Oral 127 - Permeance Prize: Thin Film Composite Membranes are not Just for Reverse Osmosis Anymore: Recoupling Materials Discovery with Thin-Film Manufacturability Jeff McCutcheon (UCONN)</p> | <p>3:30 - 4:00 PM Oral 133 - A Tale of Two Carbon-Capture Properties: Bulk and Thin Films of Mixed Matrix Materials Haiqing Lin (Univ. at Buffalo)</p> | <p>Oral 137 - Strengthening Isoporous Polymer Membranes through Chain Entanglements Adam Mann (UT Austin)</p> | <p>Oral 142 - The application of tangential flow filtration for the continuous processing of monoclonal antibodies: process optimization based on particle morphology Ali Behboudi (Penn State University)</p> |
| 3:50 PM | <p>Oral 128 - Evaluation of Commercial Nanofiltration and Reverse Osmosis Membrane Filtration to Remove PFASs: Effects of Transmembrane Pressures, Water Matrices such as Surfactants, and Ion Valency and Temperatures Guangyu Zhu (NJIT)</p> | <p>4:00 - 4:30 PM Oral 134 - Osmoses: Developing Gas Separation Membranes to Enable Sustainable Energy Solutions Holden Lai (OSMOSES)</p> | <p>Oral 138 - Highly Selective Thin B-Oriented MFI Zeolite Membranes on Scalable Modified Stainless-Steel Supports Jerry Lin (ASU)</p> | <p>Oral 143 - A more sustainable all-membrane process for the purification of monoclonal antibodies Cristiana Boi (Univ. of Bologna)</p> |
| 4:10 PM | <p>Oral 129 - A Concise Analytical Model for the System Performance of an RO Desalination Process Lianfa Song (Texas Tech)</p> | <p>4:30 - 5:00 PM Oral 135 - Deep Flue Gas Decarbonization with Novel Membrane Process Designs Richard Baker (MTR)</p> | <p>Oral 139 - Rational Design of Mixed-Matrix Membranes for Energy-Intensive Separation: Impact of MOF's Crystal Morphology and Orientation Shuvo Jit Datta (KAUST)</p> | <p>Oral 144 - IgG-BSA Separation and Purification by Internally Staged Ultrafiltration Lixin Feng (NJIT)</p> |
| 4:30 PM | <p>Oral 130 - Novel artificial water channel membranes with improved molecular separation properties in reverse osmosis Maria Di Vincenzo (KAUST)</p> | <p>5:00 - 5:30 PM Oral 136 - Polymer membranes stability under sour-humid natural gas mixtures and their role towards decarbonization Nitesh Bhuwania (Chevron)</p> | <p>Oral 140 - Ion-sieving membranes based on Polymers of Intrinsic Microporosity for aqueous organic redox flow batteries Chunchun Ye (Univ. of Edinburgh)</p> | <p>Oral 145 - Effect of protein on the location of virus entrapment during virus filtration Ranil Wickramasinghe (Univ. of Arkansas)</p> |
| 4:50 PM | <p>Oral 131 - Regulating interfacial polymerization via multi-functional calcium carbonate based interlayer for highly permselective nanofiltration membrane Mengyang Hu (Kobe University)</p> | | <p>Oral 141 - Role of salt additives in tuning the structure of β-cyclodextrin-based membranes Jinting Hu (Kuleuven)</p> | <p>Oral 146 - The Effects of Pressure and Process Interruption on The Location of Virus Particles Captured during Virus Filtration Wenbo Xu (Univ. of Arkansas)</p> |
| 5:10 PM | <p>Oral 132 - Three-dimensional modeling of flow and mass transfer in spacer-filled channels in Reverse osmosis/Nanofiltration processes Santiago Cespedes (KAUST)</p> | | <p>Oral 142 - Revealing Molecular Mechanisms in Hierarchical Nanoporous Carbon via Nuclear Magnetic Resonance Haiyan Mao (Stanford University)</p> | <p>Oral 147 - Fouling Mechanisms During Virus Filtration Yair Kaufman (Teraporetech)</p> |

Wednesday Morning

| Parallel Sessions | Room: Milagro-Kearny Membranes for carbon capture II | Room: Peralta-Lamy Specific Ion separations | Room: O’Keeffe Scaling up: bridging the gap between lab and industry | Room: Coronado/DeVargas Contaminants removal from water I |
|-------------------|---|--|---|---|
| Chairs | David Hopkinson david.hopkinson@netl.doe.gov Joshua D. Moon Joshua.moon@ufl.edu Zhongyun Liu zhongyunliu@gatech.edu | Ngoc Bui ngoctbui21@ou.edu Geoffrey Geise geise@virginia.edu | Oguz Karvan o.karvan@emi-twente.nl Guy Ramon ramong@technion.ac.il | Zora Huang zihanhuang@chevron.com Jian Xu jian.xu@bayer.com Ahmad Shamsabadi arabishamsabadi@gmail.com |
| 8:30 AM | Oral 148 – Large pilot testing of MTR’s membrane-based post-combustion CO2 capture process Witopo Salim (MTR) | Oral 155 - Tailoring Interlayer Spacing and Surface Chemistry of MXene Free-standing Membranes for Selective Separation of Precious Ions from Water Ahmed Al Mayyahi (Univ. of Alabama) | Oral 162 - Electrospayed membranes for CO2-selective gas separations Noah Ferguson (UConn) | Oral 169 - Structure-property relationships in intercalated graphene oxide nanofiltration membranes for enhanced separation of salts and organics from aqueous streams Muskan Sonker (GaTech) |
| 8:50 AM | Oral 149 – Designing membranes using bottlebrush poly(1,3-dioxolane) acetate for CO2 capture Fathy Attia (Univ. at Buffalo) | Oral 156 - A study of NF membrane assessment as pretreatment for lithium recovery from salt-lake brine Juan Zhai (Texas Tech) | Oral 163 - Simplified Synthesis Methods for Membrane-Protein Nanosheets and Biomimetic Membranes Ronald Vogler (UT Austin) | Oral 170 - Removal of Dodecyl Benzenesulfonic Acid by Amine-Modified Membrane Adsorbents Hadi Rouhi (Univ. of Alabama) |
| 9:10 AM | Oral 150 - Random Poly(1,3-dioxolane)-based Terpolymers for CO2 Separations Justin Rosenthal (UT Austin) | Oral 157 - Understanding the dopant effects on the selective transport of cations in conductive polymers Meng Shen (CSU) | Oral 164 - Evaluation of spacer-induced hydrodynamic mixing using particle image velocimetry: Impact on membrane distillation performance Mahdi Malmali (Texas Tech) | Oral 171 - Impact of feedwater composition on the removal of short, ultrashort, and neutral PFAS in nanofiltration Yukai Tomsovic (UC Boulder) |
| 9:30 AM | Oral 151 - Highly Permeable Rubbery Thin Film Composite Membranes for CO2 Capture from Steel Mills Lingxiang Zhu (NETL-DOE) | Oral 158 - Supported liquid membrane contactor for efficient cesium extraction using crown ether ionic liquid Jintao He (Univ. of Arkansas) | Oral 165 - A Fractal Analysis Based Metrology to Quantify Porous Structure of Membranes Riccardo Lovison (UC Boulder) | Oral 172 - Thin Film Nanocomposite Membranes Embedded with ZIF-67 for Desalination and Boron Removal Suer Kurklu Kocaoglu (UT Austin) |
| 9:50 AM | Oral 152 - Investigating PIM-1 and cPIM-1 applications for CCUS under real-world conditions Sean R McIntyre (Surface Measurement Systems) | Oral 159 – Ion-selective Membranes for Critical Materials Separation Ngoc Bui (Univ. of Oklahoma) | Oral 166 - Design of Experiments to Optimize the Polyimide Membrane Structure Margaret Lee (PALL) | Oral 173 - Unlocking the power of a gutter layer: A new frontier in dye-desalination using amine-crosslinked nanoporous graphene oxide (aHGO) platform. Ameya Tandel (Univ. at Buffalo) |
| 10:10 AM | Oral 153 -SAFT-based framework to describe carbon capture with polymeric membranes Alexandros Chremos (NIST) | Oral 160 - Aligned macrocycle pores in ultrathin films for accurate molecular sieving Zhiwei Jiang (QMul) | Oral 167 - Spiral Wound Module Development and Scale-up for Olefin-Paraffin Separations with OptiperM™ Membrane System Jacob Wargo (CoimpactMembrane) | Oral 174 - Experimental and Modeling Results for the Rejection of Ultrashort Per-and Polyfluoroalkyl Substances Aron Griffin (Mines) |
| 10:30 PM | Oral 154 - | Oral 161 - Elucidating selectivity mechanisms of anionic pollutants in nanofiltration membranes Idit Shefer (Technion) | Oral 168 - Effect of polymer molecular weight on the long-term process stability of crosslinked polybenzimidazole (PBI) membranes Adam Oxley (Exactmer) | Oral 175 - Thermally and Chemically Stable Isoporous Block Copolymer Membranes Volkan Filiz (HZG) |

Wednesday Afternoon

| Parallel Sessions | Room: Milagro-Kearny Mixed matrix and composite membranes for gas separation | Room: O’Keeffe Solute selective separations modeling | Room: Peralta-Lamy NAMS Keynote II <i>Talks in this session have a 40 min slot</i> | Room: Coronado/DeVargas Contaminants removal from water II |
|-------------------|--|---|--|---|
| Chairs | Shailesh Singh Dangwal dangwals@ornl.gov Jay (Junqiang) Liu jiu7@dow.com Hani A.E. Hawa hhawa@precision-combustion.com | Meng Shen meshen@fullerton.edu Jianjia Yu jianjia.yu@nmt.edu | Mahdi Malmali mahdi.malmali@ttu.edu Grigorios Panagakos gpanagak@andrew.cmu.edu Shouliang Yi shouliang_yi@hotmail.com | Zora Huang zihanhuang@chevron.com Ahmad Shamsabadi arabishamsabadi@gmail.com |
| 1:00 PM | Oral 176 - UV-Crosslinked Nanocomposite Membranes for Fast and Selective Transport of Small Molecules Joo-Eon Kim (KRICT) | Oral 181 - Ion and water dynamics in the transition from dry to wet conditions in salt-doped PEG Nico Marioni (UT Austin) | 1:00 – 1:30 PM Oral 186 - Dirt and waste as source materials for resource recovery membranes Seth Darling (ANL) | Oral 190- Ionic liquid membrane for selective removal of nanoplastics from water: Investigating the interfacial interactions between polystyrene nanoplastics and dissolved organic matters Ashish Srivastava (Univ. of Alabama) |
| 1:20 PM | Oral 177 - Computational insights from the polymer/MOF interface in Mixed-Matrix Membranes Moein Hajian Zaker Damghan (Texas Tech) | Oral 182 - The influence of Donnan – Manning and dielectric exclusion on ion partitioning in sulfonated polysulfone Sean Bannon (UVA) | 1:30 – 2:00 PM Oral 187 - Pall's Filtration Solution for Separation and Purification in Enabling Decarbonization Varun Vakharia (PALL) | Oral 191 - Catalytic Membranes Based on Reduced Graphene Oxide for Micropollutant Treatment Enabled by Peracetic Acid Erda Deng (Univ. at Buffalo) |
| 1:40 PM | Oral 178 - Leveraging anomalous gas transport in thin-film composite membranes based on polymers of intrinsic microporosity Taehoon Lee (MIT) | Oral 183 - Influence of backbone rigidity and water content on lithium/magnesium selectivity in hydrated polymer membranes Paul Irving (UT Austin) | 2:00 – 2:30 PM Oral 188 - Opportunities and challenges for CO2 separation membranes in decarbonization of the electric power, cement, and steel industries David Hopkinson (NETL-DOE) | Oral 192 - Enhancing Water Evaporation in Membrane Processes Using Hydrogel Coatings Omar Laris (UC Boulder) |
| 2:00 PM | Oral 179 - CO2/C2H2 Transport in SSZ-13 Zeolite Crystals and Membranes, and the Implication on Zeolite Membrane Microstructure Shaowei Yang (csuohio) | Oral 184 - Molecular Dynamics Simulations of Lithium/Magnesium Mixed Solutions in Polyamide Membranes Richard Lueptow (Northwestern Univ.) | 2:30 – 3:00 PM Oral 189 – Carbon capture through membranes: leveraging multiphysics modeling, dimensional analysis and machine learning to scale up and optimize devices and processes for decarbonization Grigorios Panagakos (Carnegie Mellon) | Oral 193 - Designing the fluorinated superfine-activated carbon adsorptive membrane for selective removal of long- and short-chain PFAS Medha Kasula (Univ. of Alabama) |
| 2:20 PM | Oral 180 - Gas Permeation and Separation Characteristics of Microporous Tphz COF Membranes Synthesized by Substrate-Assisted Interfacial Polymerization Jose E Lopez-Cazares (ASU) | Oral 185 - Modeling polymer aging in solvent environments with symbolic regression Matthew Rivera (MIT) | | Oral 194 - Dynamic ammonium retention for nutrient separation from manure digestate Marrit van der Wal (TUE) |
| 2:40 PM | | | | Oral 195 - Advanced functionalized polyether ether ketone/polysulfone membranes with 2D nanomaterials for enhanced water treatment performance Usman Yousaf (Univ. of Kentucky) |

Sweeney E-F, 11:00 am - 12:00 pm, Monday, May 13th

Membranes: Smart Enabler for a Sustainable Gas Economy

Plenary Speaker

Dr. Goetz Baumgarten

Head of the Membranes Innovation Growth Field, Evonik



After studying chemistry at the University of Hannover and earning a doctorate in the treatment of landfill leachate with membrane processes, Dr. Baumgarten began his career at Amafilter Deutschland GmbH in Düsseldorf in 1997 as project manager. From 2001, he was product manager for the Membrane Technology Product Line for the entire Amafilter Group (today: Mahle Industrial Filtration) before moving to Evonik in 2005. At Evonik, Dr. Baumgarten initially headed the Membrane Technology Group in the Process Technology & Engineering Service Unit before assuming the position of Business Manager SEPURAN in July 2010. Since January 2016, he has been responsible for the Membrane Business of Evonik.

Abstract

Backward integration is the key driver of Evonik's innovative strength in membranes. Thanks to the group's many years of expertise in polymer chemistry and backward integration, Evonik adjusts the membrane properties already at the development stage of the base material—the high-performance polymer—to produce particularly selective, productive and robust membranes that can withstand extreme pressures and temperatures in challenging conditions.

SEPURAN[®] membranes are polymer-based hollow-fibre membranes designed to separate gases such as methane (CH₄), nitrogen (N₂), or hydrogen (H₂) from gas mixtures. The advantages of Evonik's membrane technology are more precise separation of the gases, higher productivity and their outstanding robustness and lifetime based on the entirely crosslinked polymer basis. SEPURAN[®] Green membranes and our 3-stage upgrading process shaped the market for biogas upgrading with now more than 1000 references worldwide. SEPURAN[®] N₂ membranes for efficient nitrogen generation are used, for example, to inert aircraft tanks. SEPURAN[®] Noble membranes extract hydrogen transported through natural gas pipelines selectively from the CH₄/H₂ gas mixture at the delivery points. SEPURAN[®] NG as well as PURAMEM[®] membranes enable efficient natural gas processing from gas sources with high CO₂ and/or H₂S concentration. SEPURAN[®] and PURAMEM[®] membranes are being successfully used in more than 2,000 system installations worldwide.

Following the Sustainable Development Goals of the United Nations, Sustainability is the key growth driver and the cornerstone of Evonik's product portfolio, investments and innovation management and thus an integral part of Evonik's strategy. With the innovative gas separation SEPURAN[®], PURAMEM[®] as well as the advanced ion conducting DURAION[®] membrane technologies, the specialty chemicals company makes the transition of today's conventional energy supply to a sustainable gas economy of tomorrow possible.

Sweeney E-F, 11:00 am - 12:00 pm, Tuesday, May 14th**Olefin/Paraffin Separations with Supported Ionic Liquid Membranes****Plenary Speaker****Dr. Joan Brennecke**

Professor, Cockrell Family Chair in Engineering # 16

Department of Chemical Engineering

The University of Texas at Austin, USA



Dr. Joan Brennecke is currently Cockrell Family Chair in Engineering #16 in the McKetta Department of Chemical Engineering at the University of Texas at Austin. She began her academic career at the University of Notre Dame after completing her Ph.D. and M.S. (1989 and 1987) degrees at the University of Illinois at Urbana-Champaign and her B. S. at the University of Texas at Austin (1984). Her research interests are primarily in the development of less environmentally harmful solvents. These include supercritical fluids and ionic liquids. In developing these solvents, Dr. Brennecke's primary interests are in the measurement and modeling of thermodynamics, thermophysical properties, phase behavior and separations. Major awards include the 2001 Ipatieff Prize from the American Chemical Society, the 2006 Professional Progress Award from the American Institute of Chemical Engineers, the J. M. Prausnitz Award at the Eleventh International Conference on Properties and Phase Equilibria in Greece in May, 2007, the 2008 Stieglitz Award from the American Chemical Society, the 2009 E. O. Lawrence Award from the U.S. Department of Energy, and the 2014 E. V. Murphree Award in Industrial and Engineering Chemistry from the American Chemical Society. She served as the Editor-in-Chief of the Journal of Chemical & Engineering Data from 2010-2020. Her 250+ research publications have garnered over 24,000 citations (ISI), with an H-index of 66. She was inducted into the National Academy of Engineering in 2012 and served as the Chair of The National Academies study on A Research Agenda for a New Era in Separations Science, published in 2019.

Abstract

Olefins are a key building block of the petrochemicals industry because they are precursor materials for numerous chemical products and plastics. The current commercial production method is steam cracking of ethane followed by cryogenic distillation of olefin/paraffin mixtures, which involves large energy consumption and greenhouse gas footprint (0.3% of world energy use). Membranes using facilitated transport show promising olefin/paraffin selectivity due to the presence of carriers that specifically complex with olefins. We have developed facilitated transport-based supported ionic liquid membranes (SILMs) with excellent olefin/paraffin selectivity and permeability, using mixtures of silver salts and ionic liquids (ILs). The metal ions dissolved in the IL act as carriers and the IL medium allow the carriers to be mobile in the membrane pores. Previously, facilitated transport-based membranes for olefin/paraffin separation have not been viable because the silver carriers deactivate rapidly in the presence of any H₂, which chemically reduces the silver salts to inactive silver metal. We show that the proper choice of IL results in stable olefin/paraffin separation performance even after extended exposure to H₂. Using Raman spectroscopy, we show how the formation of anion aggregates play a key role in the suppression of silver metal nanoparticle formation. Moreover, we have modified the anodic aluminum oxide (AAO) membrane supports with uniformly sized ~6-8 nm diameter cylindrical silica mesopores to improve the blow-out transmembrane pressure (TMP). This modification increases the feasible TMP for various ionic liquids from ~4 bar to more than ~20 bar. Additionally, the liquid in the membrane at depths where the AAO membrane has not been modified (i.e., greater than a few microns) is expelled from the large pores, reducing the effective thickness of the liquid in the membrane, and increasing permeance. This approach is analogous to asymmetric polymeric membranes. This innovation paves the way for selective olefin/paraffin separation with dramatically reduced energy consumption, that is viable from laboratory to commercial scale operation.

Sweeney E-F, 11:00 am - 12:00 pm, Wednesday, May 15th

Beyond the upper limit? What we are missing & challenges

Plenary Speaker

Dr. Ho Bum Park

Professor and Department Chair, Energy Engineering
Hanyang University, South Korea



Dr. Park is a Professor in the Energy Engineering Department at Hanyang University (HYU) in Seoul in Korea. He received his Ph.D. in Chemical Engineering from HYU in 2002 and worked as a postdoctoral fellow for the University of Texas at Austin (UT Austin) between 2005 and 2008. He joined HYU as an assistant professor in 2008, an associate professor in 2011, and a full professor in 2017. He worked as a visiting scholar at the Department of Chemical Engineering of UT Austin, USA (2014). He has established a state-of-the-art research laboratory for advanced membrane research at HYU since 2008 and a dozen research collaborations and international scholar exchange programs. During his service period at HYU, he has published more than 140 peer-reviewed SCI papers, including some of the highest-impact scientific journals, contributed 8 book chapters, and more than 90 patents. He has served on the Membrane Society of Korea (MSK) Board of Directors for 14 years. He now serves as a Department Chair of Energy Engineering at Hanyang University. He has organized many international and national conferences and also served as an editorial board member of five scientific journals related to chemical engineering and materials science and engineering.

Abstract

Dr. Robeson first presented the correlation between permeability and selectivity of polymeric materials for various gas pairs of interest in 1991. This brought awareness to the separation limits of polymeric materials for gas separation membranes and motivated much research to overcome them. Subsequently, this concept has also been applied to other types of membranes, such as ultrafiltration, ion exchange, and desalination membranes. These membranes are evaluated based on their water permeance, solute rejection, ion conductivity, water uptake, water permeability, and water/ion selectivity. This has led to a renewed focus on developing membrane materials that can surpass their respective separation limits. Currently, the range of materials that can be used as membranes extends beyond polymers. New materials such as carbons, silica, zeolites, metal-organic frameworks, and 2D materials are being investigated as separation membranes. These materials exhibit superior permeability and selectivity properties that surpass the upper limits. It is important to note that all evaluations are objective and clearly marked as such. Although there are numerous excellent membrane materials available, only around ten are currently used in membrane processes. This presentation will address some of the crucial aspects that are lacking in membrane R&D and the challenging work that lies ahead. Based on my previous experience in R&D for gas separation and other membranes, this presentation discusses the current status of various membrane materials that have been and are being developed. It also comments on the many factors that need to be considered before a material becomes a viable separation membrane in the near future.