





ARC Research Hub for

DIRECTOR'S WELCOME

Welcome to the first newsletter of the Australian Research Council Research Hub for Carbon Utilisation & Recycling (RECARB Hub). Our hub, which was officially granted in July 2022, and formally commenced operation in August 2023, aims to develop technologies to transform carbon dioxide emissions from Australian's energy and manufacturing sectors into valuable products and create pathways to market to drive industry transformation. In this issue we are pleased to share with you the overview and highlights of the RECARB Hub, our Hub Participants' stories, successful grants and their publications.

Professor Paul Webley

OVERVIEW

- 25 **Chief Investigators**
- 18 **Industry Partners**
- 5 **Australian Universities**
- 3 International Universities
- 19 **Research Projects**

The Research Hub aims to develop technologies to transform carbon dioxide emissions from our energy and manufacturing sectors into valuable products and create pathways to market to drive industry transformation. This hub aims to achieve this by developing novel electro, thermo, and biochemical methods for converting CO2 from sectors that cannot easily avoid emissions and a technological pathway for CO2 recycling. The outcomes of this Hub are likely to be transformative for industry, the economy, and society in moving the fate of CO2 from pollutant to feedstock. The benefits to Australia are intended to be the stimulation of a new industry, a skilled workforce for this emerging industry and a contribution to meeting CO2 reduction targets.

INDUSTRY PARTNERS

The Hub is proud to collaborate with 16 local and international companies spanning diverse industries including energy, chemicals, microbiology, instrumentation, consumer goods, and consulting services. This collective expertise fosters a dynamic environment where cutting-edge research and innovation thrive. Through collaborative research projects, RECARB Hub is uniquely positioned to pioneer transformative CO2 conversion technologies, offering innovative solutions that address pressing global challenges. These partnerships underscore our commitment to driving positive change and advancing sustainable practices across industries



AUSTRALIAN AND INTERNATIONAL UNIVERSITIES



RECARB Hub engages in collaborative research endeavors with five esteemed Australian universities and three prominent international institutions. Together, we are dedicated to pioneering groundbreaking advancements in CO2 transformation, leveraging our collective expertise and resources to explore innovative approaches. By fostering cross-disciplinary collaboration and harnessing the diverse perspectives of our partner institutions, we aim to develop sustainable solutions that not only mitigate carbon emissions but also generate valuable products with tangible societal and economic benefits.

ADVISORY PANELS

The Advisory Panels has established to review and advise the strategic direction and performance of Recarb Hub and support Recarb Hub to achieve its purpose.

SCIENTIFIC ADVISORY PANEL

- Professor Volker Sick, Regents of the University of Michigan
- Professor Niall Mac Dowell, Imperial College London
- Dr Graeme Puxty, CSIRO Energy
- Professor Lars Nielson, The University of Queensland
- Professor Adri van Duin, The Pennsylvania State University

INDUSTRY ADVISORY PANEL

- Ms Jodie Kimber, Wesfarmer Chemicals, Energy & Fertilisers
- Mr John Beever, CO2VALUE Australia
- Mr Kwong Soon Chan, CO2CRC Limited
- Ms Voula Terzoudi, Woodside Energy





OVERVIEW



GRANT ANNOUNCEMENT

The Australian Research Council (ARC) has announced on 14 July 2022 that Monash University will receive \$5 million funding to lead a new Research Hub to develop cutting-edge technologies to transform carbon dioxide emissions from the energy and manufacturing sectors into valuable products. The Research Hub will stimulate jobs and growth in an emerging industry, estimated to be worth more than \$1 trillion globally by 2050. <u>READ MORE</u>



OFFICIAL LAUNCH

The Australian Research Council (ARC) Research Hub for Carbon Utilisation and Recycling (RECARB) was officially launched by The Hon. Cassandra Fernando MP, Federal Member for Holt, on behalf of The Hon. Jason Clare MP, Minister for Education at Monash University's Clayton campus. <u>READ MORE</u>



THEME LEADERS MEETING

The RECARB Hub participants were meeting with the Theme Leaders after the Official Launch to discuss the research projects. The meeting has shaped the research direction and aligned the expectation of the academia and industry partners. MORE PHOTOS



VOLUNTEERS

A remarkable team of PhD students whose dedication and hard work played a pivotal role in ensuring the success of our official launch and lab tours. Their commitment to excellence and tireless efforts behind the scenes were instrumental in creating an engaging and enlightening experience for all attendees.

MORE PHOTOS



RECARB HUB LOGO WINNER

A young talents, Jason Wonlee Kua, a gifted Year 10 student from Camberwell Grammar School who recently secured victory in the esteemed RECARB Hub Logo Competition. Jason's unique fusion of scientific insight and design finesse has earned him the highly sought-after title, a testament to his deep passion for both domains. <u>READ MORE</u>



FIRST PHD STUDENT

RECARB HUB proudly announces a significant milestone with the enrolment of its first PhD student, Sireesha Rameswarapu. With a steadfast commitment to combatting the escalating levels of atmospheric carbon dioxide (CO2), Sireesha is set to embark on a pioneering research journey within the ARC Research Hub's transformative initiative. <u>READ MORE</u>



WOODSIDE DELEGATION

We are privileged to host a delegation, Dr Sui Boon Liaw, Dr Pratigya Sharma and Dr Sahil Garg, from Woodside Energy. They have visited our labs and demonstration of Direct Air Capture Technologies. <u>MORE PHOTOS</u>

SUCCESS STORIES

LIFE SCIENTIST OF THE YEAR

Professor Chris Greening has been awarded the Frank Fenner Prize for Life Scientist of the Year – one of seven Prizes for Science awarded by the Prime Minister every year. <u>The Prime Minister's Prizes for Science</u> are highly prestigious national awards that recognise outstanding achievement in scientific research, research-based innovation, and excellence in science teaching. <u>WATCH VIDEO</u>



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CO2 TO ACETIC ACID

Professor Akshat Tanksale and his team have unlocked an industrial process that harnesses excess atmospheric carbon dioxide to produce acetic acid. This ground-breaking discovery showcases how sustainable technology can transform a greenhouse gas into a valuable resource. <u>READ MORE</u>



HIGHLY CITED RESEARCHERS 2023

Professor Zongping Shao and Professor Moses Tade were selected Clarivate Highly Cited Researchers 2023. Each researcher selected has authored multiple Highly Cited Papers^M which rank in the top 1% by citations for their field(s) and publication year in the Web of Science^M over the past decade. <u>READ MORE</u>



ANDREW LEGACY BURSARY AWARD

Satya Sireesha Rameswarapu has been honoured with the esteemed Andrew Legacy Bursary, securing her participation in the upcoming Catalysis Summer School at the University of Liverpool from 24-28 June 2024. Her selection for this prestigious bursary stands as a testament to her unwavering dedication and expertise in the field of catalysis. READ MORE

ROADMAP DECARBONISE WA

Professor Tejas Bhatelia is at the forefront of an ambitious initiative aimed at decarbonizing Western Australia through the implementation of integrated mineral carbonation. Through strategic planning and collaborative partnerships, Professor Bhatelia is spearheading the development of a comprehensive roadmap that promises to significantly reduce carbon emissions while unlocking new opportunities for sustainable growth and development. <u>READ MORE</u>





UN CLIMATE CHANGE CONFERENCE

Professor Zongping Shao and his team has been selected out of nearly 3000 submissions from 710 universities across 100 countries, to be part of the United Nations Climate Change Conference (COP28). Their research is focus on producing green hydrogen as fuel o aid global carbon neutralisation goals. <u>READ MORE</u>



SUCCESS STORIES



AEA SEED GRANT SUCCESS

Professor Paul Webley and his team has successfully secured funding through the Department of Education's AEA (Australia's Economic Accelerator) Seed Grant. This grant aims to develop the next generation of Direct Air Capture (DAC) technology -DAC2Bio.

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NATIONAL PHD PROGRAM

Professor Paul Webley secures funding for Innovative Climate Change Projects in National Industry PhD Program. He has secured 6 industry researcher postgraduates through the innovative Industry Doctoral Program (IDP) at Monash University. <u>READ MORE</u>



LINKAGE GRANT SUCCESS

Dr Yusuf Kaneti secures \$255k Linkage Grant, in which he aims to use agricultural waste to manufacture highly active and stable non-precious metal catalysts for accelerating hydrogen production from water electrolysis. <u>READ MORE</u>

PUBLICATIONS

Professor Akshat Tanksale and his team published a review on recent progress in thermocatalytic liquid phase CO2 conversion to bulk chemical and Fuels. The use of both homogeneous and heterogeneous catalysts has been evaluated based on their performance, reaction pathway, and optimizations. Energy Fuels 2023, 37, 24, 19377–19399 <u>ACCESS FULL PAPER</u>

Professor Zongping Shao and his team has published a technical paper on using perovskite for electrocatalytic oxygen evolution at elevated temperature. They found that the BSCF's activity increases with increasing temperature. These new understandings of the fundamental OER catalysis over perovskite materials at industrial-relevant temperature conditions are expected to have strong implications for the research of OER catalysts to be deployed in practical water electrolyzers. ChemSusChem 2024, e202301534. ACCESS FULL PAPER

Professor Zongping Shao and Meng Ni published an article discussed on the material needs and advances for fuel cell. This article gives a thorough perspective on the challenges and recent advances in anode, electrolyte, and cathode materials for the various types of fuel cells. Finally, the key areas of need and major opportunities for further research in the field are outlined.

Shao, Z., Ni, M. Fuel cells: Materials needs and advances. MRS Bulletin 49, 451–463 (2024). <u>ACCESS FULL PAPER</u>

Professor Zouyou Yin and his team published a mini review on photoreforming light alcohols for valueadded resources. In this review, the recent developments in this field are summarized; various studies regarding H2 evolution rate, illumination condition, quantum efficiency, etc., are compared; and the development prospects of this field, with the hope of sparking widespread research interest, are proposed.

Energy Fuels 2024, 38, 7, 5659–5675 <u>ACCESS FULL PAPER</u>









Staggered gap (type-II) ARC Research Hub for Carbon Utilisation & Recycling Professor Zouyou Yin and his team published a mini review on the perspectives on Cu-Ag bimetallic catalysts for electrochemical CO2 reduction reaction. They outlined the challenges and perspectives for the better development of electrochemical CO2 reduction by Cu-Ag bimetallic catalysts. Energy Fuels 2024, 38, 7, 5659–5675 <u>ACCESS FULL PAPER</u>



UPCOMING EVENTS

Woodside Monash Energy Partnership Conference

Climate Change and Energy Transition: The Role of Institutions Technology and Industry Date: 27-29 June 2024 Venue: Monash University Prato Centre, Italy <u>MORE INFORMATION</u>

CONTACT US

<u>Woodside Building for Technology and Design</u> <u>20 Exhibition Walk,</u> <u>Monash University,</u> <u>Clayton VIC 3168, Australia</u>



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