North American Membrane Society
28th Annual Meeting

Membrane Separations for Emerging Water, Energy, and Health Applications

PROGRAM BOOK

Conference Chairs:
David Latulippe, McMaster University
Meagan Mauter, Carnegie Mellon University
Andrew Zydney, Penn State University

www.nams2019.org
@NAMS2019

May 11-15, 2019
Pittsburgh, PA
## Program at a Glance

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td><strong>Saturday</strong></td>
<td><strong>May 11</strong></td>
<td>8:00 am - 5:00 pm Workshop 1: Measurement Methods for Membranes (Benedum Room)</td>
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<td></td>
<td>8:00 am - 5:00 pm</td>
<td>Workshop 2: Membranes for Water Treatment Applications (Duquesne Room)</td>
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<td><strong>Sunday</strong></td>
<td><strong>May 12</strong></td>
<td>8:00 am - 5:00 pm Workshop 3: Membranes for Gas Separations (Birmingham/Smithfield Room)</td>
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<td></td>
<td>8:00 am - 5:00 pm</td>
<td>Workshop 4: Polymeric and Inorganic Membrane Materials and Membrane Formation (Benedum Room)</td>
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<td>8:00 am - 5:00 pm</td>
<td>Workshop 5: Membranes for Bioprocessing (Duquesne Room)</td>
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<td>12:00 pm - 6:00 pm</td>
<td>Registration (Lobby)</td>
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<td>1:30 pm - 4:30 pm</td>
<td>NAMS Student Workshop (Sterlings Room)</td>
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<td>6:00 pm - 9:00 pm</td>
<td>Welcome Reception (<a href="https://www.carnegiesciencecenter.org">Carnegie Science Center, 1 Allegheny Avenue</a>)</td>
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<td><strong>Monday</strong></td>
<td><strong>May 13</strong></td>
<td>7:00 am - 7:00 pm Registration (Ballroom Foyer)</td>
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<td>7:00 am - 9:00 pm</td>
<td>Exhibitors (Ballroom Foyer)</td>
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<td>7:45 am - 9:00 am</td>
<td>Plenary Lecture - Dr. Peter Fiske (Ballroom 1)</td>
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<td>9:00 am - 9:30 am</td>
<td>Coffee Break</td>
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<td>9:30 am - 12:30 pm</td>
<td>Parallel Technical Sessions I</td>
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<td>12:30 pm - 2:00 pm</td>
<td>Lunch With Legends (Commonwealth Room) − Pre-registration required</td>
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<td>2:00 pm - 5:00 pm</td>
<td>Parallel Technical Sessions II</td>
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<td>7:00 pm - 10:00 pm</td>
<td>Poster Session (Ballrooms 1 &amp; 2)</td>
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<td><strong>Tuesday</strong></td>
<td><strong>May 14</strong></td>
<td>7:30 am - 7:00 pm Registration (Ballroom Foyer)</td>
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<td>Plenary Lecture - Dr. Tim Merkel (Ballroom 1)</td>
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<td>9:30 am - 12:30 pm</td>
<td>Parallel Technical Sessions III</td>
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<td>2:00 pm - 5:00 pm</td>
<td>Parallel Technical Sessions IV</td>
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<td>5:30 pm - 6:30 pm</td>
<td>NAMS Business Meeting (Kings Garden 5)</td>
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<td>6:30 pm - 7:30 pm</td>
<td>Happy Hour (Ballroom Foyer)</td>
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<td>7:30 pm - 11:00 pm</td>
<td>Banquet &amp; Awards Ceremony (Ballroom 1)</td>
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<td><strong>Wednesday</strong></td>
<td><strong>May 15</strong></td>
<td>7:30 am - 12:00 pm Registration (Ballroom Foyer)</td>
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<td>7:00 am - 5:00 pm</td>
<td>Exhibitors (Ballroom Foyer)</td>
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<td>7:45 am - 9:00 am</td>
<td>Plenary Lecture - Dr. Rachel Segalman (Ballroom 1)</td>
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<td>9:00 am - 9:30 am</td>
<td>Coffee Break</td>
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<td>9:30 am - 12:30 pm</td>
<td>Parallel Technical Sessions V</td>
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<td>2:00 pm - 5:00 pm</td>
<td>Parallel Technical Sessions VI</td>
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### Get Connected!

Wyndham WiFi – Username: **NAMS1** Password: **CONF19**  #NAMS2019
<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>7:45</td>
<td><strong>MONDAY AM</strong></td>
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<tr>
<td>9:30</td>
<td><strong>KINGS GARDEN 1</strong></td>
<td>#5 Materials: Inorganic Materials</td>
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</tbody>
</table>
Marine Michel (Imperial College London)  
5a - Two-Dimensional Membranes for Gas Separation  
Dan Zhao (National University of Singapore)  
3a - Sacrificial Protective Layer for Fouling Control in Reverse Osmosis Desalination  
Moon Son (Penn State University)  
1a - Hydrodynamic-colloidal interactions of an oil droplet and a membrane surface  
Guy Z Ramon (Technion - Israel Institute of Technology) |
| 10:00  | **KINGS GARDEN 3**                                                    | #3 Applications: Seawater Desalination                                  |
| 10:00  | #1 Processes: Fundamentals of Predicting and Preventing Membrane Fouling | 1b - Do Graphene Oxide Nanostructured Coatings Mitigate Bacterial Adhesion to Membrane Interfaces?  
Santiago Romero-Vargas Castrillon (University of Cambridge)  
1c - Fouling mechanisms in constant flux crossflow ultrafiltration  
Alon Kirschner (The University of Texas at Austin)  
1d - Fouling-Resistant, Multi-Functional Membranes with Ultra-Thin Hydrogel Selective Layers using Interfacially Initiated Free Radical Polymerization (IIFRP)  
Ayse Asatekin (Tufts University) |
| 11:00  | **KINGS GARDEN 5**                                                    | #6 Applications: Assessing Performance, Robustness, and Scalability for Carbon Capture |
| 11:00  | #6 Materials for Gas Separations                                    | 2a - Continuous on-demand dehydration of solvents in flow chemistry manufacturing processes  
Hannah Murnen (Compact Membrane Systems)  
4b - Tailored Synthesis of Inorganic-supported Polymer, Graphene, and Nanocomposite Membranes for Liquid-Phase Separations  
Michael Z Hu (Oak Ridge National Laboratory)  
5b - Restricting Lattice Flexibility in Polycrystalline Metal-Organic Framework Membrane for Efficient Carbon Capture  
Kumar Varoon Agrawal (L'Ecole polytechnique fédérale de Lausanne)  
3b - Water Transport through Ultrathin Polyamide Nanofilms Used for Reverse Osmosis  
Zhifei Jiang (Imperial College London)  
1b - Do Graphene Oxide Nanostructured Coatings Mitigate Bacterial Adhesion to Membrane Interfaces?  
Santiago Romero-Vargas Castrillon (University of Cambridge)  
1c - Fouling mechanisms in constant flux crossflow ultrafiltration  
Alon Kirschner (The University of Texas at Austin)  
1d - Fouling-Resistant, Multi-Functional Membranes with Ultra-Thin Hydrogel Selective Layers using Interfacially Initiated Free Radical Polymerization (IIFRP)  
Ayse Asatekin (Tufts University)  
6b - Bench scale testing of next generation hollow fiber membrane modules at subambient conditions at the National Carbon Capture Center  
David Hasse (Air Liquide) |
| 11:30  | **KINGS GARDEN 5**                                                    | #6 Applications: Assessing Performance, Robustness, and Scalability for Carbon Capture |
| 11:30  | #6 Materials for Gas Separations                                    | 2e - 2D boron nitride encapsulated nanofiber membranes for membrane distillation  
Yunchul Woo (Korea Institute of Civil Engineering and Building Technology)  
4e - Nanocomposite RO Membranes with High Aspect Ratio Functional Nanoparticles for Controlled Interfacial Transport  
Stephen M Martin (Virginia Tech)  
5e - Insights on the Carbon Molecular Sieve Structure from Stability and Rejuvenation Tendencies  
Samuel Hays (Georgia Institute of Technology)  
3e - Zwitierionic poly(aryl ether sulfone) (PAES) copolymer for biofouling/chlorine resistant desalination membranes  
Yi Yang (Arizona State University)  
1e - Unravel the Gordian Knot of membrane desalination: Understanding and mitigating silica scaling in reverse osmosis  
Tiezheng Tong (Colorado State University)  
6e - High-permeance polymer-functionalized graphene membranes that surpass the post-combustion carbon capture target  
Kumar Varoon Agrawal (L'Ecole polytechnique fédérale de Lausanne) |
| 12:00  | **KINGS GARDEN 5**                                                    | #6 Applications: Assessing Performance, Robustness, and Scalability for Carbon Capture |
| 12:00  | #6 Materials for Gas Separations                                    | 2f - Impact of membrane properties on scaling-induced wetting in membrane distillation  
Allison L McCaughhey (University of Southern California)  
4f - If one were to develop a new NF/RO membrane, specifically for uncharged organic solute rejection, how permeable could it be to water while meeting organic solute rejection goals?  
Eric Heek (UCLA)  
5f - Fabrication of zeolitic imidazolate framework ZIF-8 membranes by ligand-induced perselectivation in vapor phase  
Xiaoli Ma (University of Wisconsin-Milwaukee)  
3f - Chlorine resistance of functionalized HNTs-based TFN membranes  
Boguslaw Kruczek (University of Ottawa)  
1f - RO Mineral Scale Mitigation via Self-Adaptive Feed-Flow Reversal  
Yeehwa Kim (UCLA)  
6f - Fabrication of Thin Film Composite Membranes using Microporous Polymer Blends and Polybenzimidazole Nanoporous Supports for CO2/N2 Separation  
Lingxiang Zhu (U.S. Department of Energy National Energy and Technology Laboratory) |
### Sessions Summary (Presenting author listed)

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<tr>
<th>Time</th>
<th>BALLROOM 3</th>
<th>BALLROOM 4</th>
<th>KINGS GARDEN 1</th>
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<tr>
<td>2:00</td>
<td>8a - CFD simulation of crimped hollow fiber membranes for liquid separation processes</td>
<td>9a - Structural and Transport Properties of Membranes in High-Salinity Desalination using Cascading Osmotically Mediated Reverse Osmosis</td>
<td>11a - Ion Transport Through Perforated Nanoporous Graphene</td>
<td>12a - Expanding the chemical palette for reliable chemical separations using molecular simulations and machine learning</td>
<td>10a - Tannic acid-iron network based green technique for enhanced membrane performance in water reuse</td>
<td>7a - Field trial of spiral-wound facilitated transport membrane module for CO$_2$ capture from flue gas Yang Han (Ohio State University)</td>
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<td>Mohammad Younas (University of Engineering and Technology, Peshawar)</td>
<td>Xi Chen (Columbia University)</td>
<td>Mandakranta Ghosh (University of Twente)</td>
<td>David Sholl (Georgia Institute of Technology)</td>
<td>Hao Guo (The University of Hong Kong)</td>
<td>Yang Han (Ohio State University)</td>
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<td>9b - Utilization of reverse solute diffusion to enhance membrane performance during Osmotically-Driven processes - improved boron retention and silica scaling mitigation</td>
<td>11b - Developing a new approach to describe ion sorption and transport in Nafion membranes</td>
<td>12b - Diffusion, Reaction, and Network Structure Modeling of Interfacial Polymerization of Polyamide Membranes</td>
<td>10b - Membrane Distillation (MD) and Reverse Osmosis (RO) processes for water recovery from pre-treated high strength brewery wastewater</td>
<td>7b - Gen-2 Proteusz™ membrane and module development for CO$_2$ capture from gasification streams Witopo Salim (Membrane Technology &amp; Research Inc.)</td>
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<td>Yining Wang (Nanyang Technological University)</td>
<td>Rahul Sujanani (The University of Texas at Austin)</td>
<td>Jeffrey D Willutt (DuPont Water Solutions)</td>
<td>Naowrin Anwar (Concordia University)</td>
<td>Navin Mittal (The University of Melbourne)</td>
<td>Witopo Salim (Membrane Technology &amp; Research Inc.)</td>
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<td>3:00</td>
<td>8c - Direct numerical simulation of unsteady mixing in direct contact membrane distillation systems with membrane spacers</td>
<td>9c - Co-transport of neutral solutes in Nafion 117 using In-situ ATR FTIR spectroscopy for multicomponent solution speciation</td>
<td>12c - Optimization of Mixed Matrix Membrane Materials for Post-Combustion Carbon Capture</td>
<td>10c - Field Demonstration of Real-Time Colloidal Particle Monitoring to Improve MF and UF Membrane Performance</td>
<td>7c - One-pot surface modification of nano-cellulose fibrils and effect of manipulated fibril surfaces in Hybrid Facilitated Transport Membranes for CO$_2$ capture Saravan Janakiram (Norwegian University of Science and Technology)</td>
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<td>Jinchong Lou (Colorado School of Mines)</td>
<td>Breanna Dobyns (Auburn University)</td>
<td>Breeanna Dobyns (Auburn University)</td>
<td>Janice A. Stoeckel (U.S. Department of Energy National Energy and Technology Laboratory)</td>
<td>Navin Mittal (The University of Melbourne)</td>
<td>Saravan Janakiram (Norwegian University of Science and Technology)</td>
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<td>Li Lai (Nanyang Technological University)</td>
<td>Gregory M Newblom (Membrion, Inc.)</td>
<td>Simcha Shtzion (Technion - Israel Institute of Technology)</td>
<td>Sanhita Chaudhury (Ben-Gurion University of the Negev)</td>
<td>Junya Okazaki (JGC Corporation)</td>
<td>Sanhita Chaudhury (Ben-Gurion University of the Negev)</td>
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<td>4:00</td>
<td>8e - Analysis of Micromixers to Minimize Scaling Effects on Reverse Osmosis Membranes</td>
<td>9e - Incorporating membrane deformation into the boundary layer equation to model water and reverse salt flux in osmotic processes</td>
<td>11e - Polymerization of counterions in self-assembled, 1 nm pores of hydrophobic liquid crystal anion exchange membrane to tune nanopore and ion transport properties</td>
<td>12e - Modeling of polymer membrane formation via phase inversion by mesoscopic phase-field methods: Investigating the development of structure on multiple scales</td>
<td>10e - Water Recovery from Produced Water via Robust Membrane Distillation</td>
<td>7e - Coating of hollow fiber membrane for carbon molecular sieve membrane preparation Yuhe Cao (Georgia Institute of Technology)</td>
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<td>Jeremy Walker (U.S. Army)</td>
<td>Jaime A. Idarraga-Mora (Clemson University)</td>
<td>Michael J. McGrath (University of Colorado at Boulder)</td>
<td>Michael R Cervellere (University of Arkansas/EMD Millipore)</td>
<td>Rong Wang (Nanyang University)</td>
<td>Yuhe Cao (Georgia Institute of Technology)</td>
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<td>9f - A Thin-Film Forward-Osmosis Membrane Made from a Graphene Oxide-Silver Metal-Organic Framework Nanocomposite: Antifouling and Antifouling Assessment</td>
<td>11f - Quantifying tortuosity and diffusion over multiple scales in ionic and non-ionic polymer membranes</td>
<td>12f - Multiscale Modeling of Gas Permeation Through Poly(Dimethyl Phenylene Oxide) (PPO) and Its Pre-Steady State Polymer Response</td>
<td>Marielle Soniat (Lawrence Berkeley National Laboratory)</td>
<td>Lu Lin (New Mexico State University)</td>
<td>Marielle Soniat (Lawrence Berkeley National Laboratory)</td>
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<td>Milad Rabbani Esfahani (University of Alabama)</td>
<td>Laura Madsen (Virginia Tech)</td>
<td>Michael R Cervellere (University of Arkansas/EMD Millipore)</td>
<td>Madeleine Bonnefoy (Lafayette Research)</td>
<td>Alessio Fuoco (CNR)</td>
<td>Lu Lin (New Mexico State University)</td>
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<td>Akhah Dezhmakh (Yale University)</td>
<td>Lu Lin (New Mexico State University)</td>
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<td>7:45</td>
<td><strong>Plenary Session 2 - Dr. Tim Merkel, Development of Membranes for CO\textsubscript{2} Capture (Ballroom 1)</strong></td>
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<td><strong>TUESDAY AM</strong></td>
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<td><strong>9:30</strong></td>
<td>14a - Oil drop behavior on model nanofiltration membrane surfaces under conditions of hydrodynamic shear Charifa Hajase (Michigan State University)</td>
<td>15a - Membrane solvent recovery in edible oil industry Petrus Cuperus (SolSep BV)</td>
<td>16a - Responsive CNT Composite Membranes for Protection Against Chemical Warfare Agents Melinda L Jue (Lawrence Livermore National Laboratory)</td>
<td>13a - Scaling mitigation in membrane distillation through electrokinetic mixing Unnati Rao (UCLA)</td>
<td>17a - Mixed-matrix membranes formed from imide-functionalized UiO-66-NH\textsubscript{4} for improved interfacial compatibility Qihui Qian (MIT)</td>
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<td><strong>10:00</strong></td>
<td>14b - A case study review of the application of reverse osmosis membranes for water treatment and reagent recovery in mining and mineral processing operations Chris Biederman (Hatch)</td>
<td>15b - Molecular Design of Polymeric Membranes for Organic Solvent Recovery Tai-Shung Chung (National University of Singapore)</td>
<td>16b - Highly Efficient Dimethyl Ether Production from CO\textsubscript{2} Hydrogenation in a Dehydration Membrane Reactor Huazheng Li (Rensselaer Polytechnic Institute)</td>
<td>13b - Donnan dialysis desalination with thermolytic salts Hanqing Fan (Columbia University)</td>
<td>17b - Janus polymers bearing tri(n-alkoxy)silyl side groups: glassy membrane materials with properties of rubbers Yury P Yampolskii (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences)</td>
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<td><strong>11:00</strong></td>
<td>14c - Self-Cleaning Nanocomposite Membranes with Phosphorene-Based Pore Fillers for Water Treatment Joyner Eke (University of Kentucky)</td>
<td>15c - Epoxy-based solvent resistant nanofiltration membranes prepared through phase inversion Maarten Bastin (KU Leuven)</td>
<td>16c - Poly-methacrylic acid Functionalized Membranes with Incorporated Reactive Pd/Fe Nanoparticles: Lab Scale to Groundwater Remediation Applications Hongyi (Derek) Wan (University of Kentucky)</td>
<td>13c - Electrically Conductive Membranes as Sensors: Stability, Conductivity, and Sensitivity Charles-François de Lannoy (McMaster University)</td>
<td>17c - Solution processable metal organic frameworks for gas separations: from porous liquids to mixed matrix membranes Anasgiya V Bavykina (KAUST)</td>
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<td><strong>12:00</strong></td>
<td>14d - Optimization of nanofiltration process for treating industrial wastewater of time-varying composition, Ryan LaRue (McMaster University)</td>
<td>15d - Nanoporous Graphene Membranes for Organic Solvent Nanofiltration David Cheng (MIT)</td>
<td>16d - Investigation of a smart electrically responsive ultrafiltration membrane Chia Miang Khor (UCLA)</td>
<td>13d - Electrocatalytic Membrane Reactor-based Integrated Processes for Landfill Leachate Treatment Jianxin Li (Tianjin Polytechnic University)</td>
<td>17d - Enhancing CO\textsubscript{2}/N\textsubscript{2} Selectivity and Elimination of Langmuir Sorption within High Tg, Glassy Polynorbornene Membranes Brian Long (University of Tennessee)</td>
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<td><strong>13:00</strong></td>
<td>14f - Selective separation of mono- and di-valent cations in electrodialysis during brackish water desalination: bench and pilot-scale studies Xuesong Xu (New Mexico State University)</td>
<td>15f - Enabling Organic Solvent Nanofiltration and Reverse Osmosis using Ceramic Supported TFC Membranes Jeffrey R McCutcheon (University of Connecticut)</td>
<td>16f - Plasmonic membrane catalytic activation of peroxide for quantized oxidation via residence time control Bruce Hinds (University of Washington)</td>
<td>13f - Simulations of Highly Selective Separations Based on Electromigration Merlin Bruning (University of Notre Dame)</td>
<td>17f - Composite gas separation membranes from metal-induced ordered polymeric frameworks Michael D Guiver (Tianjin University)</td>
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### Sessions Summary (Presenting author listed)

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<tr>
<td>2:00</td>
<td>21a - Reduction of Brackish Water Desalination Brine Volume using Membrane Evaporation Coupled with Activated Sludge Aeration Waste Heat&lt;br&gt;Drew W Johnson (The University of Texas at San Antonio)</td>
<td>22a - Novel Spirocyclic Polymers for Membrane-based Organic Solvent Separations&lt;br&gt;Ronita Mathias (Georgia Institute of Technology)</td>
<td>20a - Air Products Hybrid Membrane Adsorption&lt;br&gt;Cory E Sanderson (Air Products and Chemicals)</td>
<td>19a - Minimizing the cost of membrane distillation&lt;br&gt;Timothy V Bartholomew (Carnegie Mellon University)</td>
<td>18a - High temperature gas separation properties of sub-micron polybenzimidazole membranes&lt;br&gt;Melanie M Merrick (The University of Texas at Austin)</td>
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<td>21b - Smart High Recovery RO Boosts Recovery Rate to More Than 90% for Reuse Purposes&lt;br&gt;Ronit Erlitzki (AdEdge Water Technologies)</td>
<td>22b - 3D Printed fouling resistant composite membranes&lt;br&gt;Davide Mattia (University of Bath)</td>
<td>20b - Hybrid Distillation and Facilitated Transport Membrane Processes for C3 Splitter&lt;br&gt;Debottlenecking&lt;br&gt;Christine Parrish (Compact Membrane Systems)</td>
<td>19b - Process Optimization Using Perturbation Expansion Solutions for Membrane Gas Separation Modules&lt;br&gt;Glenn Lipscomb (University of Toledo)</td>
<td>18b - Thermally Rearranged Semi-interpenetrating Polymer Network (TR-SIPN) Membranes for Olefin/Paraffin Separations&lt;br&gt;Young Moo Lee (Hanyang University)</td>
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<td>3:00</td>
<td>21c - Membrane Distillation for Enhanced Water Recovery by Inland Brackish Water Desalination Plants&lt;br&gt;Zhewei Zhang (University of Pittsburgh)</td>
<td>22c - Next-Generation Membranes Using Thin-Film Lift Off&lt;br&gt;Mackenzie Anderson (UCLA)</td>
<td>20c - Water Recovery via Forward Osmosis - Freeze Concentration&lt;br&gt;Vladimiro Papangelakis (University of Toronto)</td>
<td>19c - Multi-physics Simulation of Hollow Fiber Vacuum Membrane Distillation Using OpenFoam&lt;br&gt;Albert Kim (University of Hawaii)</td>
<td>18c - Conformation-controlled molecular sieving effect for membrane-based propylene/propane separation&lt;br&gt;Yang Liu (Georgia Institute of Technology)</td>
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<td>21d - Selective Separation of Industrial Relevant Metal Ions from High TDS Water using Wafer-Enhanced Electrodeionization (WE-EDI)</td>
<td>22d - Interfacial Junctions Control Electrolyte Transport Through Charge-Patterned Membranes&lt;br&gt;Bill Phillip (University of Notre Dame)</td>
<td>20d - Leverage membrane technology in process intensification and new application design - from early stage design to technical scale implementation&lt;br&gt;Peter Kreis (Evonik Technology &amp; Infrastructure GmbH)</td>
<td>19d - Scale-up of Facilitated Transport Membrane Module for CO2 Capture from Flue Gas&lt;br&gt;Kai Chen (Ohio State University)</td>
<td>18d - Mixed matrix materials containing soluble discrete metal-organic polyhedra in rubbery polyethers for CO2/gas separation&lt;br&gt;Haiqing Lin (The State University of New York at Buffalo)</td>
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<tr>
<td>4:00</td>
<td>21e - Pilot Evaluation of Closed Circuit Reverse Osmosis (CCRO) for Treatment of RO Concentrate for Potable Reuse&lt;br&gt;Han Gu (Orange County Water District)</td>
<td>22e - Fabrication of Inside-Out Isoporous Hollow Fiber Membranes via Spinning and Coating Methods&lt;br&gt;Kirit Sankhala (Heinrich-Zentrum Geesthacht, Geesthacht)</td>
<td>20e - Carbon Capture utilizing Hybrid Membrane/Liquifauction&lt;br&gt;David Hasse (Air Liquide)</td>
<td>19e - Development of industrial scale polyvinylidene fluoride transfer membrane&lt;br&gt;Marta E Bojarska (GVS Fitter Technology)</td>
<td>18e - Accessing novel microporous polymers to enhance yield, stereoochemical control, and membrane performance in the recovery of light hydrocarbons from natural gas&lt;br&gt;John Lawrence (Aramco)</td>
</tr>
<tr>
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<td>21f - Brine Treatment for Minimal and ZLD&lt;br&gt;Malynda Cappelle (The University of Texas at El Paso)</td>
<td>22f - Empirical evidence suggests that polyamide film formation during interfacial polymerization in thin film composite (TFC) membranes is not self-limiting&lt;br&gt;Kasia Grzebyk (University of North Carolina at Chapel Hill)</td>
<td>20f - Membrane distillation hybridized with a thermoelectric heat pump for energy-efficient water treatment and space cooling&lt;br&gt;Jia Wei Chew (Nanyang Technological University)</td>
<td>19f - Low energy seawater desalination using multistage electrodialysis&lt;br&gt;Gis Doornbusch (Technical University Eindhoven/ Wetsus)</td>
<td>18f - Insight into the transport in polymeric and mixed matrix membranes via analysis of unique mixed gas diffusion coefficients&lt;br&gt;Johannes Carolus (John) Jansen (National Research Council of Italy)</td>
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### Sessions Summary

**WEDNESDAY AM**

#### Parallel Sessions

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<tr>
<th>Time</th>
<th>Ballroom 3</th>
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<th>Kings Garden 3</th>
<th>Kings Garden 4</th>
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<td>7:45</td>
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#### Plenary Session 3 - Dr. Rachel Segalman, Polymeric Ionic Liquids: A New Platform for Materials and Energy

<table>
<thead>
<tr>
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<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
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<td>9:00</td>
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</table>

#### 9:30

**23a - Creation of well-defined "mid-sized" micropores in carbon molecular sieve membranes for organic solvent separations**

Yao Ma (Georgia Institute of Technology)

**24a - Experimental and Theoretical Investigations of the Loss of Protein Sieving Due to Fouling of ATF Microfilters**

Alex Apostolidis (Amgen)

#### 10:00

**25a - A systematic approach to remove bottlenecks in high concentration UF/DF for subcutaneous application of biological drug substances**

Hasin M Feroz (Bristol-Myers Squib)

**26a - Artificial Water Channels - toward biomimetic membranes for desalination**

Mihail Barboiu (Institut European des Membranes)

**28a - Crack-resistance of graphene membranes with a robust performance in gas mixture separation**

Chuyang Y Tang (University of Hong Kong / University of New South Wales)

#### 10:30

**25b - Continuous Diafiltration for cGMP Biomanufacturing**

Akshat Gupta (MilliporeSigma)

**26b - Self-Assembly of Long-Lasting Lipid Bilayers and the Effect of Temperature of their Ion Rejection**

Yair Kaufman (Ben Gurion University of the Negev)

**28c - Mechanism of chlorine attack during with transfer assisted TIPS - the Plugging**

Hideto Matsuyama (Kobe University)

#### 11:00

**25d - Treating Poultry Processing Wastewaters by Combined Electrocoagulation and Ultrafiltration**

Ranil Wickramasingha (University of Arkansas)

**26d - Scalable High-Performance Membranes with High Density Channel Protein-Polymer Nanosheets**

Yu-Ming Tu (Penn State University)

**23d - Unprecedented CO2/H2 Selectivity and CO2 Permeance Demonstrated in Facilitated Transport Membranes with Tunable Amine-CO2 Chemistry**

Yang Han (Ohio State University)

#### 11:30

**25e - Mass transfer assisted TIPS process to precisely tailor the hollow fiber membrane surface and sublayer structures**

Hideto Matsuyama (Kobe University)

**26e - Fabrication of aquaporin-based biomimetic membrane for seawater desalination**

Ye Li (Nanyang Technological University)

**24e - Unraveling the Plugging Mechanisms during a Combined Tangential-flow and Depth Filtration Process**

Xianghong Qian (University of Arkansas)

**23e - Engineering the Nanochannels in Reduced Graphene Oxide Membrane for Dye Desalination**

Liang Huang (The State University of New York at Buffalo)

#### 12:00

**25f - Organic solvent resistant membranes obtained by using non-toxic solvents**

Stefan Chisca (King Abdullah University of Science and Technology)

**26f - Biomimetic channel membranes: can they realize their full potential upon scale-up?**

Viatcheslav Freger (Technion - IIT)

**24f - Functionalized Microporous Membranes for Protein Capture and Analysis**

Joshua Berwanger (University of Notre Dame)

**23f - Impact of module design on heat transfer and Nusselt correlation selection in membrane distillation**

Alexander V Dudchenko (Carnegie Mellon University)

**27f - Operando Membrane Spectroscopy for Elucidating Transport Mechanisms in Membranes**

Casey O’Brien (University of Notre Dame)
## Sessions Summary

### Wednesday PM

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<tr>
<th>Parallel Sessions</th>
<th>BALLROOM 4</th>
<th>KINGS GARDEN 3</th>
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<tr>
<td>2:00</td>
<td>28a - Biofouling resistant membranes for wound healing</td>
<td>31a - Optimizing Microfluidic Nanoparticle Capture from Biofluids on Ultrathin Silk Nanomembranes: A Computational and Experimental Analysis of Tangential Flow Analyte Capture (TFAC)</td>
<td>30a - Numerical and experimental studies on the deposition of sticky particles near a membrane surface</td>
<td>29a - A novel method to distinguish between crystal and defect transport in zeolite membranes</td>
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<tr>
<td>2:30</td>
<td>29a - A Holistic Approach to Explore Interfacially Confined Ionomers Designed for Energy Conversion Device</td>
<td>32b - Anion Conducting Membranes Based on Poly(norbornene): High Conductivity, Chemical Stability and Fuel Cell Performance &gt;2.5 W/cm²</td>
<td>30b - Characterization of the Striping Phenomenon during Membrane Fouling via Optical Coherence Tomography</td>
<td>29b - Study on antifouling behaviors of GO modified nanocomposite membranes through QCMD and surface energetics analysis</td>
</tr>
<tr>
<td>3:00</td>
<td>28c - Biomimetic membrane systems utilizing electro-dynamic interfaces</td>
<td>31c - Characterization of EV Secretion at Single Cell Resolution</td>
<td>30c - A closer look at biofouling: time-lapse optical microscopy of biofilm formation in wastewater reuse</td>
<td>29c - 3D characterization of polyelectrolyte reverse osmosis membranes</td>
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<tr>
<td>3:30</td>
<td>28d - Responsiveness and function of DNA-gated membranes</td>
<td>31d - Charge, size distribution and hydrophobicity of viruses: Effect of the virus purification method</td>
<td>30d - Improved graphene oxide membrane increases membrane distillation desalination of RO concentrate</td>
<td>29d - Selective Ion Transport Properties of Membrane Materials</td>
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<td>4:00</td>
<td>30e - Automated real-time membrane biofouling assessment using microbial enzyme activity</td>
<td>31e - Membrane-based oil-gas separation for dissolved gas-in-oil extraction: gas transport properties of ceramic supported Teflon membranes</td>
<td>29e - Membrane-based oil-gas separation for dissolved gas-in-oil extraction: gas transport properties of ceramic supported Teflon membranes</td>
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<tr>
<td>4:30</td>
<td>31f - Use of Nanosphere Self-Assembly to Pattern Nanoporous Membranes for the Study of Extracellular Vesicles</td>
<td>30f - Interactions between extracellular polymeric substances and zwitterionic hydrogels as a designing tool for antifouling surfaces</td>
<td>29f - Porous support of TFC membranes: Does it truly have negligible resistance?</td>
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### Additional Details
- **Presenting author listed**
ORAL SESSIONS

Presenting authors are indicated by an asterisk*. See the most up-to-date version of the program with abstracts at nams2019.org or via the Attendify (NAMS 2019) app.

Plenary Session 1
7:45 am - 9:00 pm  |  Ballroom 1
Dr. Peter S. Fiske
Lawrence Berkeley National Laboratory
Innovation Pathways in the Water Ecosystem: The PAX Water Story

#1 Processes: Fundamentals of Predicting and Preventing Membrane Fouling
9:30 am - 12:30 pm  |  Kings Garden 4

Co-Chairs: Manish Kumar (Penn State University), Davide Mattia (University of Bath), Saifur Rahaman (Concordia University)

9:30 am  MONDAY
1a - Hydrodynamic-colloidal interactions of an oil droplet and a membrane surface
Mariano Galvagno (Technion - Israel Institute of Technology), Guy Z Ramon (Technion - Israel Institute of Technology)*

10:00 am  MONDAY
1b - Do Graphene Oxide Nanostructured Coatings Mitigate Bacterial Adhesion to Membrane Interfaces?
Santiago Romero-Vargas Castrillon (University of Edinburgh)*, Sara BinAhmed (University of Minnesota), Karl Wuolo-Journey (University of Minnesota)

10:30 am  MONDAY
1c - Fouling mechanisms in constant flux crossflow ultrafiltration
Alon Kirschner (The University of Texas at Austin)*, Yu-Heng Cheng (The University of Texas at Austin), Donald Paul (The University of Texas at Austin), Robert Field (University of Oxford), Benny Freeman (The University of Texas at Austin)

11:00 am  MONDAY
1d - Fouling-Resistant, Multi-Functional Membranes with Ultra-Thin Hydrogel Selective Layers using Interfacially Initiated Free Radical Polymerization (IIFRP)
Ayse Asatekin (Tufts University)*, Ilin Sadeghi (Tufts University), Eric Liu (Tufts University), Alice Oliveira Aguiar (Tufts University), Hyunmin Yi (Tufts University)

11:30 am  MONDAY
1e - Unravel the Gordian Knot of membrane desalination: Understanding and mitigating silica scaling in reverse osmosis
Tiezheng Tong (Colorado State University)*, Song Zhao (Tianjin University), Amanda Quay (Carnegie Mellon University), Yunlong Qi (Tianjin University)

12:00 pm  MONDAY
1f - RO Mineral Scale Mitigation via Self-Adaptive Feed-Flow Reversal
Yeunha Kim (UCLA)*, Anditya Rahardianto (UCLA), Tae Lee (UCLA), Yoram Cohen (UCLA)

#2 Processes: Membrane Distillation and Pervaporation: Innovations in Process Design and Scalability
9:30 am - 12:30 pm  |  Ballroom 3

Co-Chairs: Lee Vane (Environmental Protection Agency), David Warsinger (Purdue University)

9:30 am  MONDAY
2a - Continuous on-demand dehydration of solvents in flow chemistry manufacturing processes
Hannah Murnen (Compact Membrane Systems)*, Sudip Majumdar (Compact Membrane Systems)

10:00 am  MONDAY
2b - How membrane technology has been successfully applied to ethanol processing
Stephan Blum (Whitefox Technologies)*, Trond Heggenhougen (Whitefox Technologies), Meridith K. Bridge (Whitefox Technologies)
10:30 am  MONDAY
2c - Modeling the effect of different single-walled carbon nanotube orientations on permeation through mixed matrix membranes
Ali Zamani (University of Ottawa)*, Jules Thibault (University of Ottawa), Handan Tezel (University of Ottawa)

11:00 am  MONDAY
2d - Unique 3D printed spacers for process enhancement in membrane distillation
Navya Thomas (Khalifa University)*, Nurshaun Sreedhar (Khalifa University), Oraib Al-Ketan (Khalifa University), Reza Rowshan (New York University Abu Dhabi), Rashid Abu Al-Rub (Khalifa University), Hassan Arafat (Khalifa University)

11:30 am  MONDAY
2e - 2D boron nitride encapsulated nanofiber membranes for membrane distillation
Yunchul Woo (Korea Institute of Civil Engineering and Building Technology)*, Ho Kyong Shon (University of Technology Sydney), June-Seok Choi (Korea Institute of Civil Engineering and Building Technology)

12:00 pm  MONDAY
2f - Impact of membrane properties on scaling-induced wetting in membrane distillation
Allyson L McGaughey (University of Southern California)*, Prathamesh Karandikar (University of Southern California), Malancha Gupta (University of Southern California), Amy Childress (University of Southern California)

#3 Applications: Seawater Desalination
9:30 am - 12:30 pm  |  Kings Garden 3

Co-Chairs: Sunny Jiang (UC Irvine), Bill Phillip (University of Notre Dame)

10:00 am  MONDAY
3b - Water Transport through Ultrathin Polyamide Nanofilms Used for Reverse Osmosis
Zhiwei Jiang (Imperial College London)*, Santanu Karan (Imperial College London), Andrew Livingston (Imperial College London)

10:30 am  MONDAY
3c - Balancing Carbon, Nitrogen and Phosphorus Concentration in Seawater as a Strategy to Prevent Accelerated Membrane Biofouling
Siqian (Simon) Huang (University of Minnesota, Duluth), Nikolay Voutchkov (Water Globe Consultants, LLC), Sunny Jiang (UC Irvine)*

11:00 am  MONDAY
3d - Flow Reversal for Increased Recovery of 2nd Pass Seawater RO
Tomer Osman (Rotec Water Ltd.), Dan Peled (AST-Water Ltd.), Noam Perlmutter (Rotec Water Ltd.), Arina Shulman (Mekorot Water Company), Riki Harpness (Mekorot Water Company), Sivan Bleich (Mekorot Water Company), Eli Korin (Ben-Gurion University of the Negev), Jack Gilron (Ben-Gurion University of the Negev)*

11:30 am  MONDAY
3e - Zwitterionic poly(arylene ether sulfone) (PAES) copolymer for biofouling/chlorine resistant desalination membranes
Yi Yang (Arizona State University)*, Matthew Green (Arizona State University)

12:00 pm  MONDAY
3f - Chlorine resistance of functionalized HNTs-based TFN membranes
Farhad Asempour (University of Ottawa), Somaye Akbari (Amirkabir University of Technology), Du Bai (University of Ottawa), Ramzi Aoun (University of Ottawa), Sofia Reyes Lombardo (University of Ottawa), Amirsajad Atashgar (University of Ottawa), Boguslaw Kruczek (University of Ottawa)*
#4 Materials: Selective Polymeric and Mixed-Matrix Materials - Liquid Separations

9:30 am - 12:30 pm | Ballroom 4

Co-Chairs: Dan Miller (Lawrence Berkeley National Laboratory), Baoxia Mi (UC Berkeley)

9:30 am MONDAY
4a - Enantioselective Polymeric Membrane for Chiral Separation of Enantiomers
Marine Michel (Imperial College London)*

10:00 am MONDAY
4b - Tailored Synthesis of Inorganic-supported Polymer, Graphene, and Nanocomposite Membranes for Liquid-phase Separations
Michael Z Hu (Oak Ridge National Laboratory)*

10:30 am MONDAY
4c - Two-Dimensional (2D) Covalent Organic Framework Mixed-Matrix Membranes
Phuoc Duong (University of Wyoming), Valerie Kuehl (University of Wyoming), Bruce Mastorovich (University of Wyoming), John Hoberg (University of Wyoming), Bruce Parkinson (University of Wyoming), Katie D Li-Oakey (University of Wyoming)*

11:00 am MONDAY
4d - Enhancing water permeance in reduced graphene oxide membranes by chemical etching
Xiaoyi Chen (The State University of New York at Buffalo)*, Liang Huang (The State University of New York at Buffalo), Zhihao Feng (The State University of New York at Buffalo), Janavi Gohil (The State University of New York at Buffalo), Haiqing Lin (The State University of New York at Buffalo)

11:30 am MONDAY
4e - Nanocomposite RO Membranes with High Aspect Ratio Functional Nanoparticles for Controlled Interfacial Transport
Stephen M Martin (Virginia Tech)*, Ethan Smith (Virginia Tech), E. Johan Foster (Virginia Tech), Keith Hendren (Virginia Tech), James Haag (Virginia Tech)

12:00 pm MONDAY
4f - If one were to develop a new NF/RO membrane, specifically for uncharged organic solute rejection, how permeable could it be to water while meeting organic solute rejection goals?
Eric Hoek (UCLA)*

#5 Materials: Inorganic Materials

9:30 am - 12:30 pm | Kings Garden 1

Co-Chairs: Jay Kniep (Membrane Technology & Research), Jerry Lin (Arizona State University)

9:30 am MONDAY
5a - Two-Dimensional Membranes for Gas Separation
Dan Zhao (National University of Singapore)*

10:00 am MONDAY
5b - Restricting Lattice Flexibility in Polycrystalline Metal-Organic Framework Membrane for Efficient Carbon Capture
Deepu Babu (L'Ecole polytechnique fédérale de Lausanne), Kumar Varoon Agrawal (L'Ecole polytechnique fédérale de Lausanne)*

10:30 am MONDAY
5c - New Asymmetric and Permselective Carbon Molecular Sieve Membranes
Jay (Junqiang) Liu (The Dow Chemical Company)*, Ted Calverley (The Dow Chemical Company), Dean Millar (The Dow Chemical Company), Mark Brayden (The Dow Chemical Company), Marcos Martinez (The Dow Chemical Company)

11:00 am MONDAY
5d - Hitz zeolite membrane separation system (HDS) for gas separation
Masaya Itakura (Hitachi Zosen Corporation)*, Satoshi Imasaka (Hitachi Zosen Corporation), Kentaro Shinoya (Hitachi Zosen Corporation), Masashi Okada (Hitachi Zosen Corporation)
11:30 am MONDAY
5e - Insights on the Carbon Molecular Sieve Structure from Stability and Rejuvenation Tendencies
Samuel Hays (Georgia Institute of Technology)*, Oishi Sanyal (Georgia Institute of Technology), Nicholas Leon (Georgia Institute of Technology), Chen Zhang (University of Maryland), Pezhman Arab (Georgia Institute of Technology), William Koros (Georgia Institute of Technology)

12:00 pm MONDAY
5f - Fabrication of zeolitic imidazolate framework ZIF-8 membranes by ligand-induced permselectivation in vapor phase
Xiaoli Ma (University of Wisconsin-Milwaukee)*, Prashant Kumar (University of Minnesota), Nitish Mittal (University of Minnesota), Alexandra Khlyustova (University of Minnesota), Prodromos Doutidis (University of Minnesota), Andre Mkhoyan (University of Minnesota), Michael Tsapatsis (Johns Hopkins University)

#6 Applications: Assessing Performance, Robustness, and Scalability for Carbon Capture
9:30 am - 12:30 pm | Kings Garden 5
Co-Chairs: Dave Hopkinson (U.S. Department of Energy National Energy Technology Laboratory), Winston Ho (Ohio State University)

9:30 am MONDAY
6a - Polymers with Side Chain Porosity for Ultrapermeable and Plasticization Resistant Materials for Gas Separations
Sharon Lin (MIT)*, Francesco Benedetti (University of Bologna), Yuan He (MIT), Chao Liu (University of Chinese Academy of Sciences), Yanchuan Zhao (University of Chinese Academy of Sciences), Hong-Zhou Ye (MIT), Troy Van Voorhis (MIT), Maria Grazia De Angelis (University of Bologna), Timothy Swager (MIT), Zach Smith (MIT)

10:00 am MONDAY
6b - Bench scale testing of next generation hollow fiber membrane modules at subambient conditions at the National Carbon Capture Center
David Hasse (Air Liquide)*, Shilu Fu (Air Liquide), Sudhir Kulkarni (Air Liquide), Trapti Chaubey (Air Liquide), Alexander Augustine (Air Liquide), Andrew Hamilton (Air Liquide), Monaca Mcnall (Air Liquide)

10:30 am MONDAY
6c - A Carbon Molecular Sieve Membrane-Based Reactive Separation Process for Pre-Combustion CO2 Capture
Mingyuan Cao (University of Southern California), Linghao Zhao (University of Southern California), Dongwan Xu (University of Southern California), Secgin Karagoz (UCLA), Patricia Pichardo (UCLA), Richard J. Ciota, Jr. (Media and Process Technology, Inc.), Paul Kt Liu (Media and Process Technology, Inc.), Vasilios I. Manousioutheakis (UCLA), Theodore T Tsotsis (University of Southern California)*

11:00 am MONDAY
6d - Synthesis of Polymers of Intrinsic Microporosity (PIM-1) with Poly(ethylene glycol) for Membrane Application
Volkan Filiz (Helmholtz-Zentrum Geesthacht)*, Gisela Bengtson (Helmholtz-Zentrum Geesthacht), Silvio Neumann (Helmholtz-Zentrum Geesthacht)

11:30 am MONDAY
6e - High-permeance polymer-functionalized graphene membranes that surpass the postcombustion carbon capture target
Guangwei He (L'Ecole polytechnique fédérale de Lausanne), Kumar Varoon Agrawal (L'Ecole polytechnique fédérale de Lausanne)*
12:00 pm MONDAY
6f - Fabrication of Thin Film Composite Membranes using Microporous Polymer Blends and Polybenzimidazole Nanoporous Supports for CO₂/N₂ Separation

#7 Applications: Assessing Performance, Robustness, and Scalability for Carbon Capture
2:00 pm - 5:00 pm | Kings Garden 5

Co-Chairs: Dave Hopkinson (U.S. Department of Energy National Energy Technology Laboratory), Winston Ho (Ohio State University)

2:00 pm MONDAY
7a - Field trial of spiral-wound facilitated transport membrane module for CO₂ capture from flue gas
Yang Han (Ohio State University)*, Witopo Salim (Ohio State University), Kai Chen (Ohio State University), Dongzhu Wu (Ohio State University), Winston Ho (Ohio State University)

2:30 pm MONDAY
7b - Gen-2 Proteus™ membrane and module development for CO₂ capture from gasification streams
Witopo Salim (Membrane Technology & Research Inc.)*, Karl Amo (Membrane Technology & Research Inc.), Trevor Carlisle (Oregon State University), Richard Baker (Membrane Technology & Research Inc.), Jenny He (Membrane Technology & Research Inc.), Jay Kniep (Membrane Technology & Research Inc.), Tim Merkel (Membrane Technology & Research Inc.), Vincent Nguyen (Membrane Technology & Research Inc.), Zhen Sun (Membrane Technology & Research Inc.), Jonathan Tan (Membrane Technology & Research Inc.), Bob Watson (Membrane Technology & Research Inc.), Erik Westling (Membrane Technology & Research Inc.)

3:00 pm MONDAY
7c - One-pot surface modification of nanocellulose fibrils and effect of manipulated fibril surfaces in Hybrid Facilitated Transport Membranes for CO₂ capture
Saravanan Janakiram (Norwegian University of Science and Technology)*, Xinyi Yu (Norwegian University of Science and Technology), Luca Ansaloni (SINTEF Industry), Zhongde Dai (Norwegian University of Science and Technology), Liyuan Deng (Norwegian University of Science and Technology)

3:30 pm MONDAY
7d - DDR-type zeolite membrane: The first opportunity in CO₂-EOR industry
Junya Okazaki (JGC Corporation)*, Hiroaki Hasegawa (JGC Corporation), Nobuyasu Chikamatsu (JGC Corporation), Kenji Yajima (NGK Insulators), Katsuya Shimizu (NGK Insulators), Makiko Niino (NGK Insulators)

4:00 pm MONDAY
7e - Coating of hollow fiber membrane for carbon molecular sieve membrane preparation
Yuhe Cao (Georgia Institute of Technology)*, Kuang Zhang (Georgia Institute of Technology), Dishi Sanyal (Georgia Institute of Technology), William Koros (Georgia Institute of Technology)

4:30 pm MONDAY
7f - Ultrapermeable benzotriptycene-based PIMs that redefine the upper bounds for CO₂ separations
Alessio Fuoco (National Research Council of Italy)*, Bibiana Comesaña-Gándara (University of Edinburgh), Jie Chen (University of Edinburgh), Grazia Bezzu (University of Edinburgh), Mariolino Carta (Swansea University), Ian Rose (University of Edinburgh), Maria-Chiara Ferrari (University of Edinburgh), Johannes Carolus (John) Jansen (National Research Council of Italy), Elisa Esposito (National Research Council of Italy), Marcello Monteleone (National Research Council of Italy), Neil McKeown (University of Edinburgh)
#8 Processes: Innovations in Module Modeling and Design

2:00 pm - 5:00 pm | Ballroom 3

Co-Chairs: David Ladner (Clemson University), Grigorius Panagakos (U.S. Department of Energy National Energy Technology Laboratory)

2:00 pm MONDAY
8a - CFD simulation of crimped hollow fiber membranes for liquid separation processes
Mohammad Younas (University of Engineering and Technology, Peshawar)*, Amir Muhammad (University of Engineering and Technology, Peshawar), Glenn Lipscomb (University of Toledo)

2:30 pm MONDAY
8b - Computational Fluid Dynamics Modeling for the Investigation of Multi-Layer Spacer Effects
Zachary Binger (The University of Arizona), Andrea Achilli (The University of Arizona)*

3:00 pm MONDAY
8c - Direct numerical simulation of unsteady mixing in direct contact membrane distillation systems with membrane spacers
Jincheng Lou (Colorado School of Mines)*, Jacob Johnston (Colorado School of Mines), Nils Tilton (Colorado School of Mines)

3:30 pm MONDAY
8d - Concentration polarization modeling for high-pressure membranes with engineered surface features
Zuo Zhou (Clemson University)*, David Ladner (Clemson University), Sapna Sarupria (Clemson University), Steven Weinman (Clemson University), Scott Husson (Clemson University), Ilenia Battiato (Stanford University), Negin Kananizadeh (Clemson University)

4:00 pm MONDAY
8e - Analysis of Micromixers to Minimize Scaling Effects on Reverse Osmosis Membranes
Jeremy Walker (U.S. Army)*, Shawn McElmurry (Wayne State University), James Dusenbury (U.S. Army)

4:30 pm MONDAY
8f - Do Hydrodynamic Instabilities Cause Roughness in Thin Polyamide Films of Reverse Osmosis Membranes?
Akshay Deshmukh (Yale University)*, Puskar Mondal (Yale University), Subhajyoti Chaudhuri (Yale University), Menachem Elimelech (Yale University)

#9 Processes: Osmotically-Driven Membrane Processes for Water and Energy

2:00 pm - 5:00 pm | Ballroom 4

Co-Chairs: Tony Straub (University of Colorado Boulder/MIT), Aaron Wilson (Idaho National Lab), Emily Tow (Olin College), Chris Gorski (Penn State University), Kitty Nijmeijer (Eindhoven University of Technology)

2:00 pm MONDAY
9a - Structural and Transport Properties of Membranes in High-Salinity Desalination using Cascading Osmotically Mediated Reverse Osmosis
Xi Chen (Columbia University)*, Chanhee Boo (Columbia University), Ngai Yin Yip (Columbia University)

2:30 pm MONDAY
9b - Utilization of reverse solute diffusion to enhance membrane performance during osmotically driven processes - improved boron retention and silica scaling mitigation
Yining Wang (Nanyang Technological University)*, Weiyi Li (Southern University of Science and Technology), Chuyang Tang (University of New South Wales), Rong Wang (Nanyang Technological University)

3:00 pm MONDAY
9c - Osmotic Membrane Desalination Performance Governed by Molecular Reflection at the Liquid-Vapor Interface
Akshay Deshmukh (Yale University), Jongho Lee (University of British Columbia)*
3:30 pm  MONDAY
9d - Characterization of External and Internal Fouling of Forward Osmosis (FO) Process Through Ultrasonic Time Domain Reflectometry (UTDR) Method
Li Lai (Nanyang Technological University)*, Tzyy Haur Chong (Singapore Membrane Technology Centre)

4:00 pm  MONDAY
9e - Incorporating membrane deformation into the boundary layer equation to model water and reverse salt flux in osmotic processes
Jaime A Idarraga-Mora (Clemson University)*, Alton O’Neal (Clemson University), Morgan Pfeiler (Clemson University), David Ladner (Clemson University), Scott Husson (Clemson University)

4:30 pm  MONDAY
9f - A Thin-Film Forward-Osmosis Membrane Made from a Graphene Oxide-Silver Metal-Organic Framework Nanocomposite: Antifouling and Antibiofouling Assessment
Mostafa Dadashi Firouzjaei (University of Alabama), Ahmad Arabi Shamsabadi (Drexel University), Mohammad Sharifian Gh (University of Virginia), Milad Rabbani Esfahani (University of Alabama)*, Ahmad Rahimpour (Noshirvani University of Technology), Masoud Soroush (Drexel University)

#10 Applications: Water Reuse
2:00 pm - 5:00 pm  |  Kings Garden 4
Co-Chairs:  Pei Xu (New Mexico State University), Jack Gilron (Ben-Gurion University of the Negev)

2:00 pm  MONDAY
10a - Tannic acid-iron network based green technique for enhanced membrane performance in water reuse
Hao Guo (The University of Hong Kong)*

2:30 pm  MONDAY
10b - Membrane Distillation (MD) and Reverse Osmosis (RO) processes for water recovery from pre-treated high strength brewery wastewater
Nawrin Anwar (Concordia University)*, Mahbuboor Choudhury (Concordia University), Saifur Rahaman (Concordia University)

3:00 pm  MONDAY
10c - Field Demonstration of Real-Time Colloidal Particle Monitoring to Improve MF and UF Membrane Performance
Jana Safarik (Orange County Water District)*, Ganesh Rajagopalan (Kennedy/Jenks Consultants), Helia Safaee (Kennedy/Jenks Consultants), Megan Plumlee (Orange County Water District), Zita Yu (West Basin Municipal Water District)

3:30 pm  MONDAY
10d - Selective removal of phosphorus from wastewater using electromembrane process
Sanhita Chaudhury (Ben-Gurion University of the Negev)*, Oded Nir (Ben-Gurion University of the Negev)

4:00 pm  MONDAY
10e - Water Recovery from Produced Water via Robust Membrane Distillation
Rong Wang (Nanyang Technological University)*

4:30 pm  MONDAY
10f - Potable-quality water recovery from primary effluent through an integrated algal-osmosis membrane system
Lu Lin (New Mexico State University)*, Wenbin Jiang (New Mexico State University), Pei Xu (New Mexico State University)
#11 Materials: Ion-Exchange and Electrofunctional Materials

**2:00 pm - 5:00 pm | Kings Garden 1**

**Co-Chairs:** Geoff Geise (University of Virginia), Orlando Coronell (University of North Carolina at Chapel Hill)

**2:00 pm MONDAY**

11a - Ion Transport Through Perforated Nanoporous Graphene  
Mandakranta Ghosh (University of Twente)*, Koen F. A. Jorissen (University of Twente), Jeffery A. Wood (University of Twente), Rob G. H. Lammertink (University of Twente)

**2:30 pm MONDAY**

11b - Developing a new approach to describe ion sorption and transport in Nafion membranes  
Rahul Sujanani (The University of Texas at Austin)*, Jovan Kamcev (UC Berkeley), Eui-Soung Jang (The University of Texas at Austin), Benny Freeman (The University of Texas at Austin), Donald Paul (The University of Texas at Austin)

**3:00 pm MONDAY**

11c - Co-transport of neutral solutes in Nafion 117 using In-situ ATR FTIR spectroscopy for multicomponent solution speciation  
Breanna Dobyns (Auburn University)*, Bryan S Beckingham (Auburn University)

**3:30 pm MONDAY**

11d - Functionalized Nanoporous Ceramic Membranes Towards Low-Cost Electrodialysis  
Gregory M Newbloom (Membrion, Inc.)*, Ryan Kingsbury (Membrion, Inc.), Rachel Malone (Membrion, Inc.)

**4:00 pm MONDAY**

11e - Polymerization of counterions in self-assembled, 1 nm pores of lyotropic liquid crystal anion exchange membrane to tune nanopore and ion transport properties  
Michael J. McGrath (University of Colorado at Boulder)*, Samantha Hardy, Andrew Basalla (University of Colorado Boulder), Hans Funke (University of Colorado Boulder), Bryce Manubay (University of Colorado Boulder), Zhangxing Shi (University of Colorado Boulder), Douglas Gin (University of Colorado Boulder), Richard Noble (University of Colorado Boulder)

**4:30 pm MONDAY**

11f - Quantifying tortuosity and diffusion over multiple scales in ionic and non-ionic polymer membranes  
Louis Madsen (Virginia Tech)*

#12 Materials: Membrane Material and Transport Simulation: Molecular & Process Modeling of Membranes

**2:00 pm - 5:00 pm | Kings Garden 3**

**Co-Chairs:** Chris Wilmer (University of Pittsburgh), Abhishek Roy (The Dow Chemical Company)

**2:00 pm MONDAY**

12a - Expanding the chemical palette for reliable chemical separations using molecular simulations and machine learning  
David Sholl (Georgia Institute of Technology)*, Farhad Gharagheizi (Georgia Institute of Technology), Dai Tang (Georgia Institute of Technology)

**2:30 pm MONDAY**

12b - Diffusion, Reaction, and Network Structure Modeling of Interfacial Polymerization of Polyamide Membranes  
Jeffrey D. Wilbur (DuPont Water Solutions)*, Toni Bechtel (DuPont Water Solutions), Matthew Jansma (DuPont Water Solutions), Steve Rosenberg (DuPont Water Solutions), Dan Arriola (DuPont Water Solutions)
3:00 pm  MONDAY
12c - Optimization of Mixed Matrix Membrane Materials for Post-Combustion Carbon Capture
Janice A. Steckel (U.S. Department of Energy National Energy Technology Laboratory)*, Samir Budhathoki (U.S. Department of Energy National Energy Technology Laboratory), Miguel Zamarripa-Perez (U.S. Department of Energy National Energy Technology Laboratory), Paul Boone (University of Pittsburgh), Christopher Wilmer (University of Pittsburgh)

3:30 pm  MONDAY
12d - Diffusivity in anion exchange membranes under low hydration: A molecular dynamics study
Dario Dekel (Technion - Israel Institute of Technology), Israel Zadok (Technion - Israel Institute of Technology), Srdan Pusara (Technion - Israel Institute of Technology), Simcha Srebnik (Technion - Israel Institute of Technology)*

4:00 pm  MONDAY
12e - Modeling of polymer membrane formation via phase inversion by mesoscopic phase-field methods: Investigating the development of structure on multiple scales
Michael R Cervellere (University of Arkansas/EMD Millipore)*, Xianghong Qian (University of Arkansas), David Ford (University of Arkansas), Paul Millett (University of Arkansas)

4:30 pm  MONDAY
12f - Multiscale Modeling of Gas Permeation Through Poly(Dimethyl Phenylene Oxide) (PPO) and Its Pre-Steady State Polymer Response
Marielle Soniat (Lawrence Berkeley National Laboratory)*, Meron Tesfaye (Lawrence Berkeley National Laboratory), Daniel Brooks (CalTech), Nicholas Humphrey (USC), Lien-Chun Weng (Lawrence Berkeley National Laboratory), Boris Merinov (CalTech), William Goddard (CalTech), Adam Weber (Lawrence Berkeley National Laboratory), Frances Houle (Lawrence Berkeley National Laboratory)
Plenary Session 2
7:45 am - 9:00 pm | Ballroom 1
Dr. Tim Merkel
Membrane Technology and Research, Inc.
Development of Membranes for CO₂ Capture

#13 Processes: Process Innovations in Electrofunctional and Electrocatalytic Membrane Processes
9:30 am - 12:30 pm | Kings Garden 4
Co-Chairs: Charles-François de Lannoy (McMaster University), David Jassby (UCLA)

9:30 am TUESDAY
13a - Scaling mitigation in membrane distillation through electrokinetic mixing
Unnati Rao (UCLA)*, Guy Z Ramon (Technion - Israel Institute of Technology), Eric Hoek (UCLA), David Jassby (UCLA)

10:00 am TUESDAY
13b - Donnan dialysis desalination with thermolytic salts
Hanqing Fan (Columbia University)*, Ngai Yin Yip (Columbia University)

10:30 am TUESDAY
13c - Electrically Conductive Membranes as Sensors: Stability, Conductivity, and Sensitivity
Nan Zhang (McMaster University), Amin Halali (McMaster University), Charles-François de Lannoy (McMaster University)*

11:00 am TUESDAY
13d - Electrocatalytic Membrane Reactor-based Integrated Processes for Landfill Leachate Treatment
Jianxin Li (Tianjin Polytechnic University)*, Hong Wang (Tianjin Polytechnic University), Junhao Ding (Tianjin Polytechnic University)

11:30 am TUESDAY
13e - Nitrogen and Phosphorus Recovery from Agricultural Wastewater Effluents - Role of Electrically Conductive Membranes
Avner Ronen (Temple University)*, Kartikeya Kekre (Temple University)

12:00 pm TUESDAY
13f - Simulations of Highly Selective Separations Based on Electromigration
Merlin Bruening (University of Notre Dame)*, Andriy Yaroshchuk (Polytechnic University of Catalonia), Mykola Bondarenko (National Academy of Sciences of Ukraine), Chao Tang (University of Notre Dame), Muhammad Ahmad (University of Notre Dame)

#14 Applications: Contaminant Removal from Water Sources
9:30 am - 12:30 pm | Ballroom 3
Co-Chairs: Andre da Costa (Michigan Technological University), Prakhar Prakash (Chevron - RPE)

9:30 am TUESDAY
14a - Oil drop behavior on model nanofiltration membrane surfaces under conditions of hydrodynamic shear
Emily Tummons (Michigan State University), Charifa Hejase (Michigan State University)*, Zhefei Yang (University of Massachusetts Amherst), Jia Wei Chew (Nanyang Technological University), Merlin Bruening (University of Notre Dame), Vlad Tarabara (Michigan State University)

10:00 am TUESDAY
14b - A case study review of the application of reverse osmosis membranes for water treatment and reagent recovery at mining and mineral processing operations
Chris Biederman (Hatch)*, Jeffrey Cobbledick (Hatch)
10:30 am TUESDAY
14c - Self-Cleaning Nanocomposite Membranes with Phosphorene-Based Pore Fillers for Water Treatment
Joyner Eke (University of Kentucky)*, Isabel Escobar (University of Kentucky)

11:00 am TUESDAY
14d - Optimization of nanofiltration process for treating industrial wastewater of time-varying composition
Salman Alizadeh Kordkandi (McMaster University); Ryan LaRue (McMaster University)*; Abhishek Premachandra (McMaster University); Jacob Sitko (McMaster University); David Latulippe (McMaster University)

11:30 am TUESDAY
14e - Adsorptive and Reactive Membranes for Remediation of PFOA, Chloro-organics, and RCRA Metals from Water
DB Bhattacharyya (University of Kentucky)*, Hongyi (Derek) Wan (University of Kentucky), Anthony Saad (University of Kentucky), Md. Saiful Islam (University of Kentucky), Ashish Aher (University of Kentucky), Rollie Mills (University of Kentucky), Lindell Ormsbee (University of Kentucky), Evan Hatakeyama (Chevron)

12:00 pm TUESDAY
14f - Selective separation of mono- and di-valent cations in electrodialysis during brackish water desalination: bench and pilot-scale studies
Xuesong Xu (New Mexico State University)*, Pei Xu (New Mexico State University), Guanyu Ma (New Mexico State University)

#15 Materials: Materials for Organic Solvent Separations
9:30 am - 12:30 pm | Ballroom 4
Co-Chairs: Steve White (Membrane Technology & Research Inc.), Ryan Lively (Georgia Institute of Technology)

9:30 am TUESDAY
15a - Membrane solvent recovery in edible oil industry
Petrus Cuperus (SolSep BV)*, Ingrid Wienk (SolSep BV), Pieter Vandezande (VITO), Marco Pipolo (Bunge), Jan Kolijn (TUSTI), Will Fuchten (MTSA)

10:00 am TUESDAY
15b - Molecular Design of Polymeric Membranes for Organic Solvent Recovery
Tai-Shung Chung (National University of Singapore)*

10:30 am TUESDAY
15c - Epoxy-based solvent resistant nanofiltration membranes prepared through phase inversion
Maarten Bastin (KU Leuven)*, Jasper Raymenants (KU Leuven), Ivo Vankelecom (KU Leuven)

11:00 am TUESDAY
15d - Nanoporous Graphene Membranes for Organic Solvent Nanofiltration
David Cheng (MIT)*, Rohit Karnik (MIT)

11:30 am TUESDAY
15e - OSN Technology in Petrochemical Industry: Looking Back, Looking Forward
Dhaval Bhandari (ExxonMobil), JR Johnson* (ExxonMobil)

12:00 pm TUESDAY
15f - Enabling Organic Solvent Nanofiltration and Reverse Osmosis using Ceramic Supported TFC Membranes
Jeffrey R McCutcheon (University of Connecticut)*, Lingling Xia (University of Connecticut), Marcus Weyd (Fraunhofer Institute for Ceramic Technologies and Systems IKTS), Mi Zhang (University of Connecticut)
ORAL SESSIONS TUESDAY

#16 Materials: Catalytic and Responsive Materials
9:30 am - 12:30 pm | Kings Garden 3

Co-Chairs: Miao Yu (Rensselaer Polytechnic Institute), Ayse Asatekin (Tufts University)

9:30 am TUESDAY
16a - Responsive CNT Composite Membranes for Protection Against Chemical Warfare Agents
Melinda L Jue (Lawrence Livermore National Laboratory)*, Chiatai Chen (Cornell University), Yifan Li (MIT), Eric Meshot (Lawrence Livermore National Laboratory), Ngoc Bui (Lawrence Livermore National Laboratory), Rong Zhu (MIT), Myles Herbert (MIT), Sei Jin Park (Lawrence Livermore National Laboratory), Steven Buchsbaum (Lawrence Livermore National Laboratory), Kuang Jen Wu (Lawrence Livermore National Laboratory), Timothy Swager (MIT), Francesco Fornasiero (Lawrence Livermore National Laboratory)

10:00 am TUESDAY
16b - Highly Efficient Dimethyl Ether Production from CO₂ Hydrogenation in a Dehydration Membrane Reactor
Huazheng Li (Rensselaer Polytechnic Institute)*, Fanglei Zhou (Rensselaer Polytechnic Institute), Qiaobei Dong (Rensselaer Polytechnic Institute), Shoujie Ren (Missouri University of Science and Technology), Xinhua Liang (Missouri University of Science and Technology), Naomi Klinghoffer (Gas Technology Institute), Shiguang Li (Gas Technology Institute), Miao Yu (Rensselaer Polytechnic Institute)

10:30 am TUESDAY
16c - Poly-methacrylic acid Functionalized Membranes with Incorporated Reactive Pd/Fe Nanoparticles: Lab Scale to Groundwater Remediation Applications
Hongyi (Derek) Wan (University of Kentucky)*, Md. Saiful Islam (University of Kentucky), Nicolas Briot (University of Kentucky), Anthony Saad (University of Kentucky), Lindell Ormsbee (University of Kentucky), DB Bhattacharyya (University of Kentucky)

11:00 am TUESDAY
16d - Investigation of a smart electrically responsive ultrafiltration membrane
Chia Miang Khor (UCLA)*, David Jassby (UCLA)

11:30 am TUESDAY
16e - Catalytic Membranes for Groundwater Treatment
Alexander J Sutherland (McMaster University)*, Charles-François de Lannoy (McMaster University)

12:00 pm TUESDAY
16f - Plasmonic membrane catalytic activation of peroxide for quantized oxidation via residence time control
Hao Tang (University of Washington), Guozheng Shao (University of Washington), Bruce Hinds (University of Washington)*

#17 Materials: Selective Polymeric and Mixed-Matrix Materials - Gas Separations
9:30 am - 12:30 pm | Kings Garden 5

Co-Chairs: Ben Sundell (Aramco Services Company), Zach Smith (MIT)

9:30 am TUESDAY
17a - Mixed-matrix membranes formed from imide-functionalized UiO-66-NH₂ for improved interfacial compatibility
Qihui Qian (MIT)*, Zach Smith (MIT)

10:00 am TUESDAY
17b - Janus polymers bearing tri(n-alkoxy)silyl side groups: glassy membrane materials with properties of rubbers
10:30 am TUESDAY
17c - Solution processable metal organic frameworks for gas separations: from porous liquids to mixed matrix membranes
Anastasiya V Bavykina (King Abdullah University of Science and Technology)*, Alexander Knebel (Leibniz University Hannover Institute for Physical Chemistry and Electrochemistry), Shuvo Datta (King Abdullah University of Science and Technology), Magnus Rueping (King Abdullah University of Science and Technology), Mohamed Eddaoudi (King Abdullah University of Science and Technology), Juergen Caro (Leibniz University Hannover Institute for Physical Chemistry and Electrochemistry), Jorge Gascon (King Abdullah University of Science and Technology)

11:00 am TUESDAY
17d - Enhancing CO2/N2 Selectivity and Elimination of Langmuir Sorption within High Tg, Glassy Polynorbornene Membranes
Christopher Maroon (University of Tennessee), Jacob Townsend (University of Tennessee), Kevin Gmernicki (University of Tennessee), Daniel Harrigan (Aramco Services Company), Ben Sundell (Aramco Services Company), John Lawrence (Aramco), Shannon Mahurin (Oak Ridge National Laboratory), Konstantinos Vogiatzis (University of Tennessee), Brian Long (University of Tennessee)*

11:30 am TUESDAY
17e - Ultra-High Permeability Mixed-Matrix Membranes as a Next-Generation Carbon Capture Technology for Post-Combustion
Sameh K Elsaidi (U.S. Department of Energy National Energy Technology Laboratory)*, Surendar Venna (U.S. Department of Energy National Energy Technology Laboratory), Ali Sekizkardes (Battelle/ U.S. Department of Energy National Energy Technology Laboratory), Mona Mohamed (University of Pittsburgh), David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory)

12:00 pm TUESDAY
17f - Composite gas separation membranes from metal-induced ordered polymeric frameworks
Zhihua Qiao (Tianjin University), Song Zhao (Tianjin University), Menglong Sheng (Tianjin University), Jixiao Wang (Tianjin University), Zhi Wang (Tianjin University), Chongli Zhong (Tianjin University), Michael D Guiver (Tianjin University)*
ORAL SESSIONS

4:00 pm TUESDAY
18e - Accessing novel microporous polymers to enhance yield, stereochemical control, and membrane performance in the recovery of light hydrocarbons from natural gas
John Lawrence (Aramco Services Company)*

4:30 pm TUESDAY
18f - Insight into the transport in polymeric and mixed matrix membranes via analysis of unique mixed gas diffusion coefficients
Johannes Carolus (John) Jansen (National Research Council of Italy)*, Alessio Fuoco (National Research Council of Italy), Marcello Monteleone (National Research Council of Italy), Elisa Esposito (National Research Council of Italy)

#19 Processes: Process Scale-Up and Techno-Economic Assessment
2:00 pm - 5:00 pm | Kings Garden 4

Co-Chairs: JR Johnson (ExxonMobil), Bharat Bhut (Merck Pharmaceuticals), Ivy Huang (Membrane Technology and Research), Albert Kim (University of Hawaii)

2:00 pm TUESDAY
19a - Minimizing the cost of membrane distillation

2:30 pm TUESDAY
19b - Process Optimization Using Perturbation Expansion Solutions for Membrane Gas Separation Modules
Norfamila Che Mat (Universiti Malaysia Sarawak), Glenn Lipscomb (University of Toledo)*

3:00 pm TUESDAY
19c - Multi-physics Simulation of Hollow Fiber Vacuum Membrane Distillation Using OpenFoam
Albert Kim (University of Hawaii), Ho Ji (Korea Research Institute Of Ships And Ocean Engineering), Deok-Soo Moon

3:30 pm TUESDAY
19d - Scale-up of Facilitated Transport Membrane Module for CO2 Capture from Flue Gas
Kai Chen (Ohio State University)*, Witopo Salim (Ohio State University), Yang Han (Ohio State University), Dongzhu Wu (Ohio State University), Winston Ho (Ohio State University)

4:00 pm TUESDAY
19e - Development of industrial scale polyvinylidene fluoride transfer membrane
Marta E Bojarska (GVS Filter Technology)*, Deb English (GVS Filter Technology), Gil Tavares (GVS Filter Technology)

4:30 pm TUESDAY
19f - Low energy seawater desalination using multistage electrodialysis
Gijs Doornbusch (Eindhoven University of Technology)*, Michele Tedesco (Wetsus), Jan Post (Wetsus), Zandrie Borneman (Eindhoven University of Technology), Kitty Nijmeijer (Eindhoven University of Technology)

#20 Processes: New Concepts in Hybrid Processes and Process Integration
2:00 pm - 5:00 pm | Kings Garden 3

Co-Chairs: Jia Wei Chew (Nanyang Technological University), Ed Sanders (Air Liquide-Global Markets & Technologies)

2:00 pm TUESDAY
20a - Air Products Hybrid Membrane Adsorption
Cory E Sanderson (Air Products and Chemicals)*, Don Henry (Air Products and Chemicals)

2:30 pm TUESDAY
20b - Hybrid Distillation and Facilitated Transport Membrane Processes for C3 Splitter Debottlenecking
Kenneth Pennisi (Compact Membrane Systems), Christine Parrish (Compact Membrane Systems)*, Sudip Majumdar (Compact Membrane Systems)
ORAL SESSIONS

3:00 pm  TUESDAY
20c - Water Recovery via Forward Osmosis - Freeze Concentration
Georgios Kolliopoulos (University of Toronto), Jeffrey Martin (University of Toronto), Chenbo Xu (University of Toronto), Vladimiro Papangelakis (University of Toronto)*

3:30 pm  TUESDAY
20d - Leverage membrane technology in process intensification and new application design - from early stage design to technical scale implementation
Peter Kreis (Evonik Technology & Infrastructure GmbH)*, Kah Peng Lee (Evonik Fibres GmbH), Lars Peters (Evonik Fibres GmbH), Erik Hoving (Evonik Cooperation), Steven Pedersen (Evonik Canada Inc.), Kumar Abhinava (Evonik Cooperation)

4:00 pm  TUESDAY
20e - Carbon Capture utilizing Hybrid Membrane/Liquifaction
David Hasse (Air Liquide)*

4:30 pm  TUESDAY
20f - Membrane distillation hybridized with a thermoelectric heat pump for energy-efficient water treatment and space cooling
Yong Zen Tan (Nanyang Technological University), Nick Guan Ping Chew (Nanyang Technological University), Wai Hoong Chow (Nanyang Technological University), Rong Wang (Nanyang Technological University), Jia Wei Chew (Nanyang Technological University)*

#21 Applications: Brine Treatment for Minimal and Zero Liquid Discharge

2:00 pm - 5:00 pm  |  Ballroom 3

Co-Chairs: Radisav Vidic (University of Pittsburgh), Kerri Hickenbottom (University of Arizona)

2:00 pm  TUESDAY
21a - Reduction of Brackish Water Desalination Brine Volume using Membrane Evaporation Coupled with Activated Sludge Aeration Waste Heat
Drew W Johnson (The University of Texas at San Antonio)*

2:30 pm  TUESDAY
21b - Smart High Recovery RO Boosts Recovery Rate to More Than 90% for Reuse Purposes
Ronit Erlitzki (AdEdge Water Technologies)*

3:00 pm  TUESDAY
21c - Membrane Distillation for Enhanced Water Recovery by Inland Brackish Water Desalination Plants
Zhewei Zhang (University of Pittsburgh)*, Radisav Vidic (University of Pittsburgh)

3:30 pm  TUESDAY
21d - Selective Separation of Industrial Relevant Metal Ions from High TDS Water using Wafer-Enhanced Electrodeionization (WE-EDI)
Humeyra B Ulusoy Erol (University of Arkansas)*, Christa Hestekin (University of Arkansas), Jamie Hestekin (University of Arkansas)

4:00 pm  TUESDAY
21e - Pilot Evaluation of Closed Circuit Reverse Osmosis (CCRO) for Treatment of RO Concentrate for Potable Reuse
Han Gu (Orange County Water District)*, Megan Plumlee (Orange County Water District), Mike Boyd (Desalitech), Ran Nadav (Desalitech), Michael Hwang (Jacobs), Jim Lozier (Jacobs)

4:30 pm  TUESDAY
21f - Brine Treatment for Minimal and ZLD
Malynda Cappelle (The University of Texas at El Paso)*, W. Shane Walker (The University of Texas at El Paso)
### #22 Materials: Innovations in Membrane Synthesis and Casting

2:00 pm - 5:00 pm  |  Ballroom 4

**Co-Chairs:** Rachel Dorin (Terapore Technologies), Ulrich Wiesner (Cornell University)

#### 2:00 pm TUESDAY

**22a - Novel Spirocyclic Polymers for Membrane-based Organic Solvent Separations**
Ronita Mathias (Georgia Institute of Technology)*, Kirstie Thompson (Georgia Institute of Technology), Dhaval Bhandari (ExxonMobil), JR Johnson (ExxonMobil), Huaxing Zhou (ExxonMobil), M.G. Finn (Georgia Institute of Technology), Ryan Lively (Georgia Institute of Technology)

#### 2:30 pm TUESDAY

**22b - 3D Printed fouling resistant composite membranes**
Davide Mattia (University of Bath)*

#### 3:00 pm TUESDAY

**22c - Next-Generation Membranes Using Thin-Film Lift Off**
Mackenzie Anderson (UCLA)*, Brian McVerry (UCLA), Na He (UCLA), Eric Hoek (UCLA), Richard Kaner (UCLA)

#### 3:30 pm TUESDAY

**22d - Interfacial Junctions Control Electrolyte Transport Through Charge-Patterned Membranes**
Feng Gao (University of Notre Dame), Bill Phillip (University of Notre Dame)*

#### 4:00 pm TUESDAY

**22e - Fabrication of Inside-Out Isoporous Hollow Fiber Membranes via Spinning and Coating Methods**
Kirti Sankhala (Helmholtz-Zentrum Geesthacht, Geesthacht)*, Joachim Koll (Helmholtz-Zentrum Geesthacht, Geesthacht), Maryam Radjabian (Helmholtz-Zentrum Geesthacht, Geesthacht), Clarissa Abetz (Helmholtz-Zentrum Geesthacht, Geesthacht), Volker Abetz (Helmholtz-Zentrum Geesthacht, Geesthacht)

#### 4:30 pm TUESDAY

**22f - Empirical evidence suggests that polyamide film formation during interfacial polymerization in thin film composite (TFC) membranes is not self-limiting**
Kasia Grzebyk (University of North Carolina at Chapel Hill)*, Orlando Coronell (University of North Carolina at Chapel Hill)
Plenary Session 3
7:45 am - 9:00 pm | Ballroom 1

Dr. Rachel Segalman
University of California, Santa Barbara

Polymeric Ionic Liquids: A New Platform for Materials and Energy

#23 Awards Session (Student Fellowship & Young Membrane Scientist Awards)
9:30 am - 12:30 pm | Kings Garden 4

Chair: Caleb Funk (The Dow Chemical Company)

9:30 am WEDNESDAY
23a - Creation of well-defined "mid-sized" micropores in carbon molecular sieve membranes for organic solvent separations
Yao Ma (Georgia Institute of Technology)*, Dhaval Bhandari (ExxonMobil), JR Johnson (ExxonMobil), Ryan Lively (Georgia Institute of Technology)

10:00 am WEDNESDAY
23b - PoreDesigner for computational optimization of channel proteins and porous organic cages for highly selective membrane-based separations
Ratul Chowdhury (Penn State University)*

10:30 am WEDNESDAY
23c - Crack-free, large-area, single-layer graphene membranes with a record performance in gas mixture separation
Shiqi Huang (L’Ecole polytechnique fédérale de Lausanne)*, Kumar Varoon Agrawal (L’Ecole polytechnique fédérale de Lausanne), Jing Zhao (L’Ecole polytechnique fédérale de Lausanne)

11:00 am WEDNESDAY
23d - Unprecedented CO₂/H₂ Selectivity and CO₂ Permeance Demonstrated in Facilitated Transport Membranes with Tunable Amine-CO₂ Chemistry
Yang Han (Ohio State University)*, Winston Ho (Ohio State University)

11:30 am WEDNESDAY
23e - Engineering the Nanochannels in Reduced Graphene Oxide Membrane for Dye Desalination
Liang Huang (The State University of New York at Buffalo)*, Haiqing Lin (The State University of New York at Buffalo)

12:00 pm WEDNESDAY
23f - Impact of module design on heat transfer and Nusselt correlation selection in membrane distillation

#24 Applications: Cell and Protein Purification, Harvesting, and Processing
9:30 am - 12:30 pm | Kings Garden 3

Co-Chairs: Merlin Bruening (University of Notre Dame), Jessica Molek (GlaxoSmithKline), Prity Bengani-Lutz (Repligen Corporation), Sen Xu (Merck Pharmaceuticals)

9:30 am WEDNESDAY
24a - Experimental and Theoretical Investigations of the Loss of Protein Sieving Due to Fouling of ATF Microfilters
Alex Apostolidis (Amgen)*, Glen Bolton (Amgen)

10:00 am WEDNESDAY
24b - pH and Excipient Partitioning in Ultrafiltration/Diafiltration Processes for Formulation of High Concentration Monoclonal Antibody (mAb) Products
Parinaz Emami (Penn State University)*, Youngbin Baek (Penn State University), Nripen Singh (Bristol-Myers Squibb), Andrew Zydney (Penn State University)
**ORAL SESSIONS**

10:30 am WEDNESDAY
24c - Effect of membranes molecular weight cut-off on peptides migration and selectivity during electrodialysis with filtration membranes
Sabita Kadel (Laval University)*, Jacinthe Thibodeau (Laval University), Carole Laine (Amer-Sil), Laurent Bazinet (Laval University)

11:00 am WEDNESDAY
24d - Scale down depth filtration case study using Pall Supracap™ 50 to predict large scale STAX™ capacity and product quality
Patricia Rose (Merck Pharmaceuticals)*, Jennifer Pollard (Merck Pharmaceuticals)

11:30 am WEDNESDAY
24e - Unraveling the Plugging Mechanisms during a Combined Tangential-flow and Depth Filtration Process
Xianghong Qian (University of Arkansas)*, Da Zhang (University of Arkansas), Daniel Strauss (Asahi Kasei), Parag Patel (Asahi Kasei), Ranil Wickramasinghe (University of Arkansas)

12:00 pm WEDNESDAY
24f - Functionalized Microporous Membranes for Protein Capture and Analysis
Joshua Berwanger (University of Notre Dame)*, Merlin Bruening (University of Notre Dame), Liu Yang (University of Notre Dame), Hui Yin Tan (University of Notre Dame), Weijing Liu (University of Notre Dame)

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**#25 Processes: Innovations in Microfiltration and Ultrafiltration**

9:30 am - 12:30 pm | Ballroom 3

**Co-Chairs:** Beth Goodrich (MilliporeSigma), Vlad Tarabara (Michigan State University)

11:30 am WEDNESDAY
25e - Mass transfer assisted TIPS process to precisely tailor the hollow fiber membrane surface and sublayer structures
Hideto Matsuyama (Kobe University)*, Chuanjie Fang (Kobe University), Saeid Rajabzadeh (Kobe University)

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**ORAL SESSIONS**

9:30 am WEDNESDAY
25a - A systematic approach to remove bottlenecks in high concentration UF/DF for subcutaneous application of biological drug substances
Hasin M Feroz (Bristol-Myers Squibb)*, Dongyoun Jang (Bristol-Myers Squibb), Jessica Hung (Bristol-Myers Squibb), Yan Chen (Bristol-Myers Squibb), Erinc Sahin (Bristol-Myers Squibb), Andrew Zdnyey (Penn State University), Melissa Holstein (Bristol-Myers Squibb), Sanchayita Ghose (Bristol-Myers Squibb)

10:00 am WEDNESDAY
25b - Continuous Diafiltration for cGMP Biomanufacturing
Akshat Gupta (MilliporeSigma)*, Beth Goodrich (MilliporeSigma), Herb Lutz (MilliporeSigma)

10:30 am WEDNESDAY
25c - Understanding the role that patterning plays on membrane biofouling by visualization using light imaging and simulation
Anna Malakian (Clemson University)*, Bowen Ling (Stanford University), Ilenia Battiato (Stanford University), Scott Husson (Clemson University)

11:00 am WEDNESDAY
25d - Treating Poultry Processing Wastewaters by Combined Electrocoagulation and Ultrafiltration
Ranil Wickramasinghe (University of Arkansas)*, Kamyar Sardari (University of Arkansas)

11:30 am WEDNESDAY
25f - Organic solvent resistant membranes obtain by using non-toxic solvents
Stefan Chisca (King Abdullah University of Science and Technology)*, Gheorghe Falca (King Abdullah University of Science and Technology), Tommaso Marchesi (University of Bologna), Valentina Elena Musteata (King Abdullah University of Science and Technology), Suzana Nunes (King Abdullah University of Science and Technology)
### #26 Materials: Bio-inspired and Biomimetic Materials

**9:30 am - 12:30 pm | Ballroom 4**

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<tr>
<th>Session</th>
<th>Title</th>
<th>Participants</th>
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<tr>
<td>26a</td>
<td>Artificial Water Channels - toward biomimetic membranes for desalination</td>
<td>Mihail Barboiu (Institut Européen des Membranes)*</td>
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<td>26b</td>
<td>Self-Assembly of Long-Lasting Lipid Bilayers and the Effect of Temperature of their Ion Rejection</td>
<td>Yair Kaufman (Ben Gurion University of the Negev)*, Shiju Abraham (Ben Gurion University of the Negev), Tabea Heckenthaler (Ben Gurion University of the Negev), Yacov Morgenstern (Ben Gurion University of the Negev)</td>
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<tr>
<td>26c</td>
<td>Peptoid-based membrane-mimetic 2D nanomaterials with incorporated natural and synthetic channels</td>
<td>Chunlong Chen (Pacific Northwest National Laboratory)*</td>
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<td>26d</td>
<td>Scalable High-Performance Membranes with High Density Channel Protein-Polymer Nanosheets</td>
<td>Yu-Ming Tu (Penn State University)*, Woochul Song (Penn State University), Tingwei Ren (Penn State University), Yuxiao Shen (UC Berkeley), Ratul Chowdhury (Penn State University), Prasangi Rajapaksha (University of Kentucky), Arwa Mukhtar (Penn State University), Miaozi Zhang (Penn State University), Alina Thokkadam (Rutgers University), DB Bhattacharyya (University of Kentucky), Bill Phillip (University of Notre Dame), Robert Hickey (Penn State University), Yinai Wei (University of Kentucky), Manish Kumar (Penn State University)</td>
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<tr>
<td>26e</td>
<td>Fabrication of aquaporin-based biomimetic membrane for seawater desalination</td>
<td>Ye Li (Nanyang Technological University)*, Rong Wang (Nanyang Technological University)</td>
</tr>
<tr>
<td>26f</td>
<td>Biomimetic channel membranes: can they realize their full potential upon scale-up?</td>
<td>Viatcheslav Freger (Technion - IIT)*</td>
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</table>

### #27 Materials: Advances in Membrane and Materials Characterization

**9:30 am - 12:30 pm | Kings Garden 5**

<table>
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<tr>
<th>Session</th>
<th>Title</th>
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<td>27a</td>
<td>Surface Nano-structuring with Hydrophilic Polymer Brush Layers for Membrane Performance Tailoring and Optimization</td>
<td>Yian Chen (UCLA)*, Soomin Kim (UCLA), Anditya Rahardianto (UCLA), Yoram Cohen (UCLA)</td>
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<td>27b</td>
<td>Roughness in Polyamide RO Membranes: Its Formation Mechanism, Control, and Implications</td>
<td>Chuyang Tang (University of Hong Kong / University of New South Wales)</td>
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<tr>
<td>27c</td>
<td>Mechanism of chlorine attack on polyamide membranes studied by EIS</td>
<td>Mikhail Stolov (Technion - IIT), Viatcheslav Freger (Technion - IIT)*</td>
</tr>
</tbody>
</table>
11:00 am WEDNESDAY
27d - Physicochemical and electrochemical characterization of cation-exchange membranes modified with polyethyleneimine for elucidating enhanced monovalent permselectivity of electrodialysis
Wenbin Jiang (New Mexico State University)*, Lu Lin (New Mexico State University), Xuesong Xu (New Mexico State University), Pei Xu (New Mexico State University)

11:30 am WEDNESDAY
27e - Unraveling the Film-Formation Kinetics during Interfacial Polymerization via Low Coherence Interferometry
Xin Liu (Southern University of Science and Technology)*, Weiyi Li (Southern University of Science and Technology), Zhuo Li (Southern University of Science and Technology), Anthony Fane (Singapore Membrane Technology Centre), Baolin Deng (Southern University of Science and Technology)

12:00 pm WEDNESDAY
27f - Operando Membrane Spectroscopy for Elucidating Transport Mechanisms in Membranes
Casey O'Brien (University of Notre Dame)*

#28 Materials: Bio-inspired and Biomimetic Materials
2:00 pm - 5:00 pm | Ballroom 4
Co-Chairs: Chunlong Chen (Pacific Northwest National Laboratory), Yair Kaufman (Ben Gurion University of the Negev), DB Bhattacharya (University of Kentucky)

2:00 pm WEDNESDAY
28a - Biofouling resistant membranes for wound healing
Antoine Venault (Chung Yuan Christian University)*, Hao-Tung Lin (Chung Yuan Christian University), Yung Chang (Chung Yuan Christian University)

2:30 pm WEDNESDAY
28b - How pore hydrophilicity influences water permeability?
Mingjie Wei (Nanjing Tech University)*, Fang Xu (Nanjing Tech University), Yong Wang (Nanjing Tech University)

3:00 pm WEDNESDAY
28c - Biomimetic membrane systems utilizing electro-dynamic interfaces
Bruce Hinds (University of Washington)*

3:30 pm WEDNESDAY
28d - Responsiveness and function of DNA-gated membranes
Beñat Olave (Polymat, University of the Basque Country), Iliane Rafaniello (Polymat, University of the Basque Country), Thomas Schäfer (Polymat, University of the Basque Country)*

4:00 pm WEDNESDAY
28e - Nature-inspired Coating-free Membranes for Desalination
Himanshu Mishra (King Abdullah University of Science and Technology)*, Ratul Das (King Abdullah University of Science and Technology), Sankara Arunachalam (King Abdullah University of Science and Technology), Zain Ahmad (King Abdullah University of Science and Technology), Edelberto Manalastas (King Abdullah University of Science and Technology)

4:30 pm WEDNESDAY
28f - Carbon nanotube porins as model biomimetic membrane nanopores
Aleksandr Noy (Lawrence Livermore National Laboratory)*
#29 Materials: Advances in Membrane and Materials Characterization

**2:00 pm - 5:00 pm | Kings Garden 5**

**Co-Chairs:** Wei{\textdegree}i Li (School of Environment Science and Engineering), Maria-Chiara Ferrari (The University of Edinburgh), Chuyang Tang (University of New South Wales)

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**2:00 pm WEDNESDAY**

29a - A novel method to distinguish between crystal and defect transport in zeolite membranes

David Carter (University of Ottawa), Shaaima Al Akwaa (University of Ottawa), Boguslaw Kruczek (University of Ottawa)*, Handan Tezel (University of Ottawa)

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**2:30 pm WEDNESDAY**

29b - Study on antifouling behaviors of GO modified nanocomposite membranes through QCMD and surface energetics analysis

Amin Karkooti (University of Alberta), Neda Nazemifard (University of Alberta), Mohtada Sadrazdeh (University of Alberta)*

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**3:00 pm WEDNESDAY**

29c - 3D characterization of polyamide reverse osmosis membranes

Tyler E Culp (Penn State University)*, Manish Kumar (Penn State University), Enrique Gomez (Penn State University)

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**3:30 pm WEDNESDAY**

29d - Selective Ion Transport Properties of Membrane Materials

Anita Hill (Commonwealth Scientific and Industrial Research Organisation)*, Aaron Thornton (Commonwealth Scientific and Industrial Research Organisation), Cara Doherty (Commonwealth Scientific and Industrial Research Organisation)

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**4:00 pm WEDNESDAY**

29e - Membrane-based oil-gas separation for dissolved gas-in-oil extraction: gas transport properties of ceramic supported Teflon membranes

Liang-Chih Ma (Arizona State University)*, Chuan Chen (Global Energy Interconnection Research Institute Co., Ltd.), Jerry Lin (Arizona State University)

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#30 Processes: Fundamentals of Predicting and Preventing Membrane Fouling

**2:00 pm - 5:00 pm | Kings Garden 4**

**Co-Chairs:** Manish Kumar (Penn State University), Davide Mattia (University of Bath), Saifur Rahaman (Concordia University)

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**2:00 pm WEDNESDAY**

30a - Numerical and experimental studies on the deposition of sticky particles near a membrane surface

Seon Yeop Jung (Seoul National University)*, Kyung Hyun Ahn (Seoul National University)

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**2:30 pm WEDNESDAY**

30b - Characterization of the Striping Phenomenon during Membrane Fouling via Optical Coherence Tomography

Wei{\textdegree}i Li (Southern University of Science and Technology)*, Xin Liu (Southern University of Science and Technology), Anthony Fane (Singapore Membrane Technology Centre)

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**3:00 pm WEDNESDAY**

30c - A closer look at biofouling: time-lapse optical microscopy of biofilm formation in wastewater reuse

Emily W Tow (Olin College)*, Behzad Rad (Lawrence Berkeley National Laboratory), Robert Kostecki (Lawrence Berkeley National Laboratory)
3:30 pm WEDNESDAY
30d - Improved graphene oxide membrane increases membrane distillation desalination of RO concentrate
Samuel Olatunji (Texas A&M University-Kingsville), Lucy M Camacho (Texas A&M University-Kingsville)*

4:00 pm WEDNESDAY
30e - Automated real-time membrane biofouling assessment using microbial enzyme activity
Babar K Khan (King Abdullah University of Science and Technology)*, Luca Fortunato (King Abdullah University of Science and Technology), TorOve Leiknes (King Abdullah University of Science and Technology)

4:30 pm WEDNESDAY
30f - Interactions between extracellular polymeric substances and zwitterionic hydrogels as a designing tool for antifouling surfaces
Angelina Ida Vedhamanickam (Ben-Gurion University of the Negev)*, Nir Goldberg (Ben-Gurion University of the Negev), Ronit Bitton (Ben-Gurion University of the Negev), Moshe Herzberg (Ben-Gurion University of the Negev)

2:00 pm - 5:00 pm | Kings Garden 3
#31 Applications: Purification of Non-Protein Biologics
Co-Chairs: James McGrath (University of Rochester), Onur Kas (MilliporeSigma)

2:00 pm WEDNESDAY
31a - Optimizing Microfluidic Nanoparticle Capture from Biofluids on Ultrathin Silicon Nanomembranes: A Computational and Experimental Analysis of Tangential Flow Analyte Capture (TFAC)
Kilean Lucas (University of Rochester)*, Danial Ahmad (University of Rochester), Mehdi (Aslan) Dehghani (Rochester Institute of Technology), Thomas Gaborski (Rochester Institute of Technology), Richard Waugh (University of Rochester), James McGrath (University of Rochester)

2:30 pm WEDNESDAY
31b - Development and scale-up of laterally-fed membrane chromatography for the purification of therapeutic viruses
Karina Kawka (McMaster University)*, Pedram Madadkar (McMaster University), Shabnam Shoaebargh (McMaster University), Natasha Kazhdan (McMaster University), Maria Fe C. Medina (McMaster University), Brian Lichty (McMaster University), Raja Ghosh (McMaster University), David Latulippe (McMaster University)

3:00 pm WEDNESDAY
31c - Characterization of EV Secretion at Single Cell Resolution
Gerardo Mauleon Ramos (University of Chicago)*, Kilean Lucas (University of Rochester), Vladimir Riazanski (University of Chicago), James McGrath (University of Rochester), Deborah Nelson (University of Chicago)

3:30 pm WEDNESDAY
31d - Charge, size distribution and hydrophobicity of viruses: Effect of the virus purification method
Hang Shi (Michigan State University), Vlad Tarabara (Michigan State University)*

4:00 pm WEDNESDAY
31e - Risk Mitigation Strategies for the use of polymeric consumables for manufacturing of Anti-Sense Oligonucleotides
Anuradha Vaidya (Biogen), Bill Scott* (Biogen), Dave Kolwyck (Biogen)

4:30 pm WEDNESDAY
31f - Use of Nanosphere Self-Assembly to Pattern Nanoporous Membranes for the Study of Extracellular Vesicles
Marcela Mireles (University of Rochester)*, Cody Soule (Rochester Institute of Technology), Mehdi Dehghani (Rochester Institute of Technology), Thomas Gaborski (Rochester Institute of Technology)
#32 Applications: Fuel Cells and Batteries

2:00 pm - 5:00 pm | Ballroom 3

Co-Chairs: Michael Guiver (Tianjin University), Mike Hickner (Penn State University), Peter Pintauro (Vanderbilt University)

2:00 pm WEDNESDAY
32a - A Holistic Approach to Explore Interfacially Confined Ionomers Designed for Energy Conversion Device
Shudipto K Dishari (University of Nebraska-Lincoln)*

2:30 pm WEDNESDAY
32b - Anion Conducting Membranes Based on Poly(norbornene): High Conductivity, Chemical Stability and Fuel Cell Performance >2.5 W/cm²
Mrinmay Mandal (Georgia Institute of Technology)*, Garrett Huang (Georgia Institute of Technology), Wanting Chen (Georgia Institute of Technology), Paul A Kohl (Georgia Institute of Technology)

3:00 pm WEDNESDAY
32c - High Temperature Fuel Cells with Ion-Pair Membranes and Phosphonated Ionomers
Michael R Hibbs (Sandia National Laboratories)*, Cy Fujimoto (Sandia National Laboratories), Ehren Baca (Sandia National Laboratories), Albert Lee (Los Alamos National Laboratory), Yu Seung Kim (Los Alamos National Laboratory)

3:30 pm WEDNESDAY
32d - High temperature, anhydrous proton conducting membranes and micropatterned bipolar membranes for electrochemical energy conversion and storage technologies
Christopher G Arges (Louisiana State University)*

4:00 pm WEDNESDAY
32e - Membrane through-plane alignment of ion-conducting channels
Xin Liu (Tianjin University), Yi Li (Tianjin University), Jiandang Xue (Tianjin University), Weikang Zhu (Tianjin University), Junfeng Zhang (Tianjin University), Yan Yin (Tianjin University), Michael D Guiver (Tianjin University)*

4:30 pm WEDNESDAY
32f - Novel sulfonated aromatic polymer membranes for breaking the proton selectivity-conductivity trade-off limitation in vanadium redox flow battery
Tongshuai Wang (University of Illinois, Chicago), JunYoung Han (Rensselaer Polytechnic Institute), Kihyun Kim (Rensselaer Polytechnic Institute), Andreas Muenchinger (Max-Planck-Institute for Solid State Research), Klaus-Dieter Kreuer (Max-Planck-Institute for Solid State Research), Chulsung Bae (Rensselaer Polytechnic Institute), Sangil Kim (University of Illinois, Chicago)*
Poster Presentations

Presenting authors are indicated by an asterisk*. See the most up-to-date version of the program with abstracts at nams2019.org or via the Attendify (NAMS 2019) app.

**SESSION A - Innovation in Bio-Inspired and Bio-Applied Membranes**

**A1** High-Capacity Multimodal Anion-Exchange Membranes for Purification of Biologics, Joshua Osuofa (Clemson University)*; Scott Husson (Clemson University)

**A2** High throughput screening of ultra-filtration membranes with mixed dextrans in 96 well plate, Masha Khazan (Pall Corporation)*; James Hathcock (Pall Corporation); Jian Qiu (Pall Corporation)

**A3** Impacts of Bio-inspired Zwitterionic Membranes for Health Care Applications, Yung Chang (R&D Center for Membrane Technology, CYCU)*

**A4** Enhanced Membranes for Biogas Upgrading, Ning Shangguan (Compact Membrane Systems)*; Sudip Majumdar (Compact Membrane Systems); Kenneth Pennisi (Compact Membrane Systems)

**A5** Monitoring of Membrane Fouling by the Zeta Potential, Thomas Luxbacher (Anton Paar GmbH)*; Hermina Buksek (University of Maribor); Irena Petrinic (University of Maribor); Elisa Innocenti (GSK Vaccines S.r.l.); Krzysztof Trzaskus (Aquaporin A/S); Maria Salud Camilleri-Rumbai (Aquaporin A/S)

**A6** Tangential flow microfluidics for the capture and release of nanoparticles and extracellular vesicles on conventional and ultrathin membranes, Mehdi Dehghani (Rochester Institute of Technology)*; Kilean Lucas (University of Rochester); James McGrath (University of Rochester); Thomas Gaborski (Rochester Institute of Technology)

**A7** Low-cost ultrathin porous polymeric membranes with precise control over pore size and thickness gradient for investigation of leukocyte transmigration through barrier models, Shayan Gholizadeh (Rochester Institute of Technology)*; Alec Salminen (University of Rochester); Zahra Allahyari (Rochester Institute of Technology); Robert Carter (Rochester Institute of Technology); Henry Chung (Rochester Institute of Technology); Marcela Mireles (University of Rochester); Thomas Gaborski (Rochester Institute of Technology)

**A8** Application of Novel Multimodal Anion-exchange Membrane Chromatography Columns in a Two-step mAb Purification Scheme - Aggregates and HCP Removal, Daniel Henn (Purilogics, LLC)*; Anna Forsyth (Purilogics, LLC); Graham Temples (Purilogics, LLC); Jinxiang Zhou (Purilogics, LLC); Scott Husson (Clemson University)

**A9** Effect of Nanomembrane Orientation and Flow Modality on Benchtop Urea Clearance, Sam Walker (The State University of New York at Buffalo)*; Kayli Hill (University of Rochester); Alec Salminen (University of Rochester); Dean G Johnson (University of Rochester)

**A10** Feed Spacer Modification for Listeria Control in Dairy Processing, Mainara Costa Teixeira (The University of Alabama)*; Preston Richier (The University of Alabama); Jake Colburn (The University of Alabama); Shelby Brooks (The University of Alabama); Will Baker (The University of Alabama); Thomas Hendrich (The University of Alabama); Ryan Summers (The University of Alabama); Stephen Ritchie (The University of Alabama)

**A11** Critical Flux of Ultrathin Silicon Membranes in Tangential Flow Filtration of Protein Solutions, Danial Ahmad (University of Rochester)*; Kilean Lucas (University of Rochester); Mehdi (Aslan) Dehghani (Rochester Institute of Technology); Thomas Gaborski (Rochester Institute of Technology); James McGrath (University of Rochester)
A12 Grafting Zwitterionic Polymer and Poly (amino acid) on Polyamide Membranes: "Defending and Attacking" Strategies for Biofouling Control, Wen Ma (Concordia University)*; Liuqing Yang (Concordia University); Saifur Rahaman (Concordia University)

A13 Monitoring of biological fluids with extraction membranes, Pinar Cay-Durgun (Arizona State University); Tianmiao Lai (Arizona State University); Nai-Yuan Liu (Arizona State University); Mark Sprowls (Arizona State University); Stewart Mann (Arizona State University); Leslie Thomas (Mayo Clinic in Arizona); Erica Forzani (Arizona State University); Mary Laura Lind (Arizona State University)*

A14 Fine-Tuned Biohybrid Polymeric Particles Mimicking Biological Compartmentalization Prepared by Membrane Emulsification, Emma Piacentini (National Research Council of Italy, Institute on Membrane Technology, CNR ITM); Lidietta Giorno (National Research Council of Italy - Institute on Membrane Technology)*

A15 Bio-inspired immobilization of casein-coated silver nanoparticles on cellulose acetate ultrafiltration membranes: from laboratory to scale-up, Xiaobo Dong (University of Kentucky)*; Halle Shannon (University of Kentucky); Tequila Harris (Georgia Institute of Technology); Isabel Escobar (University of Kentucky)

A16 Surface-Specific Thermoresponsive Coating of Membranes, Marcela Mireles (University of Rochester)*; Cody Soule (Rochester Institute of Technology); Luis Delgadillo (University of Rochester); Thomas Gaborski (Rochester Institute of Technology)

A17 Pervaporation Separation of n-Butanol from Aqueous Solutions Using PDMS/Lignin Mixed Matrix Membranes, Ali Zamani (University of Ottawa); Handan Tezel (University of Ottawa)*; Jules Thibault (University of Ottawa)

A18 Rapid and Selective Water Permeation Across Biomimetic Membranes Through Artificial Water Channel Aggregates, Woochul Song (Penn State University)*; Ratul Chowdury (Penn State University); Himanshu Joshi (University of Illinois at Urbana-Champaign); Joseph S. Najem (The University of Tennessee); Yue-xiao Shen (UC Berkeley); Chao Lang (Penn State University); Stephen Saries (University of Tennessee); Jun-li Hou (Fudan University); Aleksei Aksimentiev (University of Illinois at Urbana-Champaign); Manish Kumar (Penn State University)

A19 Can porous membranes be engineered to induce physiologically relevant cell-substrate interactions?, Zahra Allahyari (Rochester Institute of Technology)*; Stephanie Casillo (Rochester Institute of Technology); Shayan Gholizadeh (Rochester Institute of Technology); Henry Chung (Rochester Institute of Technology); Thomas Gaborski (Rochester Institute of Technology)

A20 High Productivity Harvest - Intensify Harvest and Displace Depth Filtration in Fed-Batch Cell Culture, Shashi Kudugunti (Repligen Corporation)*, Jyoti Amatya (Repligen Corporation), Jamie Peyser (Repligen Corporation)

A21 Membrane Filtration of Flexible Particles: Rejection of Single Stranded DNA, Hossein Nouri Alavijeh (Clarkson University)*; Ruth E. Baltus (Clarkson University)

SESSION B - Innovation in Membrane Materials, Synthesis, and Characterization: Gases

B1 Covalently modified graphene oxide incorporated in PIM-1 mixed matrix thin film composite membranes for gas separation, Elvin Aliyev (Helmholtz-Zentrum Geesthacht)*; Volkan Filiz (Helmholtz-Zentrum Geesthacht); Sergey Shishatskiy (Helmholtz-Zentrum Geesthacht)

B2 Tunable Interlayer Channels in Graphene Oxide Membranes for Molecular Separations, Shaofei Wang (King Abdullah University of Science and Technology)*; Zhongyi Jiang (Tianjin University); Michael D Guiver (Tianjin University); Suzana Nunes (King Abdullah University of Science and Technology)
B3 Nanoporous two-dimensional nanosheets and their self-assembled gas-sieving membranes, Kumar Varoon Agrawal (École polytechnique fédérale de Lausanne)*; Mostapha Dakhchoune (École polytechnique fédérale de Lausanne); Luis Francisco Villalobos (École polytechnique fédérale de Lausanne)

B4 Thermally Rearranged Semi-interpenetrating Polymer Networks (TR-SIPNs) for Olefin/Paraffin Separation Applications, Won Hee Lee (Hanyang University)*; Young Moo Lee (Hanyang University); Jong Geun Seong (Hanyang University); Ho Hyun Wang (Hanyang University); Sun Ju Moon (Hanyang University)

B5 Design of new polymeric materials for membrane gas-separation based on norbornenes bearing hydrocarbonic groups, Alyona Wozniak (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Evgeniya Bermesheva (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Danila Bakhtin (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Ilya Borisov (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Alexey Volkov (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Eugene Finkelshtein (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Maxim Bermeshev (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences)*

B6 Cake layer characterization in Activated Sludge Membrane Bioreactor: Real-time analysis, Luca Fortunato (King Abdullah University of Science and Technology)*; TorOve Leiknes (King Abdullah University of Science and Technology)

B7 Facilitated Transport Membrane for CO₂ Capture from Flue Gas: Module Fabrication and Scale-Up, Kai Chen (Ohio State University)*; Witopo Salim (Ohio State University); Yang Han (Ohio State University); Dongzhu Wu (Ohio State University); Winston Ho (Ohio State University)

B8 Interfacial phenomenon-driven hierarchical structuring of hard templated asymmetric ultrathin carbon molecular sieves films, Megha Sharma (Lehigh University)*; Mark Snyder (Lehigh University)

B9 Layer-by-Layer Assembled Metal Organic Framework Nanosheets with Polymer, Christy Koerner (U.S. Department of Energy National Energy Technology Laboratory)*; Fangming Xiang (U.S. Department of Energy National Energy Technology Laboratory); Eric Popczun (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory)

B10 Highly oxygen-rich rubbery polymers for membrane CO₂/CH₄ separation, Krysta Clark (The State University of New York at Buffalo)*; Junyi Liu (Air Liquide. Inc); Gengyi Zhang (The State University of New York at Buffalo); Haiqing Lin (The State University of New York at Buffalo)

B11 Adsorptive and Destructive Mixed Matrix Membranes for Chemical Protection, Yufeng Song (New Jersey Institute of Technology)*; John Chau (New Jersey Institute of Technology); Kamalash K Sirkar (New Jersey Institute of Technology); Gregory Peterson (U.S. Army Edgewood Chemical Biological Center); Uwe Beuscher (W.L. Gore & Associates Inc.)

B12 Maximizing Ether Oxygen Content in Polymers for Membrane CO₂ Removal from Natural Gas, Junyi Liu (American Air Liquide. Inc)*; Gengyi Zhang (The State University of New York at Buffalo); Krysta Clark (The State University of New York at Buffalo); Haiqing Lin (The State University of New York at Buffalo)

B13 Novel CO₂ gas separation membranes prepared by chemical modification of highly permeable polymers, Eugenia Mariana Sandru (SINTEF AS); Arpenik Kroyan (Norwegian University of Science and Technology); Nebosja Simic (Norwegian University of Science and Technology); Jing Deng (Norwegian University of Science and Technology); Liyuan Deng (Norwegian University of Science and Technology); Marius Sandru (SINTEF AS)*

B14 Intrinsically Microporous Pentiptycene-based Polymers for Enhanced Gas Separation Performance and Physical Aging Resistance, Tanner Corrado (University of Notre Dame)*; Ruilan Guo (University of Notre Dame)

B15 Structural Designs of Cross-linked Polymer Network and Ionic Liquids for Ion Gel Gas Separation Membranes, Victor A Kusuma (U.S. Department of Energy National Energy Technology Laboratory)*; James S Baker (U.S. Department of Energy National Energy Technology Laboratory); Megan Macala (U.S. Department of Energy National Energy Technology Laboratory); Samir Budhathoki (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory)
B16 Scalable hydrogen-bonded polyimide/metal-organic framework hybrid membranes for ultra-fast separations of multiple gas pairs, Canghai Ma (Lawrence Berkeley National Laboratory); Jeffrey Urban (Lawrence Berkeley National Laboratory)

B17 Performance Testing of Polyphosphazene-Based Membranes for Post-combustion Carbon Capture with Humidified Gas, Zi Tong (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory); Victor A Kusuma (U.S. Department of Energy National Energy Technology Laboratory)

B18 Systematic Optimization of MOF-based Mixed-Matrix Membranes: Surface Functionalization, Particle Size, and Loading, Patrick Muldoon (Oak Ridge Institute for Science and Education)

B19 Membrane heat exchanger for novel heat recovery in post-combustion carbon capture, Shuaifei Zhao (Dalian Maritime University); Shuiping Yan (Huazhong Agricultural University); Qiufang Cui (Huazhong Agricultural University)

B20 CANAL Ladder Polymers for Membrane Gas Separation, Holden W. H. Lai (Stanford University); Francesco Benedetti (University of Bologna); Zach Smith (MIT); Yan Xia (Stanford University)

B21 Fabrication of CO₂ selective miscible polyimide blend membranes for gas separation applications, Chamaal Karunaweera (The University of Texas at Dallas); John Ferraris (The University of Texas at Dallas); Kenneth Balkus, Jr. (The University of Texas at Dallas); Inga Musselman (The University of Texas at Dallas); Samitha Panangala (The University of Texas at Dallas); Shahed Haghiri (The University of Texas at Dallas)

B22 On development of constant-volume permeation system for monitoring upstream pressure decay, Haoyu Wu (University of Ottawa); Jules Thibault (University of Ottawa); Boguslaw Kruczek (University of Ottawa)

B23 Two-dimensional-material mixed-matrix membranes for gas separation, Gongping Liu (Nanjing Technical University)

B24 Synthesis of crosslinked polyether-based membranes for gas separations, Malgorzata Chwatko (The University of Texas at Austin); Christina Rodriguez (The University of Texas at Austin); Caitlin Bentley (The University of Texas at Austin); Nathaniel Lynd (The University of Texas at Austin); Benny Freeman (The University of Texas at Austin)

B25 Novel polyimides with bulky tert-butyl and fluorine-containing side groups: gas permeation parameters and free volume, Susanta Banerjee (Indian Institutes of Information Technology); Nikolay Belov (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Roman Nikiforov (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences); Mikhail Mazo (Institute of Chemical Physics, Russian Academy of Sciences); Ivan Strelnikov (Institute of Chemical Physics, Russian Academy of Sciences); Yury P Yampolskii (A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences)

B26 New mixed matrix composite membrane PEBAX based membrane incorporated with metal organic framework for CO₂ separation, Tarik Eljaddi (Laboratoire Réactions et Génie des Procédés); Julien Bouillon (Normandie University)

B27 Dual-Layer MOF Composite Membranes with Tunable Gas Transport Properties for Post-combustion CO₂ Separation, Sameh K Elsaidi (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory); Surendar Venna (U.S. Department of Energy National Energy Technology Laboratory); Mona Mohamed (University of Pittsburgh)

B28 Performance of Pd-Based Membranes and Effects of Various Gas Mixtures on H₂ Permeation, Kourosh Kian (Worcester Polytechnic Institute)
SESSION C - Innovation in Membrane Materials, Synthesis, and Characterization: Liquids

C1  Layer-by-layer modification of aliphatic polyamide anion-exchange membranes to increase chloride/sulfate selectivity, Muhammad Ahmad (University of Notre Dame)*; Chao Tang (University of Notre Dame); Liu Yang (University of Notre Dame); Andriy Yaroshchuk (Polytechnic University of Catalonia); Merlin Bruening (University of Notre Dame)

C2  Development of electrically conductive hollow fiber membranes, Melissa J Larocque (McMaster University)*, David R Latulippe (McMaster University), Charles-François de Lannoy (McMaster University)

C3  Structure Formation in Isoporous Hollow Fiber Membranes: An In Situ SAXS study, Kirti Sankhala (Helmholtz-Zentrum Geesthacht)*; D. C. Florian Wieland (Helmholtz-Zentrum Geesthacht); Joachim Koll (Helmholtz-Zentrum Geesthacht); Maryam Radjabian (Helmholtz-Zentrum Geesthacht); Clarissa Abetz (Helmholtz-Zentrum Geesthacht); Volker Abetz (Helmholtz-Zentrum Geesthacht)

C4  Microscopic membrane fouling characterization, Nandini Debnath (University of Alberta); Aloke Kumar (Indian Institute of Science); Thoams Thundat (The State University of New York at Buffalo); Mohtada Sadrzadeh (University of Alberta)*

C5  New Insights into the Impact of Nano-scale Surface Heterogeneity on the Wettability of Polymeric Membranes, Md Farhad Ismail (University of Alberta); Behnam Khoshidi (University of Alberta); Mohtada Sadrzadeh (University of Alberta)*

C6  A comparison of water and solute transport in ion exchange and desalination polymers, Ryan Kingsbury (Membrion, Inc.); Jingbo Wang (UCLA); Mikayla D Armstrong (University of North Carolina at Chapel Hill)*; Orlando Coronell (University of North Carolina at Chapel Hill)

C7  Water permeation through nanoporous particles in thin film nanocomposite membranes, Pinar Cay-Durgun (Arizona State University)*; Mary Laura Lind (Arizona State University)

C8  Printing Membranes: Enabling the Use of Both Conventional and Novel Polymers in High Performance Membranes, Jeffrey R McCutcheon (University of Connecticut); Ayse Asatekin (Tufts University); Maqsud Chowdhury (University of Connecticut); Xin Qian (University of Connecticut); Tulasi Ravindran (University of Connecticut)*; Samuel Loudner (Tufts University)

C9  Functionalization of PVDF Membranes with Thiol Groups for Heavy-Metal Capture, Ronald Vogler (University of Kentucky)*; Md. Saiful Islam (University of Kentucky); Evan Hatakeyama (Chevron Energy Technology Company); DB Bhattacharyya (University of Kentucky)

C10  Pure and mixed fluid sorption and transport in Celazole® polybenzimidazole: the effect of plasticization, Kelly P Bye (University of Oklahoma); Michele Galizia (University of Oklahoma)*

C11  Enhanced Water Interaction and Antifouling Compatible Zwitterion-PVDF Membrane Designs, Mahboobeh Maghami (University of Saskatchewan); Amira Abdelrasoul (University of Saskatchewan)*

C12  Novel strategy to develop a composite membrane for desalination by membrane distillation, Tarik Eljaddi (Laboratoire Réactions et Génie des Procédés - UMR 7274)*; Deisy Mejia Mendez (Laboratoire Réactions et Génie des Procédés - UMR 7274); Eric Favre (Laboratoire Réactions et Génie des Procédés - UMR 7274); Denis Roizard (Laboratoire Réactions et Génie des Procédés - UMR 7274)

C13  One-Step Tailoring Surface Roughness and Surface Energy to Prepared Superhydrophobic Polyvinylidene Fluoride (PVDF) Membranes for Enhanced Membrane Distillation Performances, Weihua Qing (The University of Hong Kong)*; Xiaonan Shi (New Jersey Institute of Technology); Chuang Tang (University of New South Wales)

C14  High-Performance Thin Film Composite (TFC) Membranes: Design Consideration Underneath the Polyamide Thin Film, Wangxi Fang (Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences)*; Jian Jin (Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences); Rong Wang (Singapore Membrane Technology Centre, Nanyang Technological University)
C15 Wafer-Scale, Vertically-Aligned SWCNT Composite Membranes for Nanofiltration, Melinda L Jue (Lawrence Livermore National Laboratory)*; Chiai Tai Chen (Cornell University); Steven Buchsbaum (Lawrence Livermore National Laboratory); Eric Meshot (Lawrence Livermore National Laboratory); Sei Jin Park (Lawrence Livermore National Laboratory); Kuang Jen Wu (Lawrence Livermore National Laboratory); Francesco Fornasiero (Lawrence Livermore National Laboratory)

C16 Vapor Phase Infiltration of Metal Oxides into Microporous Polymers for Solvent Stable Nanofiltration Membranes, Fengyi Zhang (Georgia Institute of Technology)*; Emily McGuinness (Georgia Institute of Technology); Yao Ma (Georgia Institute of Technology); Mark Losego (Georgia Institute of Technology); Ryan Lively (Georgia Institute of Technology)

C17 Understanding the Interlayer-spacing and Mass Transport Nexus of Graphene Oxide Membrane for Organic Solvent Nanofiltration, Sunxiang Zheng (UC Berkeley)*; Baoxia Mi (UC Berkeley)

C18 Organic-inorganic hybrid separation membrane having high chemical tolerance, Koichi Takada (TORAY Industries, Inc.)*; Takahiro Tokuyama (TORAY Industries, Inc.); Hiroki Minehara (TORAY Industries, Inc.); Takafumi Ogawa (TORAY Industries, Inc.); Masahiro Kimura (TORAY Industries, Inc.)

C19 Magnetron Sputtering-based Synthesis of Pd film on UF membrane support for environmental catalysis, Michael J Detisch (University of Kentucky)*; DB Bhattacharyya (University of Kentucky); John Balk (University of Kentucky)

C20 Influences of polymeric additives in different solvent systems on membrane performance and fouling resistance, Catharina Kahrs (Leibniz University Hannover)*; Jan Schwellenbach (Sartorius Stedim Biotech GmbH)

C21 Porous membranes with synergic solvent and thermal resistance from polyoxindole derivatives, Bruno Pulido Ponce de Leon (King Abdullah University of Science and Technology)*; Suzana Nunes (King Abdullah University of Science and Technology)

C22 Functionalized random zwitterionic copolymers as chlorine- and fouling-resistant nanofiltration membranes, Samuel J Lounder (Tufts University)*; Ayse Asatekin (Tufts University)

C23 Deterioration of nanofiltration polyamide membrane by strong acid and its mechanism, Byung-Moon Jun (University of South Carolina); Hyung Kae Lee (Ulsan National Institute of Science and Technology); Young-Nam Kwon (Ulsan National Institute of Science and Technology)*

C24 Opening new doors: Epoxides as novel chemistry for interfacial polymerization, Rhea Verbeke (Katholieke Universiteit Leuven)*; Marijn Seynaeve (Katholieke Universiteit Leuven); Wouter Arts (Katholieke Universiteit Leuven); Elke Dom (Katholieke Universiteit Leuven); Ivo Vankelecom (Katholieke Universiteit Leuven)

C25 Solution-diffusion with ion association: a non-mean-field model that successfully describes NF of multi-ion mixtures, Viatcheslav Freger (Technion - Israel Institute of Technology)*

C26 Relative permittivity properties of hydrated polymer membranes for desalination applications, Kevin Chang (University of Virginia)*; Hongxi Luo (University of Virginia); Geoffrey M Geise (University of Virginia)

C27 Multi-solute transport behavior of aqueous mixtures through polyether-based membranes, Jung Min Kim (Auburn University)*; Bryan S Beckingham (Auburn University)

C28 Comparative analysis of novel covalent organic framework nanofiltration membranes synthesis, composition, thickness and substrate dependence, Gabrielle Levato (University of Illinois at Urbana-Champaign)*; David Burke (Northwestern University); Zhiwei Jiang (Imperial College London); Daniel Mosiman (University of Illinois at Urbana-Champaign); William Dichtel (Northwestern University); Andrew Livingston (Imperial College London); Benito Marinas (University of Illinois at Urbana-Champaign)

C29 Copper-MOF Functionalized Nanofiltration Membranes for Enhanced Dye Removal: Effects of Dip-Coating and In-Situ Modification Techniques, Mostafa Dadashi Firouzjaei (University of Alabama); Zane Joseph Parkerson (University of Alabama); Milad Rabbani Esfahani (University of Alabama)*
C30 Advancing Conductivity-Permselectivity Tradeoff of Ion-Exchange Membranes with Sulfonated CNT Nanocomposites, Hanqing Fan (Columbia University)*; Yuxuan Huang (Columbia University); Ngai Yin Yip (Columbia University)

C31 Ceramic-supported thin film composite membrane for organic solvent reverse osmosis, Mi Zhang (University of Connecticut)*; Lingling Xia (University of Connecticut); Jeffrey R McCutcheon (University of Connecticut); Marcus Weyd (Fraunhofer-Institut für Keramische Technologien und Systeme)

C32 Dynamic FO tests of commercial low pressure RO TFC membrane, Du Bai (University of Ottawa); Farhad Asempour (University of Ottawa); Boguslaw Kruczek (University of Ottawa)*

C33 New generation recycled polystyrene membranes for industrial water purification using membrane distillation, Machawe M Motsa (University of South Africa)*; Bhekie Mamba (University of South Africa)

C34 Advanced supported ionic liquid (SIL) membranes for Pi electron cloud mediated separation of aromatics, Mahmood Jebur (University of Arkansas); Arijit Sengupta (University of Arkansas); Ranil Wickramasinghe (University of Arkansas)*

C35 Graphene Oxide Membranes for Selective Molecular Separation of Lignin Model Compounds, Ashish Aher (University of Kentucky)*; DB Bhattacharyya (University of Kentucky)

C36 High Flux and Anti-fouling Electrospun Nylon 6 Ultrafiltration Membrane Coated with GO/N-carboxyethylchitosan (NCECS) Functionalized Polyvinyl Alcohol Hydrogel, Liuqing Yang (Concordia University)*; Tiantian Chen (Concordia University); Zhibin Ye (Concordia University); Benoit Barbeau (Polytechnique Montreal); Saifur Rahman (Concordia University)

C37 Development and Characterization of nZVI/TiO₂ Supported Membranes for Photocatalytic Treatment of 1,4-Dioxane in Water, Larissa L. S. Silva (Federal University of Rio de Janeiro)*; Wael Abdelraheem (University of Cincinnati); Minghao Kon (University of Cincinnati); Mallikarjuna Nadagouda (Wright State University); Ana Maria Rocco (Federal University of Rio de Janeiro); Cristiano Borges (Federal University of Rio de Janeiro); Fabiana Fonseca (Federal University of Rio de Janeiro); Dionysios Dionysiou (University of Cincinnati)

C38 Oxone Mediated TEMPO-Oxidized Nanocellulose Form-I and Form-II: Materials, Membranes and Modeling, John P Moore (University of Arkansas)*

C39 Facile Fabrication of Amphiphobic Nanocomposite Membranes for Application in Membrane Distillation, Tiantian Chen (Concordia University); Liuqing Yang (Concordia University); Saifur Rahman (Concordia University)*

C40 Graphene Oxide Nanoplatelets Embedded Polyamide Thin Films for Water Desalination, Mahsa Abbaszadeh (Mississippi State University)*; Santanu Kundu (Mississippi State University)

C41 Development of Isoporous 0.2 Micron Nanoslit Silicon Nitride Membranes for Sterile Filtration of Biological Therapeutics, Evan Wright (McMaster University), Joshua Miller (Simpore), Andrew Gosselin (Simpore), Jared Carter (Simpore), James McGrath (University of Rochester), David Latulippe (McMaster University), James Roussie (Simpore)*

SESSION D - Innovation in Membranes for Energy Applications

D1 A membrane to separate light olefins and paraffins; an update on pilot trials, module design and C4 separations, Ken Loprete (Compact Membrane Systems)*; Bill Charlton (Compact Membrane Systems); Hannah Murnen (Compact Membrane Systems); Kenneth Pennisi (Compact Membrane Systems); Sudip Majumdar (Compact Membrane Systems)

D2 Cross-linked Polyethyleneimine (XLPEI) with superior H₂/CO₂ separation properties, Sankhajit Pal (The State University of New York at Buffalo)*; Weiguang Jia (The State University of New York at Buffalo); Haiqing Lin (The State University of New York at Buffalo)
D3  Self-Cleaning Nanocomposite Membranes with Phosphorene-Based Pore Fillers for Water Treatment,  
Joyner Eke (University of Kentucky)*; Isabel Escobar (University of Kentucky)

D4  Scale-up of A Catalytic Membrane Reactor for the Production of 5-Hydroxymethylfurfural from Lignocellulosic Biomass,  
Tammy Patra (University of Arkansas); Robert Beitle (University of Arkansas); Richard J. Ciora, Jr. (Media and Process Technology, Inc.); Ranil Wickramasinghe (University of Arkansas); Xianghong Qian (University of Arkansas)*

D5  Thin-Film Composite Hollow Fiber Membrane for Post-Combustion Carbon Capture,  
Shouliang Yi (U.S. Department of Energy National Energy Technology Laboratory)*; James S Baker (U.S. Department of Energy National Energy Technology Laboratory); Ali Sekizkardes (Battelle/U.S. Department of Energy National Energy Technology Laboratory); Surendar Venna (U.S. Department of Energy National Energy Technology Laboratory); Victor A Kusuma (U.S. Department of Energy National Energy Technology Laboratory); Fengming Xiang (U.S. Department of Energy National Energy Technology Laboratory); Hyuk Kwon (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory); Kevin Resnik (U.S. Department of Energy National Energy Technology Laboratory)

D6  Salinity gradient heat engine: optimising reverse electrodialysis for thermal-to-electric,  
Anna Hulme (Cranfield University)*

D7  Use of desalination brine for low-energy concentration of orange juice via forward osmosis,  
Haley D White (Tennessee Technological University)*; Leif Templeton (Tennessee Technological University); Shelby Jones (Tennessee Technological University); Laura H Arias Chavez (Tennessee Technological University)

D8  High-performance SSZ-13 membranes for CO₂ and N₂ removals from natural gas,  
Rongfei Zhou (Nanjing Technical University)*; Xinping Li (Nanjing Technical University); Bin Wang (Nanjing Technical University)

D9  Highly efficient CO₂ capture by mixed matrix membranes containing three-dimensional covalent organic framework fillers,  
Youdong Cheng (National University of Singapore)*; Dan Zhao (National University of Singapore)

D10  Industrially relevant membrane testing and novel mixed-matrix membranes for a brighter membrane future,  
Raymond Thür (Katholieke Universiteit Leuven)*

D11  Torlon® Hollow Fiber Membranes for Organic Solvent Reverse Osmosis separation of Complex Aromatic Hydrocarbon Mixtures,  
Hye Youn Y Jang (Georgia Institute of Technology)*; Ryan Lively (Georgia Institute of Technology); JR Johnson (ExxonMobil); Dhaal Bhandari (ExxonMobil)

D12  Performance Investigation of Polymer Derived Ceramic Composite Membrane in Microbial Fuel Cell (MFC),  
Vignesh Ahilan (University of Bremen)*; Camila Cabral de Barros (University of Bremen); Gourav Dhar Bhowmick (Indian Institute of Technology); Makarand M Ghangrekar (Indian Institute of Technology); Michaela Wilhelm (University of Bremen); Kurosch Rezwan (University of Bremen)

D13  PIM-1 based polymeric blend membranes for gas separation applications,  
Ashley Miles (Oak Ridge Associated Universities/U.S. Department of Energy National Energy Technology Laboratory)*; Ali Sekizkardes (Battelle/U.S. Department of Energy National Energy Technology Laboratory); Janice Steckel (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory)

D14  The dynamic fate of Organic micro-pollutants in MBR and their accumulation in fish tissue,  
Gal Dagan (Ben-Gurion University of the Negev)*; Inbal Zaibel (Ben-Gurion University of the Negev); Dina Zilberg (Ben-Gurion University of the Negev); Moshe Herzberg (Ben-Gurion University of the Negev)

D15  Improving H₂ Utilization of Solid Oxide Fuel Cell Using CO₂-Selective Membrane,  
Kai Chen (Ohio State University)*; Witopo Salim (Ohio State University); Yang Han (Ohio State University); Mike Gasda (Bloom Energy Corporation); Winston Ho (Ohio State University)

D16  Adapting a Blood CO₂ Removal Device for CO₂ Removal from Flue Gas,  
Katherine Hornbostel (University of Pittsburgh)*
D17 Experimental study of dehumidification potential of PDMS hollow fiber membrane for HVAC applications, Michelle K Croal (Oakland University); Jonathan Maisonneuve (Oakland University)*

D18 The Perfluoropolymer Upper Bound, Albert Wu (MIT)*; James Drayton (MIT); Zach Smith (MIT)

D19 Synthesis and characterization of catalytic PtNa-PdAu membranes for hydrogen production, Ana M Tarditi (Instituto de Investigaciones en Catalysis y Petroquimica)*; Laura Cornaglia (Instituto de Investigaciones en Catalysis y Petroquimica); Yohana Martinez Galeano Instituto de Investigaciones en Catalysis y Petroquimica

D20 Hybrid facilitated transport membranes containing 2D GO-based nanoplatelets and scaffolds for CO₂ separation, Saravanan Janakiram (Norwegian University of Science and Technology)*; Juan Luis Martin Espejo (Norwegian University of Science and Technology); Zhongde Dai (Norwegian University of Science and Technology); Luca Ansaloni (SINTEF Industry); Liyuan Deng (Norwegian University of Science and Technology)

D21 Current Efforts in Harvesting Algae At-Scale For Biofuels to Meet the Dual Energy Challenge, Mark A Deimund (ExxonMobil Research and Engineering)*

D22 Atomically-Ordered Intermetallic Hydrogen Separation Membranes, Casey O'Brien (University of Notre Dame)*

D23 Molten Hydroxide Dual-Phase Membranes for Intermediate-temperature Fuel Cells, Vedasri Vedharathinam (Lawrence Livermore National Laboratory)*; Anna Ivanovskaya (Lawrence Livermore National Laboratory); Maira Ceron Hernandez (Lawrence Livermore National Laboratory); Patrick Campbell (Lawrence Livermore National Laboratory)

D24 High-Yield Recovery of Dissolved Methane Using Omniphobic Membranes, Xuesong Li (University of British Columbia); Abhishek Dutta (University of British Columbia); Girong Dong (Fibracast); Sasha Rollings-Scattergood (Anaergia); Jongho Lee (University of British Columbia)*

D25 Aging minimization of CMSMs from the incorporation of copper pillars derived from metal organic polyhedra-18, Whitney Cosey (University of Texas at Dallas)*; Inga Musselman (University of Texas at Dallas); John Ferraris (University of Texas at Dallas); Kenneth Balkus (University of Texas at Dallas)

D26 (Cross-linked Poly(ionic liquid)-Ionic Liquid-Zeolite) Mixed-Matrix Membranes for CO₂/CH₄ Gas Separations Based on Curable Ionic Liquid Prepolymers, Collin A Dunn (University of Colorado Boulder)*; Zhangxing Shi (University of Colorado Boulder); Rongfei Zhou (Nanjing Technical University); Douglas Gin (University of Colorado Boulder); Richard Noble (University of Colorado Boulder)

D27 Integral hollow fiber membrane with chemical cross-linking for pressure retarded osmosis operated in the orientation of active layer facing feed solution, Ye Li (Nanyang Technological University)*; Rong Wang (Nanyang Technological University)

D28 GHG separation membrane application in KOGAS LNG regasification facilities, Kyung Taek Woo (Korea Gas Corporation)*; Hyun Seok You (Korea Gas Corporation); Jong Tae Chung (Korea Gas Corporation); Jae Dong Kim (Korea Gas Corporation)

D29 High performance electrochemical structures for power generation and oxygen separation, Ralph A Bauer (Global Research and Development Inc.)*

D30 Techno-economic comparison of RO and MD for small-scale brackish water desalination, Haamid S Usman (Concordia University)*; Khaled Touati (Concordia University); Saifur Rahaman (Concordia University)

D31 Tailor-made amphiphilic copolymer membranes for efficient gas and water vapor transport, Faheem Hassan Akhtar (King Abdullah University of Science and Technology)*; Klaus-Viktor Peinemann (King Abdullah University of Science and Technology)

D32 High-Temperature and High-Pressure Permeability-Selectivity Upper Bounds for Gas Separation Membranes Prepared From High Performance Polymers, Edson V Perez (The University of Texas at Dallas)*; Kenneth Balkus, Jr. (The University of Texas at Dallas); John Ferraris (University of Texas at Dallas); Inga Musselman (The University of Texas at Dallas)
**D33** Synthesis and Characterization of Anion Exchange Membranes based on Semi-Crystalline Poly(Ethylene-block-Styrene-block-Ethylene) Triblock Copolymer, Carrie Trant (Rensselaer Polytechnic Institute)*; Chulsung Bae (Rensselaer Polytechnic Institute); Sangwoo Lee (Rensselaer Polytechnic Institute)

**D34** Effect of Polyvinylamine Content on the CO₂ Separation Performance of Facilitated Transport Membranes, James S Baker (U.S. Department of Energy National Energy Technology Laboratory)*; Victor A Kusuma (U.S. Department of Energy National Energy Technology Laboratory); David Hopkinson (U.S. Department of Energy National Energy Technology Laboratory)

**D35** Effect of organic ballast properties on the energy efficiency of a concentration gradient flow battery, Fei Liu (University of North Carolina at Chapel Hill)*; Ryan Kingsbury (Membrion, Inc.); Jeremy Rech (University of North Carolina at Chapel Hill); Wei You (University of North Carolina at Chapel Hill); Orlando Coronell (University of North Carolina at Chapel Hill)

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**SESSION E - Innovation in Membranes for Water Treatment**

**E1** Feasibility of long-term treatment of malting wastewater in a submerged anaerobic membrane bioreactor (SAnMBR) at psychrophilic temperature conditions, Esmat Maleki (Lakehead University)*; Baoqiang Liao (Lakehead University)

**E2** Biofouling in ultrafiltration process for drinking water treatment and its control by chlorinated-water and pure water backwashing, Shao Senlin (The University of Hong Kong)*

**E3** Membrane Distillation of High Salinity Water by Induction Heated Thermally Conducting Membranes, Avner Ronen (Temple University)*; Arezou Anvari (Temple University)

**E4** Bromide Removal from Drinking Water Source Impacted by Energy Wastewater Discharge Using Electrically Conductive Membranes, Avner Ronen (Temple University)*; Mei Sun (University of North Carolina at Charlotte); Kartikeya Kekre (Temple University)

**E5** A surface modification of forward osmosis (FO) membranes to enhance dye retention and fouling resistance for the treatment of textile wastewater, Sara Azari (Sterlitech)*; Mohammad Karimi (Amirkabir University of Technology)

**E6** Evaluation of surface, bulk and electrochemical properties of Ti3C2Tx membranes used for selective ion removal from brine., Yousuf Z Bootwala (Georgia Institute of Technology)*; Wahiduz Zaman (Vanderbilt University); Kelsey Hatzell (Vanderbilt University); Marta Hatzell (Georgia Institute of Technology)

**E7** Microwave-enhanced Membrane Filtration for Water Treatment, Wanyi Fu (New Jersey Institute of Technology)*; Wen Zhang (New Jersey Institute of Technology)

**E8** Application of Nanofiltration (NF) Membranes for Perfluoroalkyl and Polyfluoroalkyl substances (PFAS) Removal, Daniel G Kulas (Michigan Technological University)*; Andre da Costa (Michigan Technological University); Ananya Ananya (Michigan Technological University); Sam Jacobs (Michigan Technological University)

**E9** Development of membrane synthesis and novel draw materials for forward osmosis process, Yusak Hartanto (Katholieke Universiteit Leuven)*

**E10** 3D Printed Self-Assembled Zwitterionic Copolymer Membranes, Xin Qian (University of Connecticut)*; Samuel J Louder (Tufts University); Ayse Asatekin (Tufts University); Jeffrey R McCutcheon (University of Connecticut)

**E11** Antifouling and Antiwetting Janus Membrane for Treating Hypersaline Oily Wastewater by Membrane Distillation, Chenxi Li (University of British Columbia); Xuesong Li (University of British Columbia); Xuewei Du (Colorado State University); Tiezheng Tong (Colorado State University); Tzahi Cath (Colorado School of Mines); Jongho Lee (University of British Columbia)*
E12  **Treating Hydraulic Fracturing Produced Waters by Membrane Distillation**, Ranil Wickramasinghe (University of Arkansas)*

E13  **Synthesis of Polystyrene-b-poly(solketal methacrylate) (PS-b-PSMA) Polystyrene-b-poly(glyceryl methacrylate) (PS-b-PGMA) Block Copolymers for Isoporous Membranes**, Sarah Saleem (Helmholtz-Zentrum Geesthacht); Sofia Rangou (Helmholtz-Zentrum Geesthacht); Clarissa Abetz (Helmholtz-Zentrum Geesthacht); Brigitte Lademann (Helmholtz-Zentrum Geesthacht); Volkan Filiz (Helmholtz-Zentrum Geesthacht)*; Volker Abetz (Helmholtz-Zentrum Geesthacht)

E14  **Uranium isolation and concentration using reactive membranes for nuclear forensics applications**, Abenazer W Darge (Clemson University); Timothy DeVol (Clemson University); Scott Husson (Clemson University)*

E15  **Development of Nano-enabled Membrane Technology for Water Reuse in Agriculture**, Xingmao Ma (Texas A&M University); Yinghao Wen (Texas A&M University)*; Jieming Yuan (Texas A&M University)

E16  **Detection of Electrically Conductive Membrane Fouling by Impedance Spectroscopy**, Nan Zhang (McMaster University)*; Charles-François de Lannoy (McMaster University)

E17  **Stability of Polyamide Nanofiltration Membranes with Peracetic Acid/Hydrogen Peroxide Disinfection**, Mohsen Ghafari (State University of New York at Buffalo)*; Boya Xiong (MIT); Ning Dai (State University of New York at Buffalo)

E18  **Fouling-Resistant Two-Dimensional (2D) Covalent Organic Framework Membranes for Industrial Water Reuse**, Phuoc Duong (University of Wyoming); Valerie Kuehl (University of Wyoming); Mohammad Afroz (University of Wyoming); John Hoberg (University of Wyoming); Bruce Parkinson (University of Wyoming); Katie D Li-Oakey (University of Wyoming)*

E19  **Reduced-holy graphene oxide(r-HGO) membranes with enhanced water permeance for water purification**, Xiaoyi Chen (The State University of New York at Buffalo)*; Liang Huang (The State University of New York at Buffalo); Zhihao Feng (The State University of New York at Buffalo); Janavi Gohil (The State University of New York at Buffalo); Haiqing Lin (The State University of New York at Buffalo)

E20  **A Comparison of PolarClean, Gamma-Valerolactone and their Mixture as Bio-derived Solvents for Polysulfone Membrane Fabrication**, Xiaobo Dong (University of Kentucky)*; Halle Shannon (University of Kentucky); Isabel Escobar (University of Kentucky)

E21  **Filterability of crude oil emulsions stabilized by COREXIT 9500 dispersant**, Seyma Kucuk (Michigan State University); Charifa Hejase (Michigan State University)*; Iryna Kolesnyk (National University of Kyiv-Mohyla Academy); Jia Wei Chew (Nanyang Technological University); Vlad Tarabara (Michigan State University)

E22  **Polyamide/CNT Thin Film Nanocomposite (TFN) Seawater RO Membranes with Improved Boron Rejection**, Ayas Guvensoy (Istanbul Technical University); Süer Kurklu Kocaoglu (Istanbul Technical University); Cansu Yildirim (Istanbul Technical University); Sadiye Velioglu (Istanbul Technical University); S. Birgul Tantekin Ersolmaz (Istanbul Technical University)*

E23  **New generation of patterned membranes for water treatment**, Asad Asad (University of Alberta); Dan Sameoto (University of Alberta); Mohtada Sadrzadeh (University of Alberta)*

E24  **Enhancing boron rejection on electrically conducting reverse osmosis membranes through local electrochemical pH modification**, Bongyeon Jung (UCLA)*; David Jassby (UCLA)

E25  **Cellulose Triacetate Membrane Parameter Estimation Under Osmotic and Osmotic-Assisted Process Conditions**, Jacob L Weidman (U.S. Department of Energy National Energy Technology Laboratory/Oak Ridge Institute for Science and Education)*; Sara Osipi (Federal University of Rio de Janeiro); Alexander V Dudchenko (Carnegie Mellon University); Meagan S Mauter (Carnegie Mellon University); Nicholas Siefert (U.S. Department of Energy National Energy Technology Laboratory)
E26 Porous hydrophobic-hydrophilic composite flat and hollow fiber membranes for direct contact membrane distillation, Aishwarya Puranik (New Jersey Institute of Technology); Lydia Rodrigues (New Jersey Institute of Technology); John Chau (New Jersey Institute of Technology); Lin Li (New Jersey Institute of Technology); Kamalesh K Sirkar (New Jersey Institute of Technology)*; Ashok Sharma (Applied Membrane Technology Inc); Stephen Conover (Applied Membrane Technology Inc); Adam Juelfs (Applied Membrane Technology Inc); Connor Colling (Applied Membrane Technology Inc); Saket Sharma (Applied Membrane Technology Inc)

E27 Polyamide-imide: a new platform for fabrication of oil/water separation membranes, Nusrat Helali (University of Alberta); Masoud Rastgar (University of Alberta); Mohtada Sadrazadeh (University of Alberta)*

E28 Monolayer Graphene transfer onto polyvinyl alcohol (PVA) microfiltration membrane for water desalination., Mansour Saberi (Clemson University)*

E29 Membrane Distillation-Crystallization (MDC) for Maximum Water Recovery in Inland Desalination, Evangelos Balis (University of Nevada, Reno); Sage Hiibel (University of Nevada, Reno)*

E30 Insights regarding thermomechanical bonding between porous membranes and thermoplastic polymers, Masoud Aghajani (MAST Center, University of Colorado Boulder)*; Adrienne Blevins (University of Colorado Boulder); Jason P. Killgore (National Institute of Standards and Technology); Ryan Sylvia (MilliporeSigma); Christina Caribrello (MilliporeSigma); Alan R. Greenberg (MAST Center, University of Colorado Boulder); Rong Long (MAST Center, University of Colorado Boulder); Yifu Ding (MAST Center, University of Colorado Boulder)

E31 Ion exchange polymer coatings enhance solute rejection of polyamide thin-film composite membranes, Mikayla D Armstrong (University of North Carolina at Chapel Hill)*; Ryan Kingsbury (Membrion, Inc.); Kasia Grzebyk (University of North Carolina at Chapel Hill); Orlando Coronell (University of North Carolina at Chapel Hill)

E32 Mechanical behaviour of the porous support of TFC membranes and its influence on the overall resistance, Masoud Aghajani (University of Colorado Boulder)*; Alan R. Greenberg (University of Colorado Boulder); Yifu Ding (University of Colorado Boulder)

E33 Development of Membrane Distillation through Tuning Membrane Surface Properties and Module Design, Siamak Nejati (University of Nebraska-Lincoln)*; Mahdi Mohammadi (University of Nebraska-Lincoln); Mona Bavarian (University of Nebraska-Lincoln)

E34 Integration of Forward Osmosis in the Treatment of Sewage by Chlorella vulgaris: Comparison between External and Immersed Systems, Xue Jin (Oregon State University)*; Mathieu Larronde-Larretche (University of Glasgow)

E35 Nanoeengineered condensation surfaces for air gap membrane distillation, Yashwant S. Yogi (Purdue University); Sina Nejati (Purdue University); Akshay K. Rao (Purdue University); Rishav Roy (Purdue University); Abhimanyu Das, Longnan Li (University of Illinois, Urbana-Champaign); Soumyadip Sett (University of Illinois, Urbana-Champaign); John Lienhard (MIT); Nenad Miljkovic (University of Illinois, Urbana-Champaign); Justin A. Weibel (Purdue University); Jaichander Swaminathan (Massachusetts Institute of Technology); David Warsinger (Purdue University)*

E36 Fouling of Anion Exchange Membranes in Ferric Chloride Solutions: mechanism and the role of ion exchange capacity, water content, and pore structure, Michael J. McGrath (University of Colorado Boulder)*; Nicholas Patterson (UC San Diego); Bryce Manubay (University of Colorado Boulder); Hans Funke (University of Colorado); Samantha Hardy (University of Colorado Boulder); Andrew Basalla (University of Colorado Boulder); Xiujun Yue (UC San Diego); Ping Liu (UC San Diego); Douglas Gin (University of Colorado Boulder); Richard Noble (University of Colorado Boulder)

SESSION F - Innovation in Modeling of Membrane Fundamentals and Processes

F1 Molecular Dynamics Processing Tool for Transmembrane Simulations, Jia Lin Cheoh (Purdue University)*; Abhimanyu Das (Purdue University); David Warsinger (Purdue University)
F2 Low energy-consumption pre-treatment system for integrated forward osmosis - reverse osmosis desalination process, Yunchul woo (Korea Institute of Civil Engineering and Building Technology)*; June-Seok Choi (Korea Institute of Civil Engineering and Building Technology); Kwang-Duk Park (Korea Institute of Civil Engineering and Building Technology)

F3 Arrested mobility effects on the spinodal decomposition of ternary polymer solutions for immersion precipitation, Jan Garcia (UC Santa Barbara)*; Douglas Tree (Brigham Young University); Kris Delaney (UC Santa Barbara); Glenn Fredrickson (UC Santa Barbara)

F4 Hydro- and perfluoro-carbon sorption, diffusion and permeation modeling in poly(dimethylsiloxane) using a PC-SAFT Equation of State, Liang Liu (The University of Melbourne)*

F5 The Potential of Low-Temperature Forward Osmosis for Water Recovery, Jeffrey Martin (University of Toronto); Georgios Kolliopoulos (University of Toronto); Vlaimidros Papangelakis (University of Toronto)*

F6 Fouling mechanisms in constant flux crossflow ultrafiltration, Alon Kirschner (The University of Texas at Austin)*; Yu-Heng Cheng (The University of Texas at Austin); Donald Paul (The University of Texas at Austin); Robert Field (University of Oxford); Benny Freeman (The University of Texas at Austin)

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