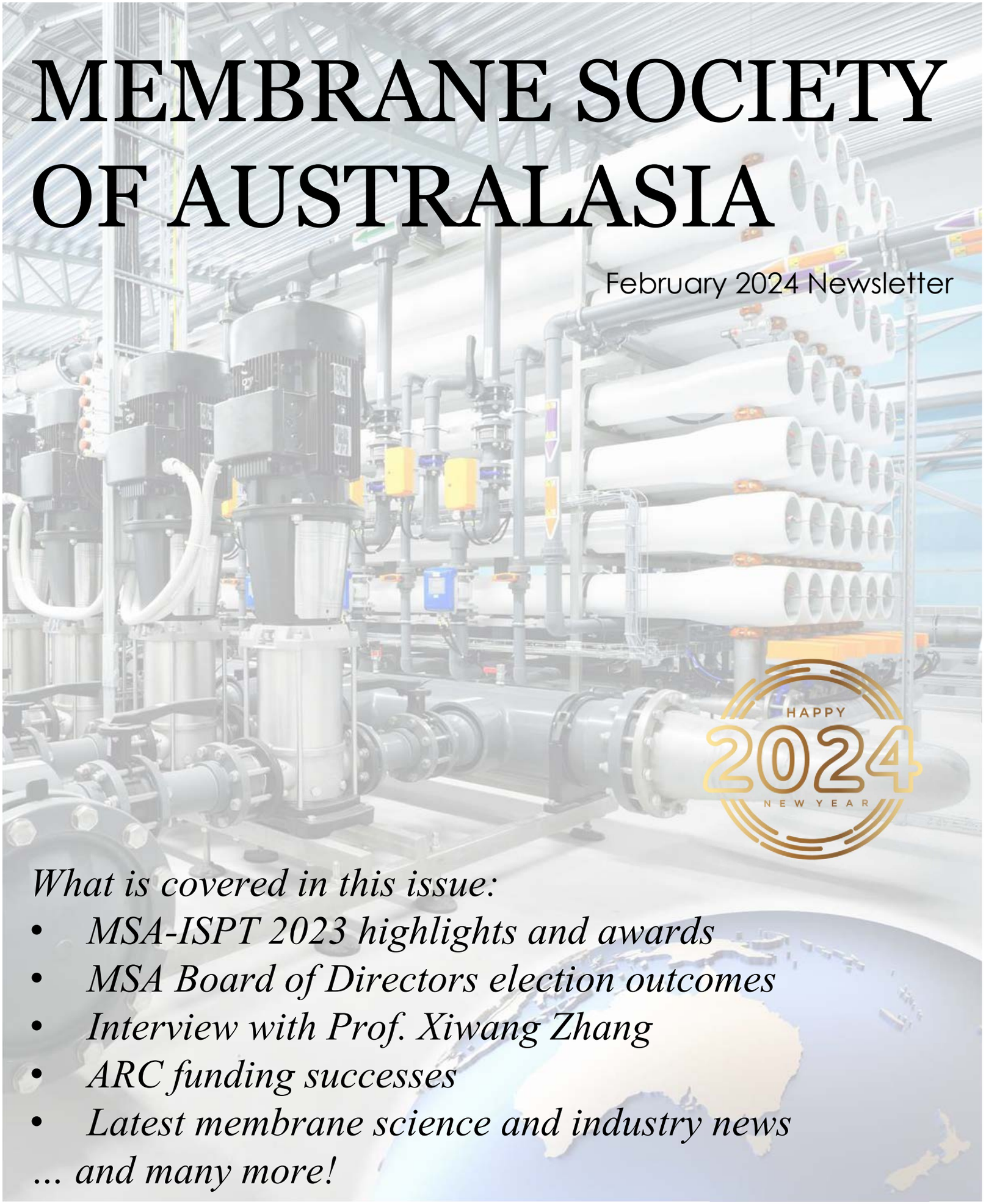
MEMBRANE SOCIETY OF AUSTRALASIA

February 2024 Newsletter



What is covered in this issue:

- *MSA-ISPT 2023 highlights and awards*
- *MSA Board of Directors election outcomes*
- *Interview with Prof. Xiwang Zhang*
- *ARC funding successes*
- *Latest membrane science and industry news*

... and many more!

Building a membrane community in Australasia.

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MSA Board of Directors Election Outcomes

MSA would like to express our gratitude and appreciation to Dr Gayathri Danasamy's and Mark Mullett's significant contribution to serving the MSA over the last 2 years.

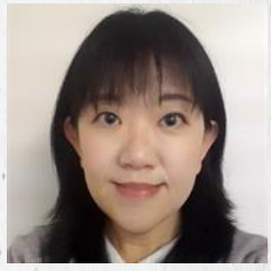
MSA Board consists of 10 Directors and 2 Non-Directors (a Secretory and a Vice-Secretory). Based on the status of current directors, a total of five vacant positions were advertised and the newly elected Board of Directors are:

Professor Faisal Hai, Head of the School of CMEA Engineering at the University of Wollongong, has transformed the Membrane Society of Australia (MSA) into a global leader with a thriving online presence. His leadership solidified the MSA as a trusted platform for membrane companies seeking talent.

Beyond his leadership, Professor Hai is a recognized MBR expert and leads research on membrane-based hybrid technologies for water treatment. His expertise is further evidenced by his editorial board positions in three Elsevier journals (Desalination, JWPE, JTICE) and his role as lead editor of a best-selling book on MBR technology published by IWA Publishing.

A/Prof Amir Razmjou, has served as the Board Director for the MSA since 2021 and holds the position of leader at the Mineral Recovery Research Centre (MRRC) at ECU, Western Australia, Perth. Additionally, he is a WA FHRI Fund Innovation Fellow and an editorial board member for Desalination and Water Process Engineering.

In his role as the MSA Board Director overseeing the MSA Newsletter, Dr. Razmjou has successfully assembled an editorial team, including 2 ECR-associated editors and several Assistant Editors. He recently has been co-chairing the 2023 Annual Conference of the MSA, co-hosted by the International Congress on Separation and Purification Technology, scheduled in Dec 2023 in Perth.



Dr. Filicia Wicaksana is presently a Senior Lecturer at the Department of Chemical and Materials Engineering, University of Auckland, New Zealand. As the current MSA Director, she brings over 20 years of research expertise in membrane technology.

Dr. Wicaksana's research spans various areas, including membrane processes for water/wastewater treatment, desalination, and applications in the dairy industry. Her focus extends to membrane fouling, exploring non-invasive techniques for fouling monitoring, and conducting hydrodynamics studies in membrane filtration systems.

A/Prof Huacheng Zhang, based at RMIT University, is an accomplished researcher in membrane science. With a background spanning academia and research institutions, she achieved the status of an ARC DECRA Fellow in 2017 and currently serves as an ARC Future Fellow while holding the position of Associate Professor at RMIT University.

Dr. Zhang has earned recognition through prestigious awards, including the RMIT Vice-Chancellor's Research Fellowship, the 2021 RMIT VC Award for Research Excellence-ECR, the 2022 MSA Membrane Science Award, and the 2023 J&J WiSTEM2D Scholars Award. Her expertise is evident in numerous invited talks and article contributions.

Dr. George Chen is a Lecturer at The University of Melbourne, focusing his research on fundamental studies of membrane processes. Specifically, he investigates the transport of ions and organic molecules in electromembrane systems, with applications in food and bio-processing.

Dr. Chen boasts a proven track record in developing membrane technology and translating research into practical solutions for food manufacturers. This enables them to reduce waste and energy consumption, promoting sustainability and increased turnover. His contributions have been acknowledged through numerous awards, including the 2022 ICM Agrifood Award from the Australian Academy of Technological Sciences and Engineering and the 2022 Applied Research Award from the MSA.

MSA- ISPT 2023 Highlights

BY Mitra Golgoli

The 2023 Annual Conference of the Membrane Society Australasia, co-hosted by the International Congress on Separation and Purification Technology (MSA-ISPT) was successfully held in the beautiful city of Perth, Western Australia. The conference was chaired by A/Prof. Amir Razmjou, A/Prof. Jingwei Hou, and Dr. Shouliang (Shawn) Yi. The conference featured a wide range of expert speakers, industry leaders, and academic researchers, who shared their insights, expertise, and perspectives on a range of topics related to membrane science and technology. A total of 142 people from 15 countries (Australia, China, Denmark, India, Saudi Arabia, etc.) participated in the conference to engage and explore the latest advancements in the field of membrane science and technology.

Organising Committee

Conference Chairs

A/Prof. Amir Razmjou

A/Prof. Jingwei Hou

Dr Shouliang Yi

Dr. Andrea Merenda – Treasurer
Dr. Milton Chai – Communication Coordinator
Dr. Rijia Lin – Communication Coordinator
A/Prof. Huacheng Zhang – Conference Program Coordinator
Dr. Jue Hou – Conference Program Coordinator
A/Prof. Jin Shang – Conference Program Coordinator
Dr. Li Gao – Sponsorship Coordinator
A/Prof. Mehdi Khiadan – Industry Coordinator
Prof. Chao He – Social Media Coordinator
Prof. Xiaobin Jiang – Social Media Coordinator

MSA Travel Awards

For this conference, MSA awarded 6 Travel Awards to 3 PhDs/3 ECRs to cover the cost of conference registration fees for them to attend the conference and present their research work.

Awardees	
HDR	
1	Mohadeseh Najafi
2	Hanwei Yu
3	Rajneesh Gautam
ECR	
1	Masoumeh Zargar
2	Xiaoheng Jin
3	Zhuyuan Wang

Volunteers

MSA- ISPT 2023 Highlights

BY Mitra Golgoli

MSA- ISPT 2023 Awards

Best ECR Oral Presentation Awards

Dr Radosław Górecki,
King Abdullah University of Science and Technology

Dr Chen Wang,
University of Technology Sydney

Dr Syed Muztuza Ali
DuPontTM

Best Student Presentation Awards

Best Oral Presentation	**Chenxin Tian** Tongji University
Best Oral Presentation	**Freja Mardal** Aarhus University
Best Oral Presentation	**Hanwei Yu** University of Technology Sydney
Best Poster Presentation	**Chinky Kochar** RMIT University
Best Poster Presentation	**Ebrahim Khair Alosta** Khalifa University

MSA-ISPT 2023

MSA- ISPT 2023 Highlights

BY Mitra Golgoli

Plenary speakers

Prof Lei Jiang, Chinese Academy of Sciences, presented about "Super-wettability and Beyond—Quantum-confined Superfluid: Biological Energy Conversion, Chemical Reaction and Information Transfer"

Prof. Suzana Nunes, King Abdullah University of Science and Technology, presented about "Polymer Membranes: Driving the Shift to a Sustainable Economy"

Prof. Huanting Wang, Monash University, presented about "Ion transport and separation in nanoporous hybrid membranes"

Conference Dinner

The conference dinner was held at Hyatt Regency Perth. A special highlight of the night was the talk by the guest speaker Professor Vicki Chen who shared MSA's journey.

Further information of the conference can be found at https://www.membrane-australasia.org/msa-isptb .

MSA- ISPT 2023 Awards

BY Shokat Akbarnezhad

A/Prof Amir Razmjou, **recipient of the MSA Industrial Innovation Award,** has developed a lithium patch for bipolar disorder treatment using membranes. He received a $250,000 WA Innovation Fellowship for his work on lithium-selective membranes and collaborated with Cochlear on inner ear applications. Additionally, he joined forces with industry partners like CSIRO, Rio Tinto, Water Co, and Vulcan for direct lithium extraction, totaling $700,000 in value. A/Prof Razmjou has garnered $1 million as a lead investigator and an impressive $7 million as a co-investigator.
Learn more about his innovative solutions and latest project: https://www.ecu.edu.au/schools/engineering/staff/profiles/lecturers/dr-amir-razmjou

Mark Mullett, a recognized figure in Water and Carbon Group, received **the MSA Service Award**. He served two terms as director, focusing on industry engagement and MSA strategy. Mark mentors young professionals and Early Career Researchers, guiding them to become membrane experts. He maintains strong ties with MSA board members, offering ongoing informal assistance. As a globally recognized industrial scientist, he specializes in nanofiltration advancements.
Learn more about his innovative solutions and latest projects: Team - The Water & Carbon Group (https://lnkd.in/gNwmKuKX)

A/Prof Jingwei Hou, **recipient of the MSA Membrane Science Award,** received his Ph.D. in Chemical Engineering from the University of New South Wales in 2015. He then joined the UNESCO Centre for Membrane Science and Technology (2015-2017) and University of Cambridge (2017-2019, affiliate of the Trinity College) for this post-doctoral research. In 2019, he returned Australia as an ARC DECRA Fellow at the School of Chemical Engineering, University of Queensland. In 2021, he was named the ARC Future Fellow. He is currently a Senior Lecturer and group leader of the Functional Materials Engineering (fme) Lab.
Dr. Jingwei Hou is a pioneer in membrane separation materials, with 130+ publications in top journals. He showcased an unbreakable glass membrane at the World Expo 2022 and secured over $4 million as a lead investigator and $37 million as a co-investigator.
Read more about Dr Jingwei Hou: https://researchers.uq.edu.au/researcher/24115

Dr. Li Gao, **MSA Early Career Research (ECR) Awardee** and Research Strategist at South East Water, holds MSc and Ph.D. degrees from Delft University of Technology (Netherlands) and Victoria University (Australia). With over 15 years of experience in water science and engineering, his expertise spans water/wastewater treatment, desalination, membrane technology, algal biotechnology, and emerging contaminant removal. Dr. Gao is an Australian Research Council inaugural Industry Fellow, a Fellow and Chartered Engineer of The Institution of Engineers Australia, and a Fellow of the Royal Society of Chemistry (UK). Additionally, he serves as an Adjunct Associate Professor at Griffith University, Australia. Currently, his research, funded by the Australian Research Council in collaboration with Monash University's Centre for Membrane Innovation, focuses on ammonium recovery with support from South East Water.

Dr. Jianhua Zhang, **recipient of the MSA Industry Achievement Award**, is the senior research fellow at the Institute for Sustainable Industries and Liveable Cities (ISILC), Victoria University, Australia. His major research direction is water treatment and membrane related technology. He is the one of the key designers of the first direct potable reuse plant in Antarctica, which is operating in Davis station, Australia. In recent years, Jianhua has published 53 papers, the total citations are more than 3800 and H-indexes are 30. He is also the inventor for six patents. The total funds he has achieved and been involved are $1,533,972.

MSA- ISPT 2023 Awards

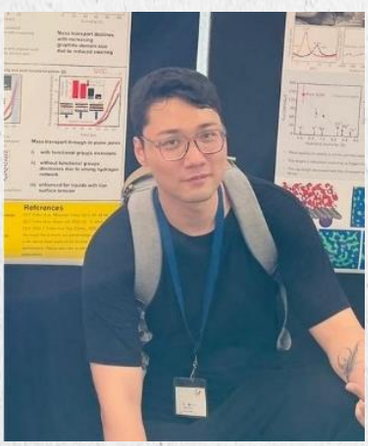
BY Shokat Akbarnezhad

Hoseong Han, a UniMelb student and **recipient of the MSA Student Award 2023,** is making strides in the development of advanced gas separation membranes to reduce CO2 emissions. She is the first to report modeling predictions in this area and has published six journal articles as the main author. In recognition of her outstanding contributions, Hoseong received Best Oral Presentation Award at ICOM2023 from the World Association of Membrane Societies.

Travel Awards- ECR

Dr. Masoumeh Zargar is a Senior Lecturer and ARC DECRA Fellow at the School of Engineering, Edith Cowan University (ECU), Australia. She also serves as the Co-Chair of the ECU Early and Mid-Career Researchers Network (EMCR). Dr. Zargar holds a Ph.D. degree in Chemical Engineering from the University of Adelaide and M.Sc. and B.Sc. degrees in Chemical Engineering from the University of Tehran. Before joining ECU, she was a Research Associate in the Fluid Science and Resources Research (FSRR) group at the University of Western Australia. Currently, Dr. Zargar leads the Advanced Materials and Membranes Research Group at ECU, guiding over ten PhD students and research assistants on diverse materials and membranes development and applications, such as water and wastewater treatment, desalination, resource recovery, plastic recycling, micro and nanoplastics removal, photocatalysis, and PFAS treatment technologies.

Dr. Zargar's accolades include winning prestigious awards and fellowships such as ARC DP, ARC DECRA, AMP Tomorrow Maker's Award, ECU Vice Chancellor Fellowship, and ECU 2023 Vice Chancellor's Staff Excellence Award for excellence in research as an ECR, along with various industry grants and presentation awards. As an invited speaker at the MSA-ISPT 2023, she presented her team's research on advanced membranes targeting micro and nanoplastics. Serving as the Scientific Associate Editor of the MSA's newsletter since June 2022, Dr. Zargar has actively and positively contributed to the MSA community and beyond.



Dr. Alan Jin is a Postdoc fellow at CSIRO Manufacturing. He received his PhD in Material Science from the University of New South Wales. During his PhD, he worked on nanocarbon membranes for gas separation and water purification applications. He is motivated to explore new materials, and expand applications of these materials for processes that achieves in cost effective, sustainable hydrogen storage and transport technologies. His current research interests include the inorganic membrane materials and catalytic membrane reactors.

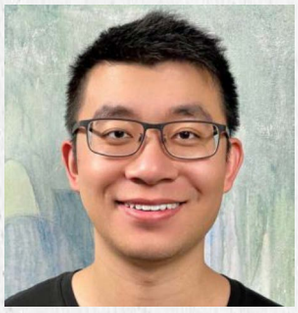
MSA- ISPT 2023 Awards

BY Shokat Akbarnezhad

MSA-ISPT Mid-Career Researcher Awardees

A/Prof. Qiang Fu is a distinguished researcher, currently leading a research group at the Centre for Technology in Water and Wastewater (CTWW) at the University of Technology Sydney. His notable achievements include being the recipient of an ARC Super Science Fellowship (2011-2014) and an ARC Future Fellowship (2018-2022). Dr. Fu holds a B.E. in Chemical Engineering from Shanghai Jiao Tong University (2004) and completed his Ph.D. in Polymer Chemistry at Fudan University in 2009. With a prolific publication record of 130 peer-reviewed journal articles, two book chapters, and four patents, his research spans the fields of 'Polymer Chemistry,' 'Renewable Energy,' 'Materials Science,' and 'Chemical Engineering.'read more here: https://profiles.uts.edu.au/Qiang.Fu

A/Prof. Ludovic (Ludo) Dumée, Assistant Professor at Khalifa University since 2020, specializes in advanced materials for separation applications. With a focus on stimuli-responsive materials, he enables the simultaneous capture, sieving, conversion, or sensing of contaminants or resources in dilute streams. Formerly with Deakin University and the University of Melbourne, he holds prestigious fellowships, including an Australian Research Council DECRA Research Fellowship (2018). Recognized for his work on desalination, he received the Prize for Best PhD Thesis in 2012. As a founding member of the Membrane Society of Australasia, he maintains active roles globally. Read more here: https://www.ku.ac.ae/college-people/ludovic-ludo-dumee



Dr. Mengran (Aaron) Li, a Chemical Engineering lecturer, obtained his PhD from the University of Queensland in 2016. With a background in reducing carbon emissions in the steel industry, he joined Delft University of Technology in 2021. In 2022, he became a Lecturer in the Chemical Engineering Department. Awarded the ARC DECRA in 2023, Dr. Li focuses on integrating carbon capture and electrolysis to reduce costs. Recognized with over AUD 1.1 million in research funds, he is a recipient of various awards, including the 2015 3M Asia-Pacific Research Award and the 2019 Most Effective Teacher at UQ. His current research concentrates on carbon dioxide electrolysis and solid oxide fuel cells to advance sustainable energy practices. Read more here: read more here: https://findanexpert.unimelb.edu.au/profile/996561-aaron-li

Dow ECR Award for Sustainable Engineering Innovation

A/Prof. Ruobin Dai of Tongji University has been honored with the ECR Award for Sustainable Engineering Innovation. His notable presentation at the MSA-ISPT conference in 2023 focused on "Nanovehicle-assisted monomer shuttling enables highly permeable and selective nanofiltration membranes for water purification." Dr. Dai's expertise spans various disciplines, including Environmental Biotechnology, Nanofiltration, Membrane materials, End-of-life membrane recycling, Nanofiltration, and Reverse osmosis, as well as Membrane-based wastewater treatment and resource recovery.

MSA- ISPT 2023 Awards

BY Shokat Akbarnezhad

Travel Awards- HDR

Zhuyuan Wang, a Postdoc Research Officer at the UQ Dow Centre in the School of Chemical Engineering, boasts a rich background with over 7 years dedicated to membrane separation research. His expertise was refined during his tenure at a listed membrane manufacturing company in China, where he focused on Polyamide Thin Film Composite (PA-TFC) membranes for water treatment. Following this, he pursued a Ph.D. at Monash University, exploring membrane science and technology under Prof. Xiwang Zhang and Prof. Huanting Wang. Currently, Zhuyuan's research centers on ion-exchange membranes, particularly anion-exchange membranes (AEMs), and their applications in electrolysers for green hydrogen production and CO2 electrochemical reduction. He showcased his work on electricity generation from the CO2 chemical adsorption process, illustrating a promising avenue for green energy facilitated by separation technologies.

Zhuyuan actively contributes to the Membrane Society of Australasia (MSA), having participated in conferences like IMSTEC 2022 and the 8th MSA Early Career Researcher event. He has been a dedicated MSA member for over three years, showcasing his commitment to the field and fostering valuable discussions among peers.

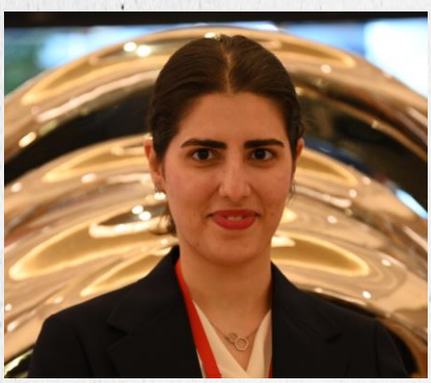
Rajneesh Gautam, a recent PhD graduate in Chemical Engineering from Victoria University Melbourne, Australia, specializes in advanced wastewater treatment with a focus on membrane separation and resource recovery. His doctoral research concentrated on the "Simultaneous recovery of biomethane and reclaimed water using SAnMBR technology for sustainable wastewater treatment," where he extensively explored the performance of a submerged AnMBR coupled with an Al2O3 flat-sheet ultrafiltration (UF) membrane for treating abattoir/slaughterhouse wastewater. Rajneesh optimized the SAnMBR system to effectively handle high-organic loading and treat high-strength wastewater. His expertise spans fouling mitigation, microbiology, and various aspects of wastewater treatment.

As an active member of the Membrane Society of Australasia, Rajneesh sought a travel grant to present his recent study findings on "Investigating the key operational strategies for sustainable operation of a submerged AnMBR coupled with ceramic ultrafiltration membrane." This research delves into fouling mitigation strategies for the sustainable operation of a ceramic UF membrane, utilizing experimental results and mathematical modeling to explore critical flux and time-related operational parameters. Additionally, Rajneesh has contributed to Q1 journals, collaborated with global membrane experts, and is currently undertaking an internship at the Environment Protection Authority, Victoria, Australia, focusing on a groundwater contamination project. Moreover, he has worked as a sessional lecturer at Victoria University.

MSA- ISPT 2023 Awards

BY Shokat Akbarnezhad

Travel Awards- HDR



Mohadeseh Najafi completed her bachelor's and master's degrees in chemical engineering at Isfahan University of Technology, Iran, where she focused on membrane separation technology with a specialization in gas separation during my master's program. In 2022, she began my Ph.D. at Edith Cowan University, researching the removal of microplastics from water and wastewater using advanced membrane technology. Her work involved using surface-modified membranes with novel monomers, resulting in a significant reduction in microplastic fouling in ultrafiltration membranes. She presented these findings at the MSA-ISPT conference.

Beyond Her academic pursuits, Mohadeseh is an active member of the Membrane Society of Australasia (MSA) and serves on the editorial board for the MSA Newsletter. In this role, she contributes by sharing the latest global membrane news, enriching the knowledge of our membrane community in Australia. Her commitment extends beyond research, reflecting her dedication to advancing membrane technology for a cleaner and sustainable future.

Hanwei Yu, a dedicated Ph.D. candidate in the School of Civil and Environmental Engineering at the University of Technology Sydney, boasts a robust academic background, having earned her Bachelor's degree from Beihang University and a Master's degree from Columbia University. Her current research delves into advanced membrane materials and Capacitive Deionization (CDI) technology for lithium recovery, a topic she presented at the MSA-ISPT 2023 conference with the title "Sulfonated polyether ketone membranes for lithium recovery via membrane capacitive deionization."

Addressing the growing demand for lithium, Hanwei's research integrates activated carbon electrodes with ion-selective membranes, enhancing selective lithium extraction from multi-cation solutions. By employing metal-organic frameworks (MOF) and functionalized membranes, her work alters ion preferences during electrosorption processes, advances sustainable lithium recovery methods, and offers critical insights into membrane materials and processes.

Hanwei is an active MSA member since 2021. Her commitment is evidenced by regular attendance at MSA conferences, where she not only presents oral sessions but also contributes to the organizational aspects, serving on the organizing committee for IMSTEC2022 and CECE2023 conferences. Hanwei's multifaceted engagement showcases her dedication to advancing membrane science and sustainable lithium recovery.

Scientific interview

In this edition of the academic engagement section, we conducted an interview with Prof. Xiwang Zhang from The University of Queensland, who is the Endowed Dow Chair in Sustainable Engineering Innovation at the University of Queensland, Director of UQ Dow Centre, and Director of ARC Centre of Excellence for Electrochemical Transformation of Carbon Dioxide.

Interview between A/Prof Amir Razmjou and Prof. Xiwang Zhang

Left: **Prof. Xiwang Zhang** Right: **A/Prof Amir Razmjou**

Amir: I really appreciate your time and the opportunity that you gave us for our MSA Newsletter. Well, I know that you are currently the MSA president, but let's put that aside and talk about your career development and then we would love to know where you have started your journey.

Xiwang: I earned my PhD degree from the Chinese Academy of Science in 2006. After graduating, I was presented with an opportunity that led me to take on a postdoctoral position in Singapore at Nanyang Technological University. The recommendation for this position came from one friend of my PhD supervisor, and it was a surprise move for me, as it was not initially planned.

Initially, I were about to sign a contract with a local University in China, but at the last minute, I received a postdoctoral opportunity in Singapore. This unexpected turn of events led me to decide to relocate and work in Singapore, where I spent four years at NTU. I started as a research fellow and was later promoted to a senior research fellow.

After those four years, a common sentiment experienced by many young researchers occurred – I began to feel exhausted from continuous research efforts. This prompted me to consider a shift to the industry. Subsequently, I resigned from my position at NTU and joined Keppel in 2010.

Amir: Before talking about your industry journey, can I ask what was your thesis about? Was it about membranes?

Xiwang: No, my PhD thesis did not focus on membranes; instead, it centred around catalytic oxidation. In my master's thesis, I did work with membranes, specifically membrane bioreactors (MBRs). During my master's studies from 2000 to 2003, MBR was still a relatively new technology. I conducted significant work on MBR, contributing to its design and implementation in wastewater recycling.

However, as MBR required dealing with sludge, I decided to shift my focus for my PhD. I didn't want to handle the challenges associated with sludge. This led me to choose advanced oxidation technology while maintaining a focus on water purification.

In Singapore, when working at NTU, I started working on membrane fabrication. I utilised functional materials as building blocks to assemble membranes. One notable project involved creating a photocatalytic membrane, a topic that remains active even today. These membranes possess catalytic activity, allowing them to separate impurities, while their self-cleaning feature helps to prevent fouling on the membrane surface. I aimed to minimise membrane fouling, contributing to the efficiency of water purification processes.

Amir: It was very interesting to know that you worked on membrane in your master and then shifted to oxidation process in your PhD study. Let's move to industry engagement after 2010. please tell us more about that time.

Xiwang: After joining Keppel in 2010, one of the largest engineering companies in Singapore that focuses on infrastructure and operates globally, I assumed the role of R&D manager at Keppel Environmental Technology Centre. My office was located in Kepple's Ulu Pandan NEWater Plant. Keppel is involved in various sectors, including water treatment and wastewater recycling, which are integral parts of the infrastructure sector. Singapore, known for its efficient water recycling, utilises membrane technology for purification and reuse. My responsibilities at Keppel included leading a reasonably sized team, working on novel technologies and supporting Kepple's NEWater Plants. At Keppel, I experienced a shift in the nature of my work.

Although still involved in research and development, the focus became more applied, addressing industry needs and problem-solving. Working closely with different customers to tailor solutions was rewarding, but it came with the challenge of adhering to the strategic direction set by the company. Unlike academia, where one has more freedom to pursue personal interests, industry work is demand-driven and aligns with the company's objectives.

Despite the valuable experiences gained, I found that the corporate structure and strategic constraints of the industry did not align with my preference for flexibility. This led me to consider a return to academia. A friend informed me about a fellowship opportunity in Australia, specifically the ARC fellowship, which was very interesting to me. With the invaluable guidance from Prof Joe Diniz da Costa, I secured the fellowship through the University of Queensland (UQ), marking a transition back to academia.

I relocated to Queensland in 2011 to take on the fellowship. The prospect of this fellowship prompted a considerable amount of contemplation, given the significant commitment and the need for another move, particularly since I had a family with two young children at the time.

The decision to transition from industry to academia and move to Australia was not taken lightly, but eventually, I made the choice to follow my passion. I left my position in industry and joined UQ, where I received valuable support and freedom for which I am grateful. In Australia, the fellowship provided the flexibility to move to other universities, leading me to Monash University.

Xiwang: I joined Monash in 2012 and initially worked at the Gippsland Campus. However, the campus was later merged with Ballarat University, and I transitioned to the Clayton campus. Monash offered me a competitive startup package and a position as an associate professor. In 2017, I was promoted to full professor. As the inaugural director, I successfully led the bid for ARC Industry Transformation Research Hub for Energy-efficient Separation (EESep). I served as the Director for 4.5 years till 2021.

At end of 2021, I accepted an offer from UQ to serve as the director of the Dow Center. This move marked my return to UQ after almost a decade at Monash. Throughout my time at Monash, from 2012 to 2021, I dedicated myself to establishing a successful team.

Amir: It is very interesting that anytime I interviewed other academics, more or less they have similar sort of journey. They moved to different places and different countries. I feel the academic journey often involves flexibility and the pursuit of diverse opportunities. Many academics find success by going in different places and countries, embracing new challenges and environments. This pattern of seeking and following opportunities contributes to the development of an academic career. It allows them to expand their perspectives, collaborate with diverse colleagues, and engage with varied research and educational systems.

Xiwang: Yes, I fully agree with that. To do well in academia, it is important to grab opportunities that come your way, especially when you are starting out. Moving around, trying new things, and working in different places can help you grow personally and professionally. Being open to change and exploring opportunities is a key for a successful academic career, giving you a diverse and fulfilling journey.

Amir: It appears that your initial involvement with membranes began during your master's degree, specifically in the field of MBR. Since then, your professional journey has been predominantly centred around membrane-related activities. It is impressive to witness this consistent trajectory. Could you share more about a crucial moment in your career? Can you share a key moment when you gained significant recognition or experienced a turning point in your professional journey?

Xiwang: Well, I think the most important one was in late 2016, I noticed the immense potential of membrane technology across various industries, which requires multidisciplinary collaboration. So, in middle of 2016, I organised a workshop, bringing together membrane researchers from various universities nationwide. The positive response encouraged me to propose the idea of an Energy Efficient Separation Research Hub to Monash University. We successfully attracted industry partners and established collaborations. The hub not only facilitated research but also garnered industry recognition, making it easier to engage new partners. This initiative became a national research collaboration platform, emphasising the importance of energy-efficient separation using membrane technology.

Amir: Great, I know that you have recently taken the director role of ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide (GETCO2), can you tell us more about that?

Xiwang: Certainly. After joining UQ in early 2022, I was asked to lead the ARC Centre of Excellence bid for Green Electrochemical Transformation CO_2(GETCO$_2$).

Xiwang: This opportunity was due to the pressing global issue of CO_2 emissions, especially in Australia. The total CO_2 emissions of Australia in 2020 was about 500 million tons. Natural processes like trees and oceans can only absorb 5% of this, and renewable energy sources alone can address 75%. However, there is still a substantial 20% of emissions that need attention, roughly 100 million tons annually. GETCO_2 aims to address this issue by not merely treating CO_2 as a waste but adding value to it. The focus is on utilising Australia's abundant renewable energy to power electrolysers for CO_2 transformation, similar to hydrogen electrolysers. The process involves electrodes, membranes, and catalysts, where membrane research plays a crucial role. As a membrane researcher, I bring expertise to this emerging field, contributing to sustainability efforts by tackling the challenges of CO_2 emissions through innovative electrochemical transformations.

Amir: I have a lot of questions, but to be conscious of time we have to move on to the next stage of interview. I think one of the main goals of this type of interview with senior academics is to share your experience with early and mid-career researchers. What would be your advice for an early or mid-career researcher to be successful?

Xiwang: You have raised a crucial point about the significance of research funding in our academic careers. When applying for such funding, it's essential to align our research interests with the needs of both industry and the government. In Australia, addressing national priorities is a key factor in securing research grants. As an early-career researcher, the topics we work on often start with our supervisors' choices during PhD studies. However, it's crucial to stay vigilant about emerging technologies and their potential applications. Keeping an eye on the problems these technologies can address is essential. It's not advisable to stick to one topic indefinitely; adaptability is key. I recall advice from a professor in my early career – every five to eight years, consider adjusting your research direction to align with evolving government priorities.

While the core technology remains, such as membrane research in my case, it can be applied to various domains, including water purification, resource recovery, separation processes, and even CO_2 conversion. The versatility of the technology allows tailoring it to different applications, ensuring its relevance and contribution to addressing evolving challenges.

Amir: Yeah, I think I agree with you that it is very important to try to see what industry and government wants rather than trying to have any type of proposal. Finding the right balance between basic research and addressing real-world needs is crucial for a successful research career. While practical applications are essential, fundamental research is the backbone of scientific progress.

Xiwang: Balancing fundamental and practical research can be tricky, but sometimes they are connected. Even though there are many technologies out there, just doing regular research might not bring something totally new. That is why diving into the basics is important. The challenge is that fundamental research is unpredictable; you might find something big in one, two, or three years. To handle this, I usually get smart PhD students for these projects. For those making progress, I guide them to connect with industry, using their knowledge in real-world situations. This helps mix theory with industry, setting them up for future research that is both smart and practical

Amir: There is always a question that I like to ask. As early career researchers, how we could make connection? How we could build up our network? Any advice for that?

Xiwang: Well, in my opinion, It is important for researchers, especially junior ones, to actively participate in university-organised events like industry workshops or visits. Even if the topic may seem unrelated to their projects, attending these events, even for a couple of hours, provides valuable insights into what industries need. The goal is not necessarily to find an industry partner right away, but to gain a better understanding. Networking might not result in immediate collaborations, but relationships are built over time. It is not about selling your technology; instead, listening closely to industry discussions can reveal areas where you might be able to help. Building these relationships takes time, patience, and a willingness to learn and adapt.

Amir: You mentioned the evolving applications of emerging technologies. When you began your master's study, MBR was a niche field. After that, as we saw, the focus was shifted on addressing fouling and developing antifouling membranes, particularly exploring nanocomposite mixed matrix materials. Over the years, there has been a noticeable shift towards ion separation in current research trends. What do you think about it? Where do you think the membrane field goes?

In the last 20 years, membranes have been super successful in cleaning water and desalination. But now, collaborating with water industries is a bit tricky. When you make small improvements, industries may not invest right away. However, membranes can do a lot more beyond water and desalination processes, for example they are effective in energy storage processes, recycling resources, ion separation technologies and in other different industries. In Australia, where we have many types of industries, membranes can play a big role because they are good at separating things, and many processes can use them. So, even though it is a bit challenging, membranes have a great chance to become even more important in the future for separation technology particularly ion separation in various industries.

Amir: Great. I think we almost are at the end of the interview; I have two general questions. First, if you had a chance to spend the rest of your life in a city around the world, which city would you choose?

Xiwang: Well, I would choose Brisbane. The pleasant weather and the overall lifestyle make it a wonderful place to live.

Amir: I see, but the weather is sometimes very humid there.

Xiwang: Of course, but it is just for a few months, the rest of the year is amazing in Brisbane.

Amir: Yes, most of the year is fantastic there. What would be your advice to your younger version? I mean the time that you finished your PhD.

Xiwang: Well, I would definitely say that you should be happy throughout your life, and you must follow your heart. Life is always about taking risks, but you always have chances to make it better if you are happy.

Amir: Amazing, the last question is that if you had the chance to choose another proficient what would be that?

Xiwang: Well, you know, from high school, I always wanted to be a structural engineer. So, I would say structural engineer.

MSA-ISPT Lithium Workshop

Discover the intricate world of lithium recovery with experts

The highly anticipated workshop on lithium recovery was successful held on 4th December alongside the MSA-ISPT 2023 conference. This workshop consisted of a distinguished assembly of contributors, ranging from academic scholars to industry professionals. These experts have come together to delve into the intricacies of lithium recovery, a topic of paramount importance due to the global demand for this critical energy element. The workshop was thoughtfully structured around key areas of interest, namely Supply and Demand, Processing, Sustainability, and Direct Lithium Extraction (DLE).

Distinguished Assembly of Speakers

"Membranes in the Hydrometallurgical Recovery of Battery Minerals"

Prof. Aleks Nikoloski
Professor of Extractive Metallurgy, Murdoch University

"LITHIUM – The Energy Transition Metal and the Important Role of Western Australia"

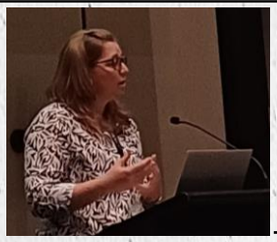
Ron Mitchell
Managing Director, Global Lithium Resource

"Leveraging Australia's Oil and Gas expertise to decarbonize the lithium sector"

Dr. Francis Wedin
Executive Chairman, Vulcan Energy Resources

"Lithium Processing Technologies: A Market Perspective"

Dr. Cameron Perks
Principal Analyst (Lithium), Benchmark Mineral Intelligence



"Modelling and Incorporation of Membrane Treatment in DLE Flowsheets"

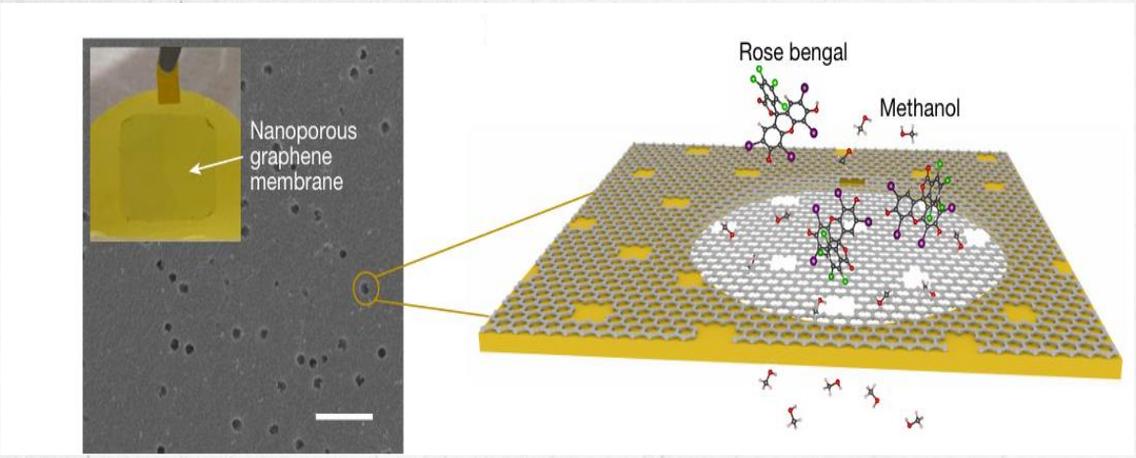
Stacey Noakes
Senior Process Engineer, Hatch

"Battery recycling and its opportunities for Li recovery"

Dr. Mohammad Assefi
Mineral Recovery Research Centre (MRRC), ECU

Cascaded Compression: Revolutionising Nanopore Engineering in Graphene for Advanced Membrane Applications

BY Mohadeseh Najafi



Solvent permeance and ultrafast nanofiltration by decoupling nanopore size distribution and density.

Dr Jiangtao Wang Dr Chi Cheng

Professor Jing Kong
(source: isn.mit.edu)

In a groundbreaking paper published in the prestigious Nature Journal, Dr Jiangtao Wang, Dr Chi Cheng, Professor Jing Kong and the team revealed a revolutionary method for creating monolayer graphene with high-density nanopores. The study, titled "Cascaded Compression Approach for Tailored Nanopore Engineering in Graphene," introduces a technique that overcomes the limitations of conventional top-down processes, offering precise control over the size distribution, density, and other critical metrics of nanopores.

The team's approach involves a cascaded compression strategy that breaks down the formation of nanopores into multiple small steps. During each step, existing nanopores undergo a combination of shrinkage and expansion, while new nanopores are simultaneously created. This repetitive process leads to a gradual increase in nanopore density with each compression cycle, resulting in high-density nanopores in monolayer graphene with a left-skewed, short-tail size distribution.

The significance of this breakthrough lies in its potential applications across various fields, including ion and molecular separations, energy storage, and electronics. The size distribution of nanopores is a crucial factor influencing the performance of these applications, and the new method allows for independent control of several nanopore metrics, such as density, mean diameter, standard deviation, and skewness.

This team also discuss the implications of their findings in the context of ultrafast nanofiltration across nanoporous graphene. Previous challenges in achieving both high density and a narrow size distribution of nanopores are addressed by the cascaded compression approach, presenting opportunities for engineering ultrahigh-flux and high-selectivity membrane processes. Results from dead-end filtration experiments demonstrated a consistent rise in permeance with an increasing number of compression cycles, where the relatively unchanged selectivity is aligned with the increase in nanopore density.

This breakthrough opens new avenues for nanotechnology, offering unprecedented control over nanopore engineering in graphene and paving the way for advanced applications in molecular separations and beyond.

The ARC Discovery Project

Improving Resilience of MCDI for Water Supply in Remote Communities

Scientia Professor
David Waite

Professor
John Fletcher

Dr Yuan Wang

Professor Lina Yao

The University of New South Wales

The aim of this project is the development of robust, PV-powered water treatment units based on the emerging technology of Membrane Capacitive Deionisation (MCDI). The development of a more resilient approach to provision of potable water is particularly significant to remote indigenous communities in central Australia where brackish groundwaters are unsuitable for use without prior treatment. Expected outcomes include development of resilient MCDI units incorporating innovative control of the charging and discharging cycles using "smart" (machine learning enabled) Digital Twins of these units. These MCDI units will benefit any community requiring removal of contaminants from brackish waters without the need for external mains power supply.

Asymmetric Bio membranes for Blue Energy Harvesting

Associate Professor
Caiyun Wang

Associate Professor
Pawel Wagner

Professor
David Officer

Professor
Li-Hsien Yeh

Professor Dr
Mutsumi Kimura

University of Wollongong

This project aims to develop a new class of biomembranes for efficient ion-selective transport, to address the challenge of low power density facing the realisation of blue energy harvesting. This will be achieved using innovative chemistries guided by theoretical modelling to endow membranes with unique features: heterogeneities in surface charge and pore structure. Expected outcomes include a new concept for membrane design, advancement of knowledge in energy conversion, creation of a new prototype power device without need of any external forces, and significant advances in self-powered wearable electronics potentially revolutionizing industries such as healthcare and entertainment.

Unlocking the ion selectivity of lithium superionic conductor membranes

Professor Huanting Wang

Monash University

This project aims to address a longstanding challenge in designing advanced membranes to enable sustainable lithium refining by unlocking the ion selectivity of lithium superionic conductors. This project expects to generate new knowledge in the areas of membrane science and emerging nanoionics by using interdisciplinary approaches. Expected outcomes of this project include a novel class of lithium separation membranes and their fabrication techniques. This should provide significant benefits in improving lithium extraction and recycling efficiency, reducing their environmental impact and building the research capacity in advanced membrane manufacturing and critical mineral refining in Australia.

A unifying model for ion exchange membranes – towards a low carbon future

Professor Sandra Kentish

Dr George Chen

The University of Melbourne

Polymeric ion exchange membranes are key to emerging renewable energy systems and bioprocessing applications. Advances in this field are currently impeded by a focus on their performance in idealised pure solutions and siloed research. This project aims to draw together fundamental and applied research to develop an innovative, unifying model for the transport of both charged ions and uncharged molecules through these membranes within complex, multicomponent mixtures. The team will build on strong collaborations to drive uptake of the new model within the clean energy and CO2 reduction sectors to advance the abatement of Australian emissions; and will prepare young researchers for a role within these emerging fields.

Novel Membranes for High-performance Zinc-Iron Redox Flow Batteries

Professor Hongxia Wang

Dr Jiaye Ye

Queensland University of Technology

Membrane is a critical component in zinc-iron redox flow battery (ZIRFB) which is considered a promising technology for large-scale energy storage in the future. This project aims to design and construct high performance membranes using low-cost polymers and nanostructured carbon materials through functionalization and innovative membrane structure design. The goal is to develop cost-effective membranes that possess high ion-selectivity and ion conductivity as well as stability that are required to fabricate high performance, long cycle lifetime ZIRFB. Successful achievement of the outcomes will enable cost-effective, reliable ZIRFB, placing Australia at the forefront of exploiting flow batteries based clean energy storage technologies.

Unlocking the potential of poly(ionic liquids) for electrochemical sensing

Professor
Debbie Silvester

Professor
David Mecerreyes

Curtin University

Unlocking the potential of poly(ionic liquids) for electrochemical sensing. This project aims to create new science that will enable the development of low-cost, miniaturised electrochemical sensors based on poly-ionic liquids. The chemistry of the materials will be tuned to selectively detect hazardous pollutants to enable trace concentration detection at analytically relevant levels. Fundamental behaviour of gases and solid contaminants dissolved in poly-ionic liquid/ionic liquid membranes will be uncovered, and their performance for sensing in real environments will be examined. It is expected that these advances will transform detection methods by taking sensing out of the lab and in to the hands of the everyday person, giving rapid and accurate knowledge about the concentration of hazards in the environment.

Wyoming Takes the Lead of the World's Largest Membrane-Based Carbon Capture Plant

Membrane Technology and Research (MTR) Carbon Capture recently initiated the building process for a substantial pilot facility at the Wyoming Integrated Test Center (ITC) located in Gillette, Wyoming (Fig. 1). Upon its scheduled completion in 2024, this facility will stand as the world's largest carbon capture plant utilising advanced membrane technology.

MTR Carbon Capture is set to function within the Large Test Center of ITC, extracting CO_2 from the flue gas generated by Basin Electric's Dry Fork Station—a coal-fired power plant using Powder River Basin coal. The Wyoming ITC stands as one of the globe's largest facilities for post-combustion demonstration at a significant scale.

MTR Carbon Capture decided to employ its exclusive Polaris™ polymeric membrane to capture over 150 tonnes of CO_2 daily at Dry Fork Station. This method involves no chemicals and minimal water, distinguishing it as a cleaner and more environmentally friendly approach to carbon capture when compared to traditional solvent-based methods.

“To meet the world’s decarbonisation goals the energy transition must start by modernising existing power and industrial facilities with proven carbon capture technology,” says MTR Carbon Capture President Brett Andrews. “Our Polaris membrane is backed by 15 years of research, development, and testing to create an effective and environmentally friendly carbon capture solution.”

The project is part of the U.S. Department of Energy’s large-scale pilot carbon capture program. The program is dedicated to advancing revolutionary technologies that promise substantial enhancements in efficiency, effectiveness, cost-effectiveness, emissions reduction, and overall environmental performance in the realm of carbon capture.

About MTR Carbon Capture

MTR Carbon Capture, based in Newark, California, specialises in the creation and implementation of eco-friendly point source carbon capture systems, utilizing its established Polaris™ polymeric membrane. The modular and scalable Polaris technology is currently employed in the world's largest membrane carbon capture plants. MTR Carbon Capture operates as a division of Membrane Technology and Research, Inc., a globally recognized leader and supplier of membrane-based separation systems for over four decades. For additional information, please visit mtrccs.com.

Source: Businesswire

Figure 1. Wyoming Integrated Test Centre (source).

Tour of Beenyup Advance Water Recycling Facilities

An industry site tour was organised by MSA for the MSA-ISPT 2023 conference. The tour involved visits to various units within the Beenyup Advanced Water Recycling Plant (AWRP), a facility dedicated to groundwater replenishment, thereby offering a novel, climate-independent water source to enhance drinking water provisions in Perth.

Initiating the process, secondary treated wastewater from the Beenyup Wastewater Treatment Plant is transferred to the AWRP for subsequent treatment stages. Upon entry into the AWRP, the water undergoes a sequence of purification processes, including ultra-filtration, reverse osmosis, and ultraviolet (UV) disinfection. These treatment steps collectively serve to refine the water to the highest quality, comparable to that of pure drinking water. Following treatment, the purified water is injected into groundwater reservoirs for storage, ensuring a sustainable and reliable water supply for future use.

AMS14 Conference

Submit your abstract now for the 14th Conference of the Aseanian Membrane Society (deadline 30 March 2024)! For more information, please visit https://www.ams14.com/.

Welcome to Nanjing!

Important Dates:

Abstract Submission Deadline:	30 March 2024
Acceptance Notification:	10 April 2024
Early Brid Registration Deadline:	10 May 2024

Organized by: The Aseanian Membrane Society (AMS)

Hosted by: Nanjing Tech University (NJTECH) , Tsinghua University

Co-Chairs: Prof. Xuehong Gu
Prof. Haihui Wang

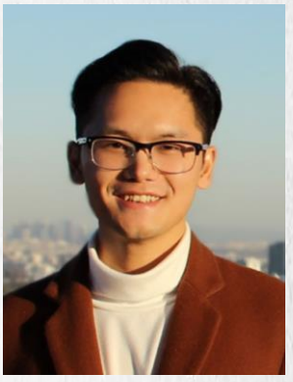
Supported by: NANJING TECH UNIVERSITY; 材料化学工程国家重点实验室 State Key Laboratory of Materials-Oriented Chemical Engineering; 国家特种分离膜工程技术研究中心 National Engineering Research Center for Special Separation Membrane

Upcoming Membrane Events

CURRENT EVENTS	DATE OF EVENT	ABSTRACT SUBMISSION
9th International Conference on Organic Solvent Nanofiltration Thuwal, Saudi Arabia osn2024.kaust.edu.sa	3 – 7 March 2024	**Closed**
33rd NAMS Annual Meeting (NAMS 2024) Santa Fe, New Mexico, US membranes.org/nams2024/	11 – 15 May 2024	**1 February 2024 (Early bird registration closes 1 April 2024)**
19th IWA Leading Edge Conference on Water and Wastewater Technologies Essen, Germany iwa-let.org	24 – 28 June 2024	**Closed**
14th Conference of Aseanian Membrane Society (AMS 14) Nanjing, China ams14.com	23 – 26 July 2024	**30 March 2024**
EUROMEMBRANE 2024 Prague, Czech Republic euromembrane2024.cz	8 – 12 September 2024	**8 March 2024**
FILTECH 2024 Cologne, Germany filtech.de	12 – 14 November 2024	**31 May 2024**
IDRA World Congress – Addressing Water Scarcity Abu Dhabi, UAE wc.idadesal.org	8 – 12 December 2024	**15 February 2024**

MSA Newsletter Taskforce

Meet our newsletter team for this February edition!



From left to right:
Javad Farahbakhsh, **Dr. Masoumeh Zargar (Associate Editor)**, **Dr. Milton Chai (Associate Editor), Dr. Amir Razmjou (Newsletter Coordinator and Editor)**, Mohadeseh Najafi, Shokat Akbarnezhad, Mitra Golgoli

On the right (top to bottom):
Hoda Khoshvaght, Dr. Shiyang Huang

We would like to welcome A/Prof. Mehdi Khiadani to the team as a new Associate Editor covering the scientific core of the newsletter!

We would like to express our gratitude to Dr. Masoumeh Zargar and Weonjung Sohn for their significant contributions to the newsletter over the past 2 years.