ARC RESEARCH HUB
ENERGY EFFICIENT SEPARATION

HUB NEWSLETTER ISSUE 1 , JULY 2018

DIRECTOR'S WELCOME

Welcome to the first newsletter of the Australian Research Council Research Hub for Energy-Efficient Separation (ARC-EESep). Our Hub, which was officially announced in June 2017, and formally commenced operation in December 2017, aims to further Australia's capability in the manufacture of advanced separation materials and equipment, and assist our industry partners to become world-leading providers in separation technologies. Through the ARC-EESep's transformative technologies, Australian industries involved in water, mining, chemical, oil and gas can become more energy-efficient, cost-competitive, and environmentally sustainable.

In last six months, the Hub has recruited 11 postdoctoral researchers and nine PhD students who are working closely with our industry partners under the supervision of the academic and industry experts. The Hub successfully held its first international conference in January 2018 on Energy-efficient Separation. This conference, held in conjunction with the International Conference on Bioinspired Materials and Membranes, attracted more than 150 delegates from six countries.

Recognising that communication and collaboration will drive the success of the ARC-EESep Hub, we have devised a series of webinars, including a Scientific Platinum Webinar, Industry Webinar and early-career researcher (ECR) Webinar, allowing all Hub members to tune-in regardless of their location. The first ECR webinar was successfully held in June 2018, with a presentation by Dr Stefania Piantavigna. The first Scientific Platinum Webinar will be presented by Professor Benny Freeman of The University of Texas at Austin (USA) in July.

With excellent achievements in scientific breakthroughs and industry engagement, the ARC-EESep is already building an international reputation and showing its impact. Professor Huanting Wang, the Deputy Director of Hub, was invited to write a perspective article entitled 'Low-energy desalination' in the prestigious journal Nature Nanotechnology. Read more about Professor Wang's on page 3.

In this issue we are pleased to introduce our node directors, our Scientific Advisory Board and industry partners. We also highlight recent publications and upcoming events, including our official launch taking place in July.
Please contact us or visit our website to learn more about our research and engagement activities.

Professor Xiwang Zhang

HUB OVERVIEW

22 Chief Investigators

11 Postdoctoral Fellows

9 Postgraduate Students

22 Industry Partners

8 Australian Universities

3 International Universities

The ARC-EESep is a critical 'one-stop-shop' for various industries to solve pressing industry problems in separation.

The Hub brings together a world-class team of 22 leading researchers in diverse disciplines (e.g., chemical engineering, materials engineering, environmental engineering, and chemistry) from eight Australian universities (Monash, UQ, UNSW, VU, Deakin, UTS, QUT, Curtin), CSIRO, and three top international universities (Yale, Warwick and Nanjing). The Hub works closely with industry players in the complete value chain of separation technologies, including separation materials fabricators, equipment manufacturers and end-users of separation technologies.

The Hub aims to develop advanced separation materials, innovative products and smart processes to reduce the energy consumption of the separation processes that underpin Australian industry. The Hub focuses on the development, synthesis, characterisation and integration of advanced materials (membranes, adsorbents and resins), across scales to enable novel products. The intended research outcomes allow the majority of Australian industries to become more energy-efficient and cost-competitive in a global economy.

NODE DIRECTORS

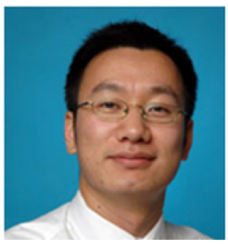
Our node directors – Professors Mikel Duke (Victoria), Chuyang Tang (New South Wales), Joe da Costa (Queensland) and Shaomin Liu (Western Australia) – are an integral part of our organisational structure and our commitment to nurture stakeholder relationships. Each node director manages and coordinates the activities of the Hub nodes in four cities and facilitates engagement with local industries.

PROFESSOR MIKEL DUKE VICTORIA NODE DIRECTOR

Professor Duke is focused on the development and implementation of innovative membrane technologies for water, foods and energy applications. His specialisation is in the fundamental development of inorganic materials such as nanotubes, silica, titania, zeolites and polymer composites, as well as in applications of membrane distillation, ceramic membranes and membrane assisted fermentation.

PROFESSOR JOE DA COSTA QUEENSLAND NODE DIRECTOR

Professor da Costa has over 20 years experience in industry, consultancy, academic and government advisory roles in Brazil, England and Australia. He has established an internationally respected program of work, which focuses on pursuing novel technological solutions for the issues facing our contemporary society.



PROFESSOR CHUYANG TANG NEW SOUTH WALES NODE DIRECTOR

Dr Tang's main research interests include membrane technology, surface and interfacial science, and advanced physical and chemical processes. He is experienced in membrane characterisation, membrane fouling mitigation, and emerging contaminant removal using reverse osmosis and nanofiltration membranes.

PROFESSOR SHAOMIN LIU WESTERN AUSTRALIA NODE DIRECTOR

Professor Liu is based at the Western Australia School of Mines: Minerals, Energy and Chemical Engineering at Curtin University. His research centres on membrane systems, membrane catalysis and fuel cells.

INTRODUCING OUR SCIENTIFIC ADVISORY BOARD

An outstanding Scientific Advisory Committee has been established for the ARC-EESep Hub. Tasked with providing advice and guidance on future research and strategic direction, the Committee comprises eight distinguished world-renowned researchers.

Professor Tamarapu Sridhar is the former Dean of the Faculty of Engineering at Monash University and served as Vice President of the University's Indian and Chinese Initiative. He has had a distinguished career as an academic engineer and is an outstanding scholar with an international reputation in the area of polymers.

Dr Anita Hill is the Executive Director of Future Industries at the CSIRO. She also serves as Chief Scientist for CSIRO. Dr Hill's research is in materials and process engineering and, more specifically, in transport of atoms, ions and small molecules in condensed matter.

Professor Menachem Elimelech is the Roberto Goizueta Professor at the Department of Chemical and Environmental Engineering at Yale University. His research includes engineered osmosis for sustainable production of water and power, environmental applications and implications of nanomaterials, and water and sanitation in developing countries.

Professor Tony Fane is an Emeritus Professor at UNSW. Professor Fane was the Head of School of Chemical Engineering and Industrial Chemistry (UNSW) and Co-Director of the UNESCO Centre for Membrane Science and Technology (UNSW). He was Temasek Professor at Nanyang Technological University, Singapore. Professor Fane is a world expert on membrane science and technology.

Professor Benny Freeman is the Richard B. Curran Centennial Chair in Engineering at The University of Texas at Austin. His research focus includes structure/property correlation development for desalination and gas separation membrane materials, new materials for hydrogen separation, natural gas purification, carbon capture, and new materials for improving fouling resistance and permeation performance in liquid separation membranes.

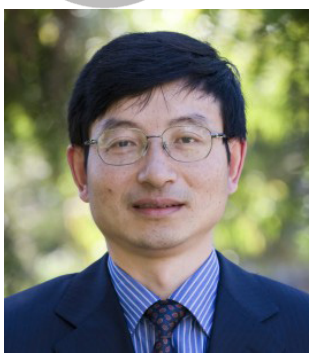
Professor Jiuhui Qu is a distinguished Professor at Tsinghua University. He is the former Director of the Research Center for Ecological and Environmental Sciences of the Chinese Academy of Sciences. His research expertise is mainly in water pollution control, particularly development of the theories, technologies, and engineering applications relating to drinking water quality and safety.

Professor Ana Deletic is Pro Vice-Chancellor (Research) at UNSW. Until mid-2017 she was the Associate Dean of Research Engineering Faculty and the Founding Director of Monash Infrastructure Institute at Monash University. Her research examines multi-disciplinary urban water issue focusing on stormwater management and socio-technical modelling for the development of a number of green nature based water treatment systems which are now widely adopted in Australia and abroad.

Professor Huanting Wang is a professor in the Department of Chemical Engineering and Associate Dean International of Monash University's Faculty of Engineering. His research focuses on the metal organic framework and nanoporous materials and composite membranes for gas separation, water treatment and desalination, and electrochemical energy applications.

The rich experiences of the IAC in research and management provide invaluable guides to the Hub's operation and provides the strategic authority to ensure achievements are maximised.

INTRODUCING HUB DEPUTY DIRECTOR HUANTING WANG



Hub Deputy Director Huanting Wang is a Professor in the Department of Chemical Engineering and Associate Dean (International) of Faculty of Engineering at Monash University.

Together with his three postdoctoral fellows and a PhD student, Professor Wang's Hub research focuses on carbon-based membranes for low energy desalination and water purification.

His industry collaborators for these projects include 2D Water Pty Ltd and the Baosteel Company.

Professor Wang graduated in material science and engineering at the University of Science and Technology of China, and subsequently completed a postdoctoral research fellowship in Chemical Engineering at the California Institute of Technology and University of California Riverside.

In 2004 he was awarded an ARC QEII Fellowship and an ARC Future Fellowship in 2010. He was a member of the ARC Future Fellowship selection advisory committee in 2011, a member of the ARC College of Experts in 2012-2015, and a Board Member of the Membrane Society of Australasia (2014-2017).

He is a Fellow of The Royal Society of Chemistry, a Fellow of The American Institute of Chemical Engineers, and a Council Member of the Aseania Membrane Society.

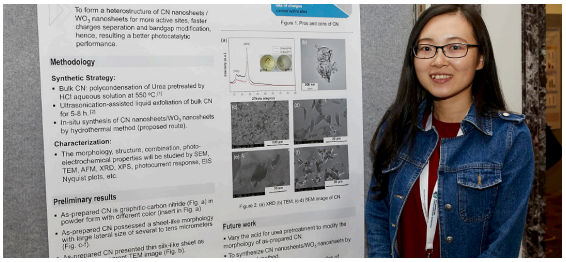
Reading online?
Learn more about Professor Wang's research here

IBMM-iEESEP2018

For a week in January, the Hub hosted a very successful conference, the IBMM-iEESEP2018. More than 150 delegates from six countries attended the conference in Melbourne to exchange innovative ideas and knowledge.

The conference also provided the perfect opportunity to officially celebrate the establishment of the new ARC Research Hub for Energy-Efficient Separation.

Professor Marc Parlange, Provost and Senior Vice President of Monash University presented the welcoming address.



Reading online?
View more photos here

ECR SEMINAR/WEBINAR

At the beginning of June we held our first ECR Seminar / Webinar at Monash University.

Speaker Dr Stefania Piantavigna, a postdoctoral research fellow at ANSTO, gave an insightful presentation on her experience in ANSTO and the facilities offered by ANSTO. The webinar was attended by 40 participants, and many more who joined the session virtually from across our partner campuses. Attendees included Mr Stephen Holts (ANSTO), Dr Lizong He (Monash University) and Professor Huanting Wang (Deputy Director of the Hub).

Dr Stefania Piantavigna joined the Bragg Institute in September 2015 as a joint postdoctoral research fellow at ANSTO, Monash University and The University of Queensland. Her project, under the supervision of Dr Stephen Holt, Dr Lizhong Le and Dr Frank Sainsbury, focuses on the characterisation and optimization of nanoemeulsions. This project involves the use of neutron reflectometry, x-ray reflectometry, ellipsometry and quartz crystal microbalance.

Reading online?
Listen to lecture here
View more photos here

INDUSTRY PARTNERS

The Hub collaborates with 22 local and international companies involved in the water, materials energy, and environmental industries. Through joint research projects the ARC-EESep can provide innovative solutions for energy efficiency in separation technologies.

CI SPOTLIGHT

Hub CI and CSIRO Project Leader Associate Professor Matthew Hill has collaborated with engineering services company QinetiQ on a ground breaking project using Metal Organic Frameworks. Associate Professor Hill states: "together, we'll be testing whether advanced materials known as Metal-Organic Frameworks (MOFs) can allow submarines to remain submerged longer. MOFs have the largest internal surface area of any known substance, which can be optimised to capture gases such as carbon dioxide (CO_2)."

UPCOMING EVENTS

1. The 1st Scientific Workshop by Professor Benny Freeman from the University of Texas at Austin
Title: Advanced Separation Membranes: Historical Development and Future Trends
Date: 10 July 2018, 2.00 – 3.30 pm
Venue: Lecture Theatre S1, 16 Rainforest Walk, Monash University, Clayton, Victoria

2. ARC-EESep Official Launch
The Minister for Small and Family Business, the Hon Craig Laundy MP will officially open the Hub at the event
Date: 13 July 2018, 10.00 am – 12.00 noon
Venue: Collaboration Lounge, New Horizons, Monash University, Clayton, Victoria

View our website for more information
www.arc-eesep.org

PUBLICATION HIGHLIGHTS

- Our Hub Deputy Director Professor Huanting Wang has published his insight into one of the most highly cited scientific journals, *Nature Nanotechnology*. His paper, titled *Nanoporous Membrane: Low-energy desalination*, explains how a nanoporous fibrous carbon membrane has greater potential for lower energy desalination than the commercial PTFE membrane. **Wang, H. *Nanoporous Membrane: Low-energy desalination*, Nature Nanotechnology 13, 273–274 (2018)**

- Our researchers have discovered an efficient and sustainable way to filter salt and metal ions from water. Dr Huacheng Zhang, Professor Huanting Wang (ARCEESEP CI) and Associate Professor Zhe Liu and their team have recently discovered that MOF membranes can mimic the filtering function, or 'ion selectivity', of organic cell membranes. **Zhang, H et al. *Ultrafast selective transport of alkali metal ions in metal organic frameworks with subnanometer pores*. Science Advances 4, 2**

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