



NAMS

The North American Membrane Society

2021

Convergence

Connecting Membrane Science with Societal Challenges

30th Annual Meeting Estes Park, Colorado Ridgeline Hotel

Aug 28 – Sep 2, 2021

Short Program Guide



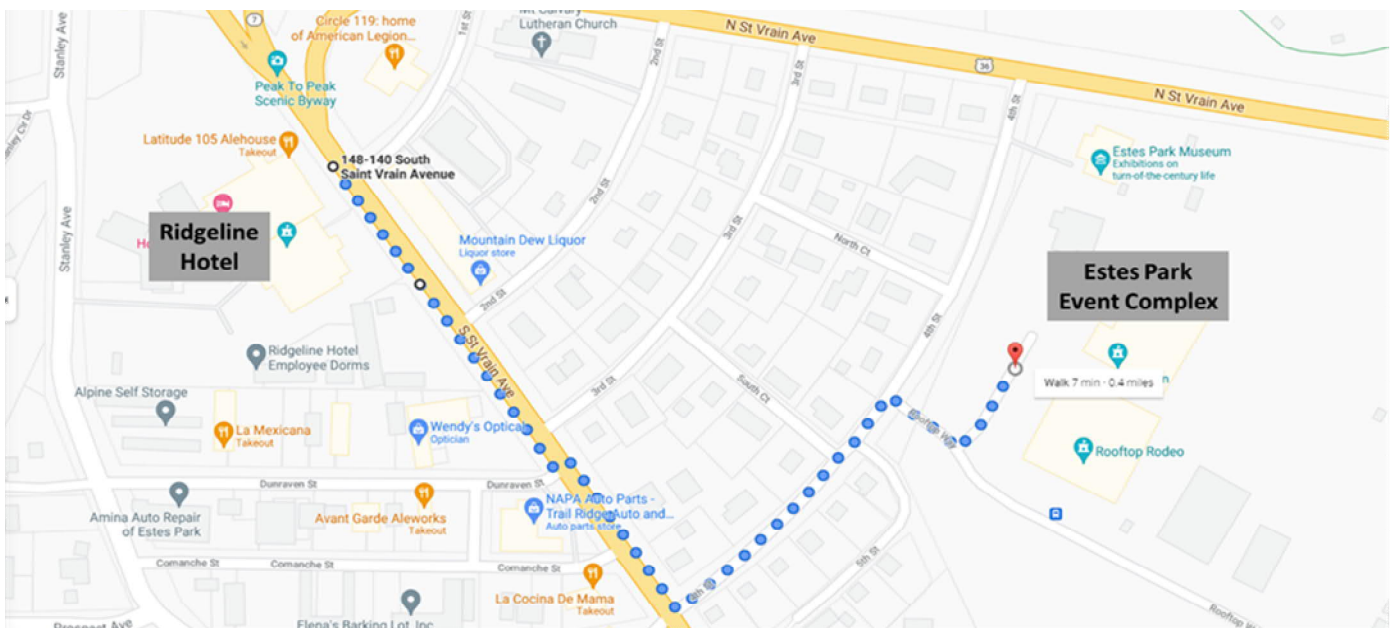
Meeting Chairs:

Uwe Beuscher, W.L. Gore & Associates, Inc.

Yifu Ding, University of Colorado - Boulder

John Pellegrino, University of Colorado - Boulder

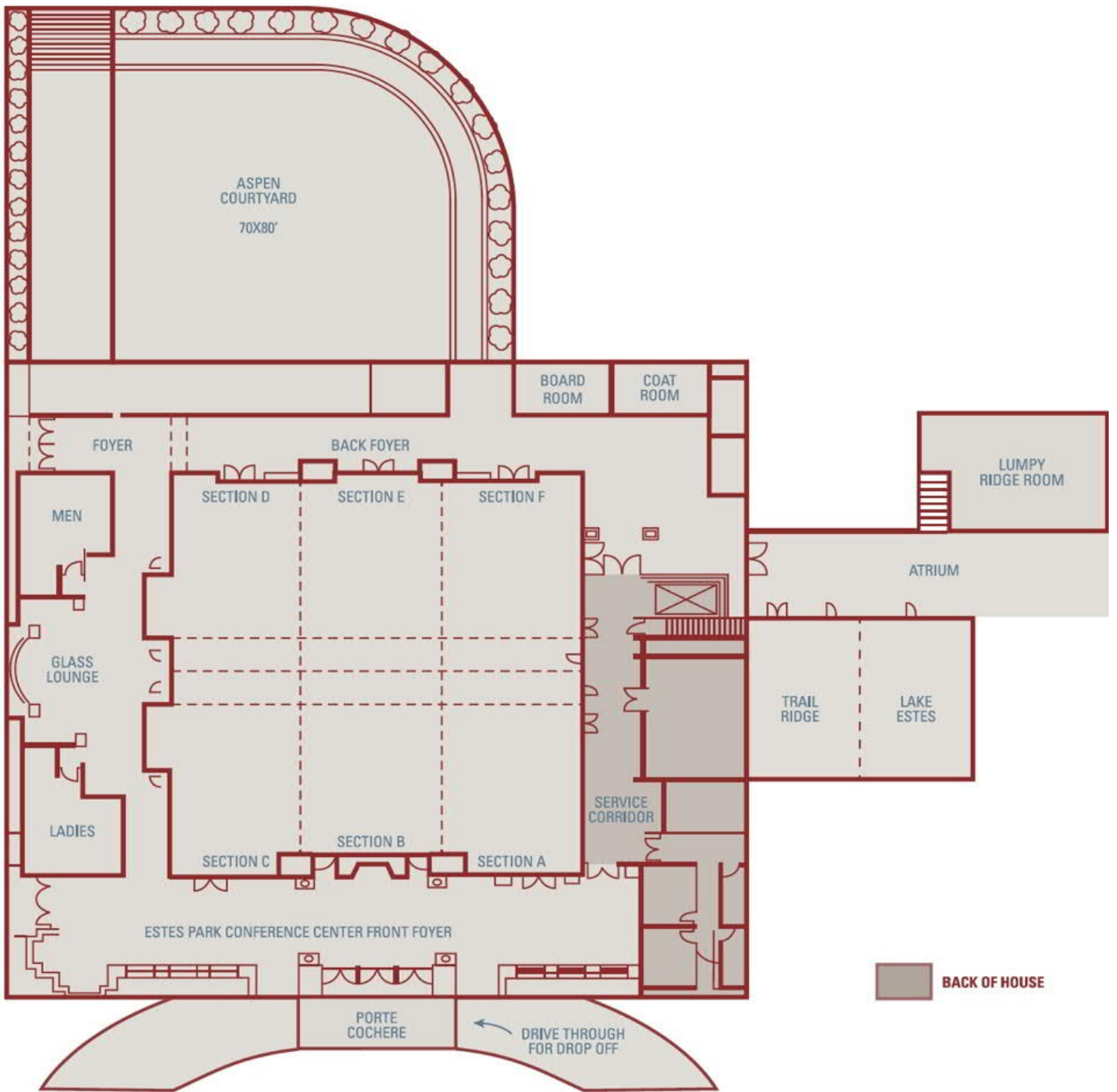
Area Maps and Directions NAMS 2021



Overall Schedule NAMS 2021

| | Saturday | Sunday | Monday | Tuesday | Wednesday | Thursday | | |
|-------|----------------|--|------------------|-------------------|------------------------|---------------------------|--------|-----------------|
| 7.00 | breakfast | breakfast | breakfast | breakfast | breakfast | breakfast | | |
| 8.00 | Water Workshop | | Plenary | Plenary | Plenary | Allan Michaels Recipients | | |
| 9.00 | | | | | | | | |
| 10.00 | | | Mon AM | Tue AM | Wed AM | Thu AM | | |
| 11.00 | | | | | | | | |
| 12.00 | | | | | | | | |
| 13.00 | | | | | Lunch w/Legends | open | | departure |
| 14.00 | | | | | | | | |
| 15.00 | | | Student workshop | Mon PM | | | Wed PM | |
| 16.00 | | | | | | | | Debate sessions |
| 17.00 | | | | | | | | |
| 18.00 | | | Business Meeting | | | | | |
| 19.00 | | Welcome Reception sponsored by CEAS University of Colorado | | | Happy Hour & cocktails | | | |
| 20.00 | | | Poster Session I | Poster Session II | Banquet & Awards | | | |
| 21.00 | | | | | | | | |
| 22.00 | | | | | | | | |

ROOM Layout



Technical Program Grid NAMS 2021

| | start | end | Ballroom C/D | Ballroom B/E | Ballroom A/F | Trail Ridge | Lumpy Ridge |
|---------------------|-------|-------|--|----------------------------------|--------------------------|---------------------------|----------------------------|
| MONDAY Aug-30 | 8.00 | 9.00 | Plenary: Peter Green – National Renewable Energy Laboratory (NREL) | | | | |
| | 9.30 | 12.30 | 1 Convergence: Pharmaceutical | 2 Membrane Fouling I | 3 Gas Separation I | 4 Osmotic Processes I | 5 Contactors MD/PV I |
| | 14.00 | 17.00 | 6 Convergence: Environmental | 7 Industry Session | 8 Gas Separation II | 9 Process Intensification | 10 Mathematics and ML |
| | 17.30 | 18.30 | NAMS Business Meeting | | | | |
| | 19.00 | 22.00 | Poster Session I (Courtyard or Foyer/Atrium; weather permitting) | | | | |
| TUESDAY Aug-31 | 8.00 | 9.00 | Plenary: Kristi Anseth – University of Colorado Boulder | | | | |
| | 9.30 | 12.30 | 11 Convergence: Medicine | 12 Water Innovation | 13 Gas Separation III | 14 Advanced Metrology | 15 Membranes for Buildings |
| | 19.00 | 22.00 | Poster Session II (Courtyard or Foyer/Atrium; weather permitting) | | | | |
| WEDNESDAY Sep-01 | 8.00 | 9.00 | Plenary: Thomas Schäfer – POLYMAT, University of the Basque Country | | | | |
| | 9.30 | 12.30 | 16 Convergence: Chemical | 17 NAMS Awards | 18 Electro-chemical I | 19 MF/UF/NF I | 20 Membranes for Med/Pharm |
| | 14.00 | 16.00 | 21 Advanced Module/Process | 22 Membrane Fouling II | 23 Osmotic Processes II | 24 Inorganic Membranes | 25 3D printed membranes |
| | 16.00 | 17.30 | Debate: More Material Science? | Debate: Funding valley of death? | Debate: Is water public? | | |
| | 19.00 | 22.00 | Conference Banquet (Estes Park Events Complex) | | | | |
| THURSDAY Sep-02 | 8.00 | 10.00 | Alan Michaels Recipient Session | | | | |
| | 10.30 | 12.30 | 26 Organic Separations | 27 Membranes for Food | 28 Electro-chemical II | 29 MF/UF/NF II | 30 Contactors MD/PV II |

MONDAY am

| 8.00 Plenary Presentation: Peter Green - National Renewable Energy Laboratory (NREL) (Estes Park Events Complex) | | | | | |
|--|---|---|--|--|--|
| parallel sessions | <u>Ballroom C/D</u> 1 - CONVERGENCE: Pharmaceutical Processing | <u>Ballroom B/E</u> 2 - Membrane Fouling I | <u>Ballroom A/F</u> 3 - Gas separation I (New Materials) | <u>Trail Ridge</u> 4 - Osmotic Processes (RO/FO/PRO) I | <u>Lumpy Ridge</u> 5 - Membrane Contactors/Membrane Distillation/Pervaporation I |
| 9.30 | 1a - Novel Membrane Processes and Devices Gastón de los Reyes (SPF) | 2a - Click Crosslinked Self-Assembled Zwitterionic Nanofiltration Membrane for High Salt Selectivity and Fouling Resistance Abhishek N Mondal (Tufts University) | 3a - Rational design of highly selective and plasticization resistant PIMs inspired by competitive sorption Katherine Mizrahi Rodriguez (MIT) | 4a - Local density inhomogeneities govern transport properties in reverse osmosis membranes Michael Geitner (The Pennsylvania State University) | 5a - Wetting in membrane distillation: modes, mechanisms, and metrics Allyson L McGaughey (University of Southern California) |
| 10.00 | 1b - Membrane applications in integrated continuous bioprocessing Anurag S Rathore (Indian Institute of Technology Delhi) | 2b - Hydrogel coated MOF interlayer on polyacrylonitrile membrane exhibits excellent fouling-resistance and separation performance for produced water treatment Roni Kasher (Ben Gurion University of the Negev) | 3b - Intrinsically Microporous Ladder Polymers Containing Pentiptycene Frameworks Exhibiting Physical Aging-Enhanced Gas Separation Performance Tanner Corrado (University of Notre Dame) | 4b - Quantifying uncertainties in water-solute selectivity of reverse osmosis membranes caused by not accounting for concentration polarization Mikayla D Armstrong (University of North Carolina at Chapel Hill) | 5b - Laboratory and pilot scale evaluation of membrane distillation for desalination of produced water from unconventional reservoirs Ritesh Pawar (University of Pittsburgh) |
| 10.30 | 1c - Virus Retentive Filters in Biotech Viral Safety: 2021 Update Kurt Brorson (Parexel International) | 2c - Micro to macro: Connecting foulant structure and mechanics with hydraulic resistance Guy Z Ramon (Technion - Israel Institute of Technology) | 3c - Enhanced CO ₂ /CH ₄ separation performance of polymerized ionic liquid-ionic liquid membranes made with multifunctional ionic cross-linkers Chamaal Karunaweera (University of Colorado Boulder) | 4c - Molecular Layer Deposition for the Fabrication of Desalination Membranes with Tunable Metrics Brian Welch (University of Colorado) | 5c - Membrane distillation combined with a refrigerant cycle for enhance performance Evyatar Shaulsky (Northeastern) |
| 11.00 | 1d - Clarification strategies for the adeno-associated viral vector cell culture harvest: Challenges and Solutions Xiaotong Fu (Biogen) | 2d - Comparison of calcium scaling in direct contact membrane distillation (DCMD) and nanofiltration (NF) Zhewei Zhang (University of Pittsburgh) | 3d - Analysis of the Transport of Guest Molecules in Molecularly Mixed Composite Membranes Containing Porous Organic Cages Matthew Rivera (Georgia Institute of Technology) | 4d - Molecular Methods for Assessing the Morphology, Topology, and Performance of Polyamide Membranes Riley Vickers (University of North Carolina at Chapel Hill) | 5d - Membrane protein (MP) based nano-porous membranes that transport vapor at high rates while being impermeable to water Hyeonji Oh (University of Texas at Austin) |
| 11.30 | 1e - Downstream purification of virus-based therapeutics - the final frontier for membrane processes? David Latulippe (McMaster University) | 2e - Fouling resistant and tunable polyampholyte selective layers for salts and small organic molecules separations Luca Mazzaferro (Tufts University) | 3e - High-temperature hydrogen/hydrocarbon separations in asymmetric carbon molecular sieve hollow fiber membranes Lu Liu (University of Maryland) | 4e - Salt and Water Transport in Reverse Osmosis: Beyond the Solution-Diffusion Model Li Wang (Yale University) | 5e - Surface Patterned Flat-sheet Poly(vinylidene fluoride) Microporous Membrane via Templated Thermally Induced Phase Separation Process: Fabrication and Membrane Distillation Performance Shouhong Fan (University of Colorado at Boulder) |
| 12.00 | 1f - Reducing the Bioprocessing Environmental Footprint and Saving Lives via Advanced Engineering Principles David Roush (Merck & Co., Inc.) | 2f - Exploring monoclonal antibody (mAb) filtration through virus retentive membranes Matthew W Billups (Pennsylvania State University) | 3f - Fluorinated Vinyl-addition Polynorbornene for Natural Gas Separation Xinyi Wang (University of Tennessee, Knoxville) | 4f - Re-thinking polyamide thin film formation: how interfacial destabilization dictates film morphology Adi Ben Zvi (Technion - Israel Institute of Technology) | 5f - Reduced Fouling Effect on DCMD Desalination by Using Phase-Inversion Synthesized GO-PSF Membrane Lucy M Camacho (Texas A&M University-Kingsville) |

MONDAY pm

| 12.30 | Lunch Break | | | | |
|-------------------|---|--|--|---|--|
| parallel sessions | <u>Ballroom C/D</u> 6 - CONVERGENCE: Environmental Applications | <u>Ballroom B/E</u> 7 - Industrial Innovations and Academia-Industry Collaborations | <u>Ballroom A/F</u> 8 - Gas separation II (Carbon Capture) | <u>Trail Ridge</u> 9 - Process Intensification with Membranes | <u>Lumpy Ridge</u> 10 - Mathematics and Machine Learning |
| 14.00 | 6a - Engineering selective desalination membrane materials via polymer backbone rigidity and functional group position Geoffrey M Geise (University of Virginia) | 7a - Chemically Resistant Thin Film Composite Reverse Osmosis Membranes Sue J Mecham (NALA Systems) | 8a - Upscaling of Facilitated Transport Membranes for Hydrogen Purification from Coal-Derived Syngas Yang Han (The Ohio State University) | 9a - RO Membrane Compaction and Permeate Carrier Embossing at High and Ultra-High Pressure Jishan Wu (UCLA) | 10a - Unifying the Pore-flow and Solution-diffusion descriptions for solvent transport through swollen, non-porous membranes Varun H Hegde (University of California Santa Barbara) |
| 14.30 | 6b - Neural Network Model with Evolutionary Algorithm and Bayesian Binary Classification of UF Performance in Pretreatment of Seawater RO Feedwater Yoram Cohen (UCLA) | 7b - Graphene Oxide Membranes for Industrial Separations Brandon MacDonald (Via Separations) | 8b - Facilitated Transport Membrane with Ionic Liquid Carrier for CO2 Separation from Air Yun-Yang Lee (Case Western Reserve University) | 9b - Catalytic Membranes for Integrated CO2 Capture and Conversion Casey O'Brien (University of Notre Dame) | 10b - Molecular Mechanisms of Ion Selectivity in Nanoporous Polymeric Membranes Cody Ritt (Yale University) |
| 15.00 | 6c - Assessing Performance of Commercial Membranes for Membrane Distillation of Produced Water Devin Shaffer (University of Houston) | 7c - Industrial Applications of Membranes in the Membrane Science, Engineering and Technology (MAST) Center at the University of Arkansas Ranil Wickramasinghe (University of Arkansas) | 8c - Molecular Design of high-performance ionenes and ionic composites for gas separation membranes Kathryn E O'Harra (University of Alabama) | 9c - What do fuel cells, gas separation, and reverse osmosis have in common? Unifying the conversation across membrane applications to enable cross-pollination Sarah M Dischinger (Lawrence Berkeley National Laboratory) | 10c - A Theoretical Methodology of Mobile Carrier Evaluation in Facilitated Transport Membranes Xuepeng Deng (The Ohio State University) |
| 15.30 | 6d - Pressure Driven Membrane Filtration for Treating Poultry Processing Wastewater Ranil Wickramasinghe (University of Arkansas) | 7d - Development of membrane technologies for the reuse of produced water Evan Hatakeyama (Chevron) | 8d - CO2 capture from gasification streams: Gen-2 Proteus™ membrane development and module field test results Witopo Salim (Membrane Technology & Research Inc.) | 9d - Polyol-Functionalized Polyether Membranes for Selective Removal of Boric Acid Matthew R Landsman (University of Texas at Austin) | 10d - Three-dimensional Flows and Dean Vortices in Membrane Distillation Systems Ankun Wang (Stanford University) |
| 16.00 | 6e - City of Lawton's Groundwater Treatment Pilot: Coagulation-Assisted Microfiltration and Side Stream NF/RO Michael Watts (Garver USA) | 7e - Bilayer Aliphatic and Aromatic Polyamide Membranes for High Rejection RO Desalination John F Thompson (NL Chemical Technology) | 8e - Synergistic Thermolabile Cross-linking and Low-temperature Carbonization to Create Sub-3.3 Å Ultramicropores for Membrane H2/CO2 Separation Leiqing Hu (University at Buffalo) | 9e - Optimization of a concentration gradient battery using an osmotic ballast to enhance saltwater-based energy storage Holly M Haflich (University of North Carolina- Chapel Hill) | 10e - Predicting the transport of soft droplets in porous media from measurable emergent properties Guillaume G Lostec (CU Boulder) |
| 16.30 | 6f - Membrane Technology vs. Water Prices: Is Water Public or Private Goods? Albert Kim (U. of Hawai'i) | 7f - Academic partnerships with industry: Creating new membranes from existing products Jeffrey R McCutcheon (University of Connecticut) | 8f - Nano-Hybrid Thin Film Composite Carbon Molecular Sieve Membranes based on a Polymer of Intrinsic Microporosity Wojciech Ogieglo (KAUST) | 9f - Multi-Objective Optimization of the Economic Feasibility for Mobile On-Site Oil and Gas Produced Water Desalination and Reuse Garrett M Cole (Colorado State University) | 10f - Origins of cation-cation selectivity in crown ether-functionalized polymer membranes Everett S Zofchak (The University of Texas at Austin) |

TUESDAY am

| 8.00 Plenary Presentation: Kristi Anseth - University of Colorado (Estes Park Events Complex) | | | | | |
|---|---|---|--|---|---|
| parallel sessions | <u>Ballroom C/D</u> 11 - CONVERGENCE: Medicine and Public Health | <u>Ballroom B/E</u> 12 - Water Innovation using Membranes | <u>Ballroom A/F</u> 13 - Gas separation III (New Concepts) | <u>Trail Ridge</u> 14 - Advanced Metrology | <u>Lumpy Ridge</u> 15 - Membranes for Energy Efficient Buildings |
| 9.30 | 11a - Forward osmosis membrane use for dialysate regeneration to enable portable kidney dialysis Bruce Hinds (Univ. of Washington) | 12a - A Computational and Experimental Test Bed for Prediction of RO Module Fouling Sarah M Dischinger (Lawrence Berkeley National Laboratory) & Mostafa Nassr (UT Austin) | 13a - Spatially Controlled Permeability and Stiffness in Photopatterned Glass-Rubber and Rubber-Rubber Two-Stage Reactive Polymer Films Adrienne Blevins (CU Boulder) | 14a - Electron tomography for the characterization of membranes Michael Geitner (The Pennsylvania State University) | 15a - Membrane-based Ventilation Energy Recovery: Current Industry Perspectives Ryan Huizing (CORE Energy Recovery Solutions) |
| 10.00 | 11b - Advancing Microporous Membranes for Mask and Filter Applications Towards Aerosol Capture and Coronavirus Deactivation DB Bhattacharyya & Rollie Mills (University of Kentucky) | 12b - Reduced-order models of concentration polarization in RO systems with spacers Nils Tilton (Colorado School of Mines) | 13b - Characterization of physical aging-induced evolution of CMS membrane using a dual-mode sorption and transport model Zhongyun Liu (Georgia Institute of Technology) | 14b - Compositional analysis of polyamide membranes via 13C MAS NMR spectral editing Christopher Stafford (NIST) | 15b - A comprehensive overview of Liquid-to-Air Membrane Energy Exchanger (LAMEE) for building HVAC application Gurubalan Annadurai (University of Saskatchewan) |
| 10.30 | 11c - 3D Printed Adsorbers for Capturing Chemotherapy Drugs before They Spread Through the Body Hee Jeung Oh (Pennsylvania State University) | 12c - A membrane fouling simulator system and omics pipeline for in operando biofouling characterization in desalination facilities Manish Kumar (University of Texas) | 13c - Elucidating the role of side chain length and dispersity in ROMP polymers with pore-generating side chains for gas separations Sharon Lin (Massachusetts Institute of Technology) | 14c - Using microfluidic interferometry to visualize diffusive solute gradients within polymer membranes Varun H Hegde (University of California Santa Barbara) | 15c - Liquid Desiccant Air Conditioning Using Selectively Permeable Membranes Matt Tilghman (Blue Frontier, LLC) |
| 11.00 | 11d - Towards an Artificial Kidney Jamie Hestekin (University of Arkansas) | 12d - Enhanced Wastewater Reclamation with Carbon Molecular Sieves Haley D White (Georgia Institute of Technology) | 13d - Greener preparation of defect-free asymmetric gas separation membranes with dihydrolevoglucosenone (Cyrene™) as an alternative polar aprotic solvent Alexander Bridge (The University of Texas at Austin) | 14d - Elucidating the Fundamental Mechanisms of CO ₂ Facilitated Transport in Amine-functionalized Polymeric Membranes Using Operando Spectroscopy Casey O'Brien (University of Notre Dame) | 15d - Efficient Dehumidification Using Membranes in the CCL Process David E. Claridge (Texas A&M University) |
| 11.30 | 11e - The surface properties and biological functionality of diamond coatings and membranes Roger Narayan (UNC/NCSU Biomedical Engineering) | 12e - Highly Precise Ion Separations via Polymeric Membranes with Host-Guest Chemistry Ryan DuChanois (Yale University) | 13e - ZIF-21 Membranes for Ammonia Separation Moises A Carreon (Colorado School of Mines) | 14e - Practical limits of the quartz crystal microbalance for elucidating membrane phenomena Thomas Schäfer (Polymat, University of the Basque Country) | 15e - High Efficiency, Water Vapor-Selective, Active Membrane Energy Exchanger for Air Conditioning Andrew Fix (Purdue University) |
| 12.00 | 11f - Implantable nanofluidic membrane technology platforms for controlled drug delivery Alessandro Grattoni (Houston Methodist Research Institute) | 12f - Pore Functionalized Catalytic and Responsive Membranes for Water remediation Dibakar Bhattacharyya (U. Kentucky) | 13f - Performance of Gas Separation Hollow Fiber Membrane Modules Fabricated from Fiber Tows Glenn Lipscomb (University of Toledo) | 14f - Particle Remobilization in Filtration Membranes during Flow Interruption Haichao Wu (University of Colorado Boulder) | 15f - Multifunctional membranes for managing moisture and heat in buildings Derek Stein (Techstyle Materials, Inc.) |

WEDNESDAY am

| 8.00 Plenary Presentation: Thomas Schäfer - Polymat, University of the Basque Country (Estes Park Events Complex) | | | | | |
|---|---|---|--|--|--|
| parallel sessions | <u>Ballroom C/D</u> 16 - CONVERGENCE: Energy & Chemical Processing | <u>Ballroom B/E</u> 17 - NAMS Awards session | <u>Ballroom A/F</u> 18 - Electrochemical Applications I | <u>Trail Ridge</u> 19 - MF/UF/NF I | <u>Lumpy Ridge</u> 20 - Medical and Pharmaceutical Applications |
| 9.30 | 16a - Some industrial perspectives on the development of novel materials for propylene/propane separations: adsorbent and membrane Jay (Junqiang) Liu (The Dow Chemical Company) | 17a - Heterogeneous Ionization Behavior of Polyamide Thin-Film Composite Membranes for Reverse Osmosis and Nanofiltration Jay Werber (University of Toronto) | 18a - Decoupling ionic conduction and cross-over in membrane separators for non-aqueous redox flow batteries Geoffrey M Geise (University of Virginia) | 19a - Ultra-permeable wafer-scale SWCNT membranes Melinda L Jue (Lawrence Livermore National Laboratory) | 20a - Performance of tangential flow filtration using reverse asymmetric membrane for CHO cell harvesting Ranil Wickramasinghe (University of Arkansas) |
| 10.00 | 16b - Organic Solvent Nanofiltration and their role in emission reduction and process intensification in the chemical/petrochemical industry Udo Dengel (Evonik) | 17b - Counter-ion diffusion in ion-exchange membranes with varying degrees of water content Jovan Kamcev (University of Michigan) | 18b - Independent tuning of anion exchange membrane conductivity and permselectivity via non-covalent crosslinking Ryan S Kingsbury (University of North Carolina at Chapel Hill) | 19b - MF and UF Coated Membranes for Selective Separation of Organic Anions-PFAS and Trivalent Cations Francisco Leniz (University of Kentucky) | 20b - Scalable synthesis of nanoporous atomically thin graphene membranes for dialysis and molecular separations via facile isopropanol-assisted hot lamination Piran Kidambi (Vanderbilt University) |
| 10.30 | 16c - High Flux CO ₂ Selective Membranes for Renewable Natural Gas and CO ₂ Capture Hannah Murnen (Compact Membrane Systems) | 17c - Bottom-up synthesis of films hosting atom-thick molecular-sieving apertures Cédric Van Goethem (EPFL) | 18c - Catalytic reactions power the self-pumping membrane Yuhang Fang (Purdue University) | 19c - Decoupling entrance and inner resistances in CNT channel Francesco Fornasiero (Lawrence Livermore National Laboratory) | 20c - Rapid size and affinity based detection of intact viral particles using functionalized microslit silicon membranes Michael Klaczko (University of Rochester) |
| 11.00 | 16d - Membrane Applications in Industrial Processes Hans Wijmans (MTR) | 17d - Entrapped Nanobubbles as Ultra-selective and Oxidation-resistant Membranes for Desalination and Water Reuse Duong T. Nguyen (University of Colorado Boulder) | 18d - Revisiting Water and Ion Transport in Nafion Rahul Sujanani (The University of Texas at Austin) | 19d - Atomic layer deposition onto and within polymers for controlling interfaces and nano-structuring UF membranes Tamar Segal-Peretz (Technion- Israel Institute of Technology) | 20d - Factors Affecting Robustness of Anion Exchange Chromatography: Selective Retention of Minute Virus of Mice Using Membrane Media Wenbo Xu (University of Arkansas) |
| 11.30 | 16e - Powering the Future of Energy Storage with membranes Michael Hu (Energy Exploration Technologies) | 17e - Advancing membrane chromatography processes for the purification of therapeutic viruses Karina Kawka (McMaster University) | 18e - Screening of electrostatic interactions between carboxylates and ion exchange membranes by co-transporting alcohols Luca Kim (Auburn University) | 19e - Ion transport in sub-1-nm carbon nanotube porins Aleksandr Noy (Lawrence Livermore National Laboratory) | 20e - Catalytic DNA-membrane reactor Thomas Schäfer (Polymat, University of the Basque Country) |
| 12.00 | 16f - Separation of complex hydrocarbon mixtures by NF and RO – extending fundamental understanding to concepts for refining and petrochemicals JR Johnson (ExxonMobil) | 17f - Membrane Protein-Based Biomimetic Membranes for Water Treatment Yu-Ming Tu (The University of Texas at Austin) | 18f - Elucidating Counterion Mobility in Ion-Exchange Membranes: Spatial Effect and Valency-Dependent Electrostatic Interaction Hanqing Fan (Columbia University) | 19f - Improving the Long-Term Performance of Living Filtration Membranes nanofiltration membranes Emily Rutledge (Montana Technological University) | 20f - Membrane emulsification for the preparation of uniform functionalized droplets with catalytic properties Lidietta GIORNO (National Research Council of Italy (CNR-ITM)) |

WEDNESDAY pm

| 12.30 | Lunch Break | | | | |
|-------------------|---|---|---|---|--|
| parallel sessions | <u>Ballroom C/D</u> 21 - Advanced Module/Process Design | <u>Ballroom B/E</u> 22 - Membrane Fouling II | <u>Ballroom A/F</u> 23 - Osmotic Processes (RO/FO/PRO) II | <u>Trail Ridge</u> 24 - Inorganic Membranes | <u>Lumpy Ridge</u> 25 - 3D Printed Membranes |
| 14.00 | 21a - Centrifugal Reverse Osmosis – A Novel Membrane Module Configuration for Desalination Near Local Thermodynamic Equilibrium William B Krantz (University of Colorado at Boulder) | 22a - Study of mineral fouling in synthetic effluent nanofiltration using real-time particle imaging and electrical impedance spectroscopy Oded Nir (Ben-Gurion University of the Negev) | 23a - Open-Access Database for Water Purification and Desalination Membranes Cody Ritt (Yale University) | 24a - Water and organic co-transport in carbon molecular sieve membranes Young Hee Yoon (Georgia Institute of Technology) | 25a - High-capacity adsorbents with hierarchical structures printed from polymer composites Bill Phillip (Notre Dame) |
| 14.30 | 21b - FuEnergy from Carbon Dioxide: A New Concept for Power Generation from Sweep Gas Permeation Sarah Moussaddy (Oakland University) | 22b - Molecular dynamics study on membrane fouling by oppositely charged proteins Jia Wei Chew (Nanyang) | 23b - Scale-up of High Performance Surface Nano-Structured Reverse Osmosis TFC Membranes Yian Chen (UCLA) | 24b - Designing Few-nanometer organosilica membranes with hydrothermal stability for selective hydrogen separation Thien N Tran (University at Buffalo) | 25b - The Future Use of Atomic Layer Processing in Membrane Production David S Bergsman (University of Washington) |
| 15.00 | 21c - Facilitated Transport Membranes for H ₂ Purification from Coal-Derived Syngas: A Techno-Economic Analysis Yang Han (The Ohio State University) | 22c - Characterization of Membrane Fouling by Zeta Potential Vidumin Dahanayake (Anton Paar USA) | 23c - Recovering end-of-life reverse osmosis membrane productivity using chlorination Bianca M. Souza Chaves (The University of Arizona) | 24c - Development and fabrication of high-performance Pd-based CMRs for ammonia decomposition Rok Sitar (Colorado School of Mines) | 25c - Customized thin film composite membranes using additive manufacturing Xin Qian (University of Connecticut) |
| 15.30 | 21d - Membrane Applications in Biogas Upgrading and Purification David Hasse (Air Liquide) | 22d - Non-invasive and real-time monitoring of membrane fouling and cleaning Iliane Rafaniello (SURPHASE) | 23d - Artificial Water Channels- toward Biomimetic Membranes for Desalination Mihail BARBOIU (Institut European des Membranes) | 24d - Designing graphene oxide membranes by etching and polydopamine intercalation for high-efficiency dye removal Haiqing Lin (The State University of New York at Buffalo) | 25d - Antimicrobial Facemask Membrane Filters Cast on a 3D Printed Support Ebuka Ogbuoji (University of Kentucky) |
| 16.00 | <u>Debate Session 1</u> New Materials Science and Commercialization | <u>Debate Session 2</u> Funding the gap between academic discoveries and translation to application | <u>Debate Session 3</u> Is Water Public or Private Goods? | | |
| 18.00 | Happy Hour and Cocktails (Estes Park Events Complex) | | | | |
| 19.00 | Conference Banquet (Estes Park Events Complex) | | | | |

THURSDAY am

| | |
|------|---|
| 8.00 | SPECIAL Session - Alan Michaels Award Recipients on Convergence (Estes Park Events Complex) |
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| parallel sessions | <u>Ballroom C/D</u> 26 - Organic Separation (OSN) | <u>Ballroom B/E</u> 27 - Membranes for Food Application | <u>Ballroom A/F</u> 28 - Electrochemical Applications II | <u>Trail Ridge</u> 29 - MF/UF/NF II | <u>Lumpy Ridge</u> 30 - Membrane Contactors/Membrane Distillation/Pervaporation II |
|-------------------|--|---|--|---|--|
| 10.30 | 26a - Chemically Resilient Hollow Fiber Nanofiltration Membranes Fabricated from Copolymers for Organic Solvent Nanofiltration Michael Dugas (University of Notre Dame) | 27a - Conversion of Food Waste to Levulinic Acid Using A Catalytic Membrane Reactor Zhexi Zhu (University of Arkansas) | 28a - Micro- and nano-patterned polymer electrolyte membranes for electrochemical energy conversion Christopher G Arges (Louisiana State University) | 29a - Elucidating the structure-performance relationship in commercially relevant virus filters using 3D electron tomography Kaitlyn P Brickey (Pennsylvania State University) | 30a - Coronavirus and Bacteriophage Removal Mechanism in Membrane Distillation Mukta Hardikar (The University of Arizona) |
| 11.00 | 26b - The role of skin layer pores in organic solvent reverse osmosis permeation through polymer membranes Hye Youn Y Jang (Georgia Institute of Technology) | 27b - Membrane Applications in Dairy Industry – Status, Challenges and Opportunities for Innovation Bing Liu (Leprino Foods) | 28b - Controlling the Structure and Rotation Direction of Electroconvection by Membrane Surface Modification Felix Stockmeier (DWI - Leibniz Institute for Interactive Materials) | 29b - Interaction-Based Ion Selectivity Exhibited by Self-Assembled, Cross-Linked Zwitterionic Copolymer Membranes Samuel J Lounder (Tufts) | 30b - Elucidating the inherent fouling tolerance of membrane contactors in ammonia recovery from wastewater Jongho Lee (University of British Columbia) |
| 11.30 | 26c - All Organic Thin-Film Nanocomposite Membranes for Organic Solvent Filtration Siamak Nejati (University of Nebraska-Lincoln) | 27c - Micellar casein from microfiltration of skim milk and its beverage application Ni Cheng (Milk Specialties Global) | 28c - Influence of Electrolyte on the Concentration-induced Conductivity-permeability Tradeoff of Ion-exchange Membranes Yuxuan Huang (Columbia University) | 29c - Membrane Bonding by Capillary Filling with Viscous Polymers: Infiltration Kinetics and Bonding Strength Jaylene Martinez (CU Boulder Mechanical Engineering) | 30c - Evaluation of Direct Heated Vacuum Membrane Distillation Process using Module-scale Simulation Yiming Liu (UCLA) |
| 12.00 | 26d - Separation of organic solvents using Dual-Layer Hollow Fiber Mixed Matrix Membranes Conrad J Roos (Georgia Institute of Technology) | 27d - Membranes for the removal of ethylene from produce ripening environments Christine Parrish (Compact Membrane Systems) | 28d - Reverse Osmosis vs. Electrodialysis: Identifying the Most Energy Efficient Technology for Brackish Water Desalination Applications Sohum Patel (Yale University) | 29d - Connecting Solute Diffusion to Pore Morphology in Self-Assembled Triblock Copolymer Membranes Anthony J Cooper (University of California, Santa Barbara) | 30d - Computational fluid and thermodynamics simulation for direct contact membrane distillation using hollow fibers: scalable meshing and decoupled heat transfer Albert Kim (U. of Hawai'i) |

| | |
|-------|-----------|
| 12.30 | DEPARTURE |
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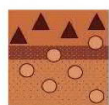


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