

HYDROGEN & CARBON

Newsletter of the Centre for Hydrogen and Carbon Innovations



HyLoCC Founding Members Mr Lim Han Kwang and Mr Tan Wooi Leong; Mr Keith Tan, Deputy Secretary (Energy, Carbon and Corporate), Ministry of Trade and Industry Singapore; Mr George Loh, Associate Vice President (Strategic Partnerships), NUS; and Founding Members Mr Chua Yong Hwee and Mr Lim Wee Seng at the launch of HyLoCC (left to right).

NUS CHCI Hosts Inaugural Industry Day, Marking a New Chapter for Hydrogen and Carbon Innovation

The NUS Centre for Hydrogen and Carbon Innovations (CHCI) welcomed leaders from academia, industry and government to its inaugural Industry Day on 14 July 2026, celebrating a significant milestone in the Centre's journey while fostering collaboration to advance decarbonisation.

The event marked the Centre's official transition from the Centre for Hydrogen Innovations (CHI) to the Centre for Hydrogen and Carbon Innovations (CHCI), reflecting its expanded mission to advance hydrogen and carbon innovations in support of Singapore's low-carbon future. Bringing together researchers, policymakers and industry partners, Industry Day celebrated this new chapter while strengthening collaborations and exchanging perspectives on the global energy transition.

The evening opened with remarks by Prof Koh Lian Pin, Vice President (Sustainability and Resilience) and Chief Sustainability Scientist at NUS, who outlined the vision behind the Centre's expanded mandate. He highlighted that while hydrogen remains a key pillar of the energy transition, deep decarbonisation also requires advances in carbon capture, utilisation and circular carbon technologies.

Following the opening remarks, an interactive crossword reveal officially unveiled the Centre's new identity as the NUS Centre for Hydrogen and Carbon Innovations (CHCI). The symbolic launch also reflected the Centre's expanded vision and strong commitment to integrated decarbonisation through interdisciplinary collaboration.

IN THIS ISSUE

**CHCI Innovation
Challenge 2026**

**Ammonia Marine
Engine Showcase
at SMW 2026**

**Hydrogen
Infrastructure and
Deployment
Workshop**

EDITORIAL BOARD

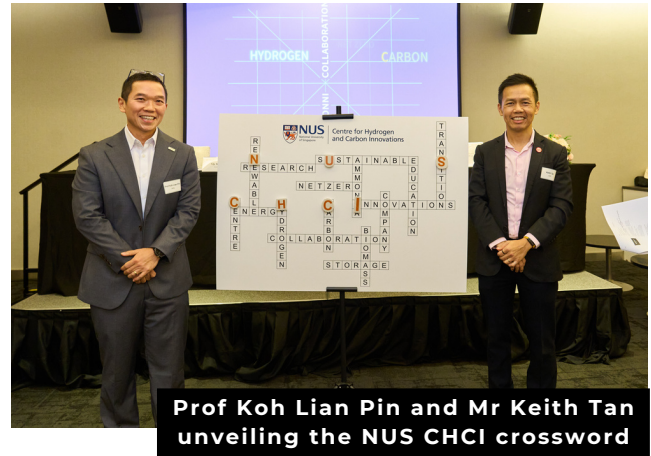
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Prof Koh Lian Pin (Vice President (Sustainability and Resilience) and Chief Sustainability Scientist, NUS)

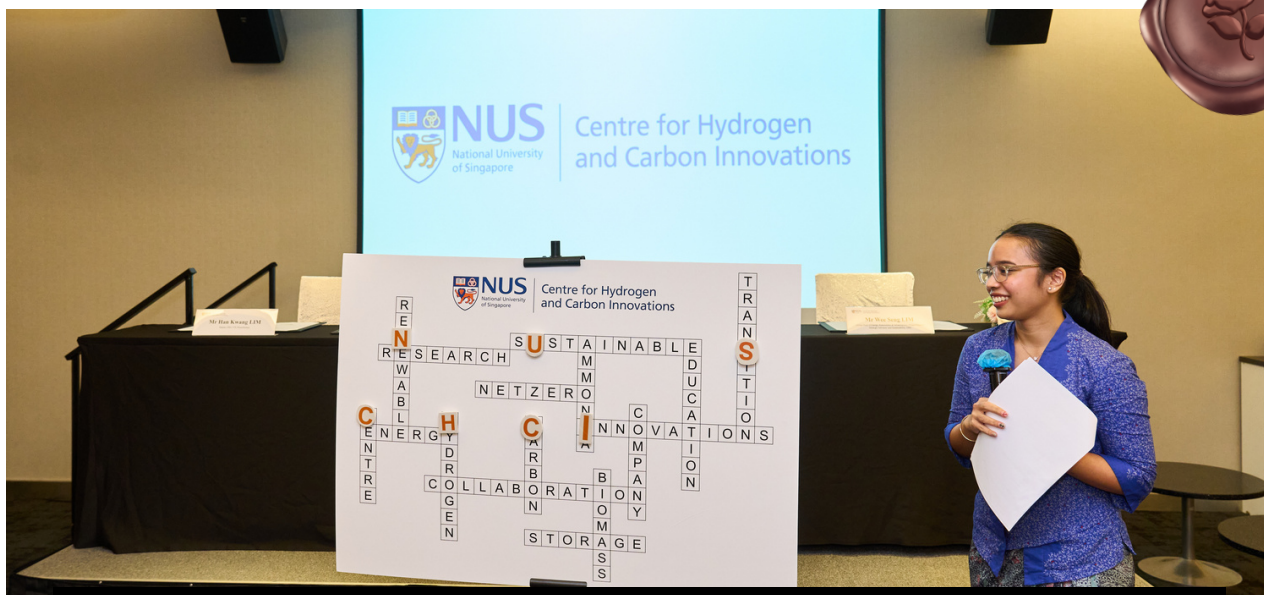


Prof Koh Lian Pin and Mr Keith Tan unveiling the NUS CHCI crossword

Following the unveiling, Mr Keith Tan, Deputy Secretary (Energy, Carbon and Corporate), Ministry of Trade and Industry, Singapore, delivered the Guest of Honour address. He emphasised the importance of strengthening collaboration between academia and industry, noting that scientific breakthroughs must be complemented by industry engagement from the early stages of research to ensure technologies can be translated into practical, commercially viable solutions. He also highlighted Singapore's continued support for low-carbon innovation through initiatives such as the Decarbonisation Grand Challenge (DGC) and Singapore Pilots for Energy and Enterprise Decarbonisation (SPEED).



Mr Keith Tan (Deputy Secretary (Energy, Carbon and Corporate), Ministry of Trade and Industry Singapore)



NUS Centre for Hydrogen and Carbon Innovations Launches at Industry Day 2026

A major highlight of Industry Day was the official launch of the Hydrogen and Low-Carbon Consortium (HyLoCC). Witnessed by Mr Keith Tan, representatives from the consortium's Founding Members — DBS, Keppel, Surbana Jurong and YTL PowerSeraya — joined NUS in a commemorative Memorandum of Understanding (MoU) ceremony, marking the beginning of a new platform for collaboration between academia and industry.

Through HyLoCC, CHCI aims to strengthen industry partnerships, accelerate research translation, nurture talent, and support the development and deployment of hydrogen and low-carbon technologies. The consortium represents a shared commitment to transforming promising research into practical solutions that contribute to a more sustainable future.



The evening concluded with a panel discussion titled Perspectives on a Low Carbon Future, moderated by Prof Yan Ning, Director of NUS CHCI. Joining him were Prof Thomas Jaramillo from Stanford University, Dr David Danielson from Breakthrough Energy, and Mr Bernd Heid from McKinsey & Company, who brought perspectives from academia, venture investment and industry to an engaging discussion on the evolving decarbonisation landscape.



The panellists explored how emerging trends, including AI-driven electricity demand, shifting investment priorities and evolving policy environments, are reshaping the global energy transition. They also discussed the challenges of scaling emerging technologies from laboratory research to commercial deployment, emphasising the importance of supportive policy frameworks, patient capital, cross-sector collaboration and sustained industry engagement in bringing innovative low-carbon solutions to market. The discussion concluded with an interactive audience Q&A session, where participants raised thought-provoking questions on the implications of AI for future energy demand, regional approaches to decarbonisation, the role of biomass in the low-carbon transition, and how emerging technologies can be successfully commercialised and adopted at scale. The lively exchange reflected the shared commitment of academia, industry and government to advancing practical low-carbon solutions through open dialogue and collaboration.



Guests networking and exchanging ideas during the reception



The formal programme concluded with a networking dinner and reception, where researchers, industry leaders, government representatives and partners continued conversations sparked throughout the evening and explored new opportunities for collaboration.

The inaugural Industry Day marked the beginning of an exciting new chapter for CHCI. Building on the momentum of the event, the Centre looks forward to strengthening collaborations across academia, industry and government, advancing hydrogen and carbon innovations, and working together with partners to accelerate the transition towards a more sustainable, low-carbon future.

CHCI Innovation Challenge 2026 Inspires AI for Hydrogen and Decarbonisation

The CHCI Innovation Challenge returned in June 2026 with the theme “AI for Hydrogen and Decarbonisation”, bringing together 147 pre-university students from 44 teams representing 13 institutions across Singapore. Through lectures, quizzes, infographic design and presentations, participants explored how artificial intelligence can accelerate hydrogen technologies and support the transition towards a cleaner, low-carbon future.



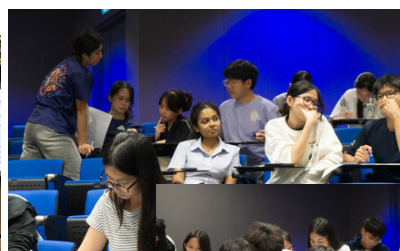
Opening address by Dr Suraj Vasudevan



Dr Lim Chia Wei delivering a lecture on AI, hydrogen, and decarbonisation

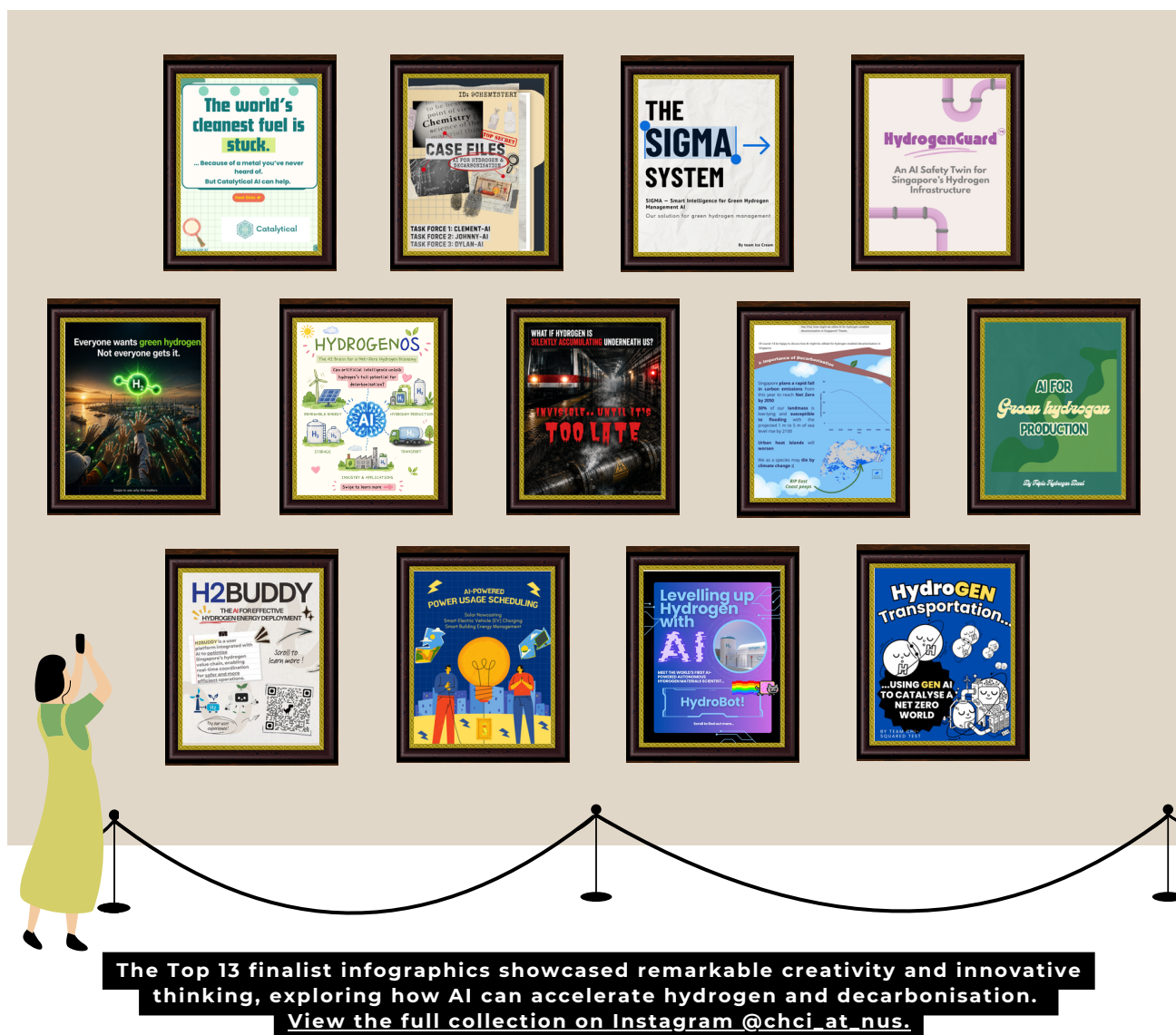
The first round, held on 6 June at the NUS College of Design and Engineering, began with an opening session by Dr Suraj Vasudevan from the Department of Chemical and Biomolecular Engineering. He introduced students to the field of Chemical and Biomolecular Engineering, highlighting its role in advancing hydrogen technologies, sustainable energy systems and decarbonisation. The session provided participants with an overview of how the discipline underpins many of the innovations explored throughout the Challenge. Participants then attended a lecture by Dr Lim Chia Wei, Lecturer from the NUS Department of Chemical and Biomolecular Engineering, who introduced three key topics: The Net Zero Goal, Renewable Energy and Hydrogen Fuel, and Introduction to Artificial Intelligence. His lecture provided students with valuable insights into the global transition towards net zero, the role of hydrogen and renewable energy in decarbonisation, and the growing potential of AI to accelerate the development of sustainable energy solutions.

Following a networking lunch, participants put their newly acquired knowledge to the test in a 45-minute pen-and-paper quiz comprising multiple-choice and structured questions. The challenge covered topics including Singapore's Green Plan 2030, decarbonisation strategies, renewable energy, hydrogen technologies and artificial intelligence, while encouraging analytical thinking, teamwork and scientific problem solving under time pressure. After a closely contested round, the top 13 teams advanced to the Final Showcase.



Teams working together during the pen-and-paper quiz

For the second round, each finalist team designed an infographic exploring a topic related to this year's theme before sharing their work with the public through Instagram voting. The submissions demonstrated remarkable creativity and depth, covering topics ranging from AI-powered catalyst discovery and digital twins to hydrogen transportation, hydrogen infrastructure, and smart energy management. Teams communicated complex scientific ideas through detective case files, comic strips, newspaper layouts, app concepts and many other imaginative designs, showcasing both scientific understanding and creative storytelling.

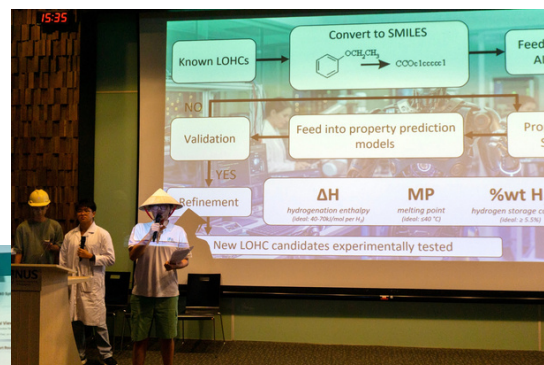
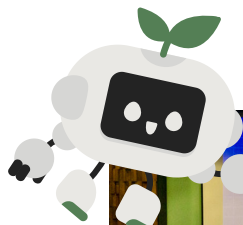


The Top 13 finalist infographics showcased remarkable creativity and innovative thinking, exploring how AI can accelerate hydrogen and decarbonisation. View the full collection on Instagram @chci_at_nus.

The teams then returned to the National University of Singapore on 28 June 2026 for the final showcase. To kick off the afternoon, the CHCI team presented a specially curated video juxtaposing excerpts from Ronny Chieng's Harvard Class Day 2026 Address and the 2024 Nobel Lecture by Chemistry Nobel Laureate Demis Hassabis, offering two contrasting perspectives on the future of artificial intelligence and setting the tone for an afternoon of thoughtful discussion. We were honoured to have Prof Saif A. Khan, Head of the Department of Chemical and Biomolecular Engineering at NUS; Mr Eugene Kwok, Director of the Low Carbon Energies Division at the Ministry of Trade and Industry and Executive Director of the Advanced Energy and Decarbonisation Office; and Assoc Prof He Qian from the Department of Materials Science and Engineering at NUS as our judges.

Each team approached this year's theme from a unique perspective, and we were treated to a wide variety of creative presentations, including website demos, Shark Tank-style pitches, role-play performances, popular songs with rewritten lyrics, and even a lively K-pop dance. After each presentation, participants confidently answered questions from our judges, demonstrating not only their creativity but also their ability to think critically about the opportunities and challenges of applying AI to hydrogen and decarbonisation.

Following a close deliberation, Team Mahjong from River Valley High School emerged as the champion of this year's challenge. Team TMS from Hwa Chong Institution (College Section) was awarded second place, while Team Hydrogenators from Nanyang Polytechnic and Team HydroPuffGirls from Raffles Girls' School (Secondary) shared third place honours. Nanyang Polytechnic received the Best School Prize in recognition of its students' outstanding performance across the competition, while Team Triple-A Battery from Singapore Polytechnic was voted the Audience Choice Prize winner.



Several Round 2 performance highlights

We warmly congratulate all participants for their creativity, curiosity and enthusiasm throughout the competition. Their innovative ideas demonstrated the exciting possibilities at the intersection of artificial intelligence, hydrogen and decarbonisation, while reinforcing the importance of empowering young people to contribute to a more sustainable future. The CHCI Innovation Challenge continues to provide a platform for students to explore emerging technologies, develop innovative solutions and exchange ideas with peers. We look forward to seeing the competition continue to inspire the next generation of innovators driving the future of hydrogen and decarbonisation.

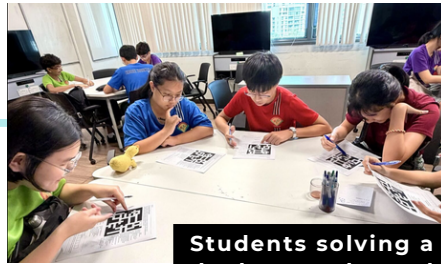


Finalists and judges celebrating an inspiring conclusion to the CHCI Innovation Challenge 2026

School Visits and Learning Journeys



Evergreen Secondary School



Students solving a hydrogen-themed crossword challenge



Temasek Junior College



Raffles Girls' School



St Patrick's School



Raffles Institution

Students from St Patrick's School, Raffles Institution, Evergreen Secondary School, Raffles Girls' School and Temasek Junior College recently took part in a series of learning journeys and outreach activities organised by the NUS Centre for Hydrogen and Carbon Innovations (CHCI). Through guided lab tours, students explored how hydrogen research is advancing sustainable energy solutions, while interactive activities such as a green energy-themed crossword challenge encouraged them to apply their knowledge in an engaging way.

In addition to welcoming students to CHCI, the Centre also visited St Patrick's School to introduce hydrogen's role in clean energy and Singapore's decarbonization efforts. These engagements aim to spark curiosity, inspire interest in STEM, and encourage the next generation to explore the opportunities of hydrogen and low-carbon innovation.



CHCI-SEAS short course on "Introduction to Hydrogen Energy" third run on 25-26 Aug 2026



Day 1 in NUS



Day 2 in SEAS

Jointly offered by the Sustainable Energy Association of Singapore (SEAS) and the NUS Centre for Hydrogen and Carbon Innovations (CHCI), this short course provides an introduction to the hydrogen industry, key technologies, global developments, and opportunities in Southeast Asia. Designed for professionals across marketing, sustainability, energy, and policy, it offers valuable insights into hydrogen's growing role in Singapore's low-carbon future.

Efficient Ammonia Marine Engine Showcased at SMW 2026



Prof. Wenming Yang and his team showcased the Efficient Ammonia Marine Engine at the 20th Singapore Maritime Week (SMW), organised by the Maritime and Port Authority of Singapore (MPA). On 21 April, Deputy Prime Minister and Minister for Trade and Industry Gan Kim Yong, Acting Minister for Transport and Senior Minister of State for Finance Jeffrey Siow, and Senior Minister of State for Law and Transport Murali Pillai SC visited the Maritime SG Showcase, where the engine was one of ten featured projects.

The project focused on a novel in-cylinder reforming gas recirculation (IRGR) engine concept, led by the NUS Centre for Hydrogen and Carbon Innovations (CHCI) and supported by the Singapore Maritime Institute (SMI). It brought together industry and academic partners to advance next-generation ammonia-fuelled marine engines. As the maritime industry continued its transition towards a cleaner future, innovations such as this played an important role in driving the development of sustainable shipping and contributed to the sector's growing momentum.

Assoc Prof Huangwei Zhang Receives the 2026 Hiroshi Tsuji Early Career Researcher Award!

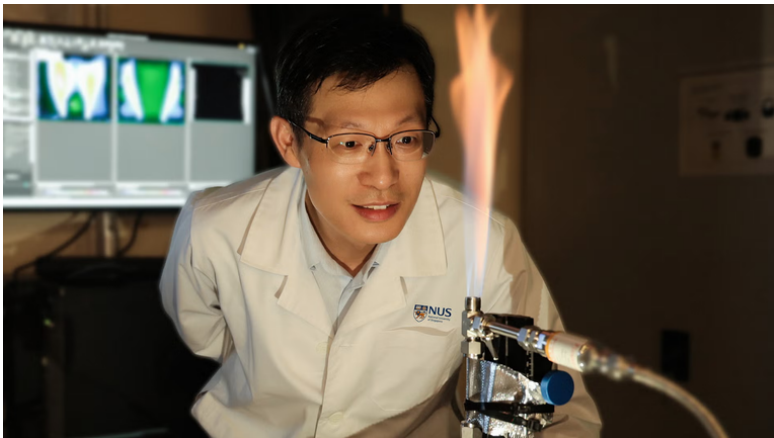


Photo: NUS College of Design and Engineering

“
This award encourages me to continue exploring new unknowns in combustion science and to contribute to the development of sustainable technologies.
”

— Assoc Prof Huangwei Zhang

CHCI warmly congratulates Assoc Prof Huangwei Zhang on being named a recipient of the 2026 Hiroshi Tsuji Early Career Researcher Award. Co-sponsored by Elsevier and The Combustion Institute, the award recognises outstanding early-career researchers for their significant contributions to fundamental or applied combustion science. Assoc Prof Zhang is a faculty member in the Department of Mechanical Engineering at the National University of Singapore (NUS) and received his PhD from the University of Cambridge. He leads a CHCI-hosted research project on the combustion of partially cracked ammonia, supported by Singapore's National Research Foundation through the Low-Carbon Energy Research (LCER) Programme.

His research advances the understanding of low-carbon fuels such as hydrogen and ammonia, leading to innovative combustion technologies for cleaner, safer and more efficient energy systems. His research is advancing next-generation hydrogen and ammonia technologies, supporting Singapore's decarbonisation and energy security ambitions while strengthening collaborations with industry partners. The award was formally presented at the 41st International Symposium on Combustion, held in Kyoto, Japan, from 26 to 31 July 2026, in recognition of his outstanding contributions to combustion science and low-carbon energy research.

Asst Prof Wang Lei Receives the 2026 Robert Brown Promising Researcher Award from MOE!



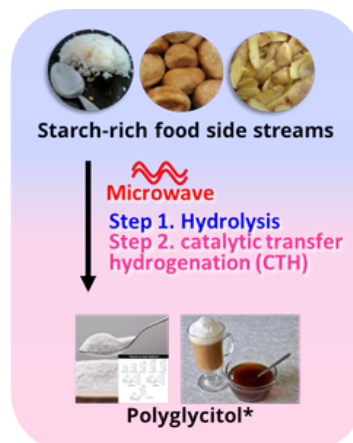
“*Electrifying catalytic processes holds tremendous potential to accelerate the transition toward a more sustainable chemical industry. This further motivates us to continue developing sustainable energy and chemical technologies through AI and advanced electrochemical sensing.*”

— Asst Prof Wang Lei

CHCI warmly congratulates Asst Prof Wang Lei on being named a recipient of the 2026 Robert Brown Promising Researcher Award by the Ministry of Education (MOE), Singapore. The award recognises outstanding early-career researchers with strong potential to advance academic research and innovation, and provides funding to help recipients expand their research and pursue new directions. Asst Prof Wang received the award for his project on AI-driven electrochemical diagnosis for sustainable catalysis, which uses AI and electrochemical sensing to better understand catalytic reactions in real time. His research focuses on developing sustainable energy and chemical technologies through AI and advanced electrochemical sensing.

CHCI welcomes our latest member, Asst Prof Iris Yu!

Iris Yu is interested in developing resource-efficient approaches for converting biomass into value-added products as sustainable alternatives to fossil-based commodities. Her research focuses on microwave-assisted processing, heterogeneous catalysis, and integrated biorefinery. Before joining NUS, she served as a Research Assistant Professor at The Hong Kong Polytechnic University, a Humboldt Fellow at the Technical University of Munich, Germany, and a postdoctoral researcher at the University of York, UK. She has received awards such as L'Oréal-UNESCO for Women in Science Singapore 2024 and MIT Technology Review Innovator Under 35 (TR35) Asia Pacific 2023.



Symposiums, Workshops and Seminars

NUS CHCI Workshop: Global Perspectives on Hydrogen Infrastructure and Deployment

25 June 2026



On 25 June 2026, the NUS Centre for Hydrogen and Carbon Innovations (CHCI) hosted a workshop themed “Global Perspectives on Hydrogen Infrastructure and Deployment”, bringing together experts from academia and industry to examine the opportunities and challenges shaping hydrogen deployment across different regions and parts of the value chain.

The workshop opened with Dr Vicky Au from Wood, who presented “Hydrogen at the System Level: Incumbent Inertia, When Strategies Stall, and the Asia-Pacific Opportunity.” Her presentation examined the systemic factors that can slow the clean energy transition, including the challenge of overcoming deeply entrenched fossil fuel systems and the gap between project announcements and actual capital commitment. The session also considered the opportunities for hydrogen development across the Asia-Pacific region.

Turning to Australia, Prof Rahman Daiyan from the University of New South Wales presented “Australian Hydrogen Economy State of Play and Scaling Power to X Technologies.” He provided an overview of Australia’s hydrogen landscape and research ecosystem, highlighting the range of hydrogen initiatives and research centres across the country. Drawing on his own experience in translating research into start-ups, he also shared perspectives on moving hydrogen innovation from the laboratory towards commercial application and scaling Power-to-X technologies.

The workshop then shifted from deployment strategy to power generation. In “Towards 100% H₂ Power Generation,” Dr Ghenadie Bulat from Siemens Energy shared the company’s experience in testing 100% hydrogen turbine combustion and discussed progress in the development of ammonia-ready turbines. His presentation offered an industry perspective on the technological advances supporting the use of hydrogen and ammonia in future power generation.

Infrastructure and transportation were brought into focus by Dr Neeraj Thirumalai from ExxonMobil, who presented “Hydrogen Embrittlement in Energy Industry: Perspective on Mechanisms and Emerging Challenges in H₂ and CO₂ Transportation.” He highlighted the critical role of pipelines in scaling the hydrogen economy, particularly the potential repurposing of existing natural gas pipelines. The presentation examined hydrogen embrittlement and the associated integrity challenges facing H₂ and CO₂ transportation infrastructure.

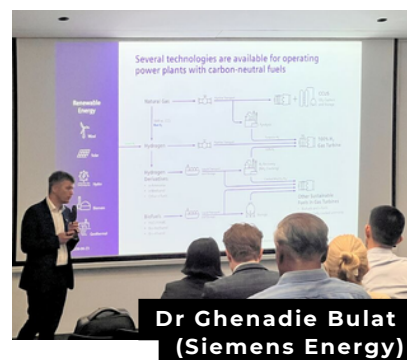
Concluding the technical sessions, Prof Li Haiwen from Sun Yat-sen University presented “Recent Advances and Future Prospects of Solid-State Hydrogen Storage Technologies.” He shared recent developments in solid-state hydrogen carriers and highlighted emerging applications, including fuel cell buses in China using metal hydride-based hydrogen storage.



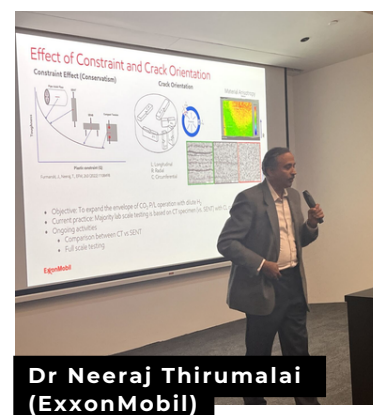
**Dr Vicky Au
(Wood)**



**Prof Rahman Daiyan
(University of New
South Wales)**



**Dr Ghenadie Bulat
(Siemens Energy)**



**Dr Neeraj Thirumalai
(ExxonMobil)**



**Prof Li Haiwen
(Sun Yat-sen University)**



**Participants Engaging
in the Q&A Session**



Through a series of expert presentations and discussions, the workshop provided participants with a comprehensive overview of the opportunities and challenges surrounding hydrogen infrastructure and deployment. The event highlighted the value of bringing together researchers, industry leaders, and practitioners to exchange perspectives and strengthen collaboration across the hydrogen value chain.

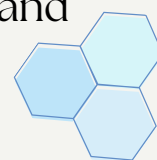


**Participants continued discussions and exchanged
ideas throughout the workshop, both during the
sessions and over lunch**



**Asst Prof Fang Liu
(Stanford University)**

NUS CHCI-ChBE Joint Seminar: Artificial Two-Dimensional Superlattices: Synthesis and Properties 1 July 2026

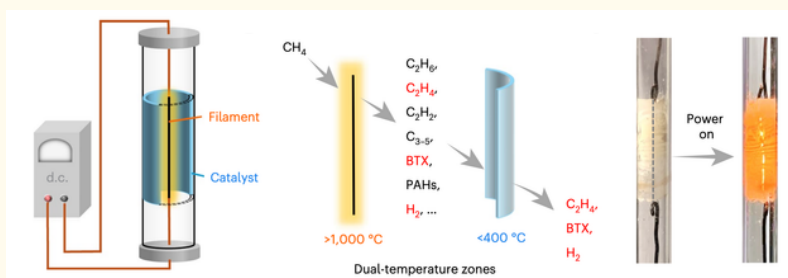


CHCI, in collaboration with the Department of Chemical and Biomolecular Engineering, hosted Asst Prof Fang Liu from Stanford University for a joint seminar titled Artificial Two-Dimensional Superlattices: Synthesis and Properties. During the seminar, Asst Prof Liu shared insights into the scalable fabrication and unique properties of artificial two-dimensional (2D) superlattices, followed by a lively discussion with attendees.

Research Highlights

Filament-catalyst lightbulb reactor for efficient methane conversion

Tan J. Y.[#], Wang S.[#], Yan N.*[#] et al.



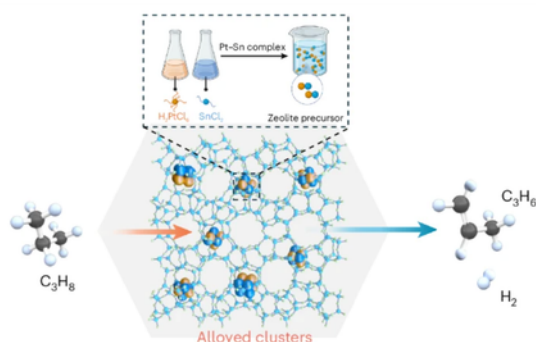
Nat. Sustain. 2026, 9, 879

Direct non-oxidative conversion of methane offers a sustainable route to valuable chemicals but is fundamentally limited by the trade-off between conversion and selectivity under isothermal conditions. Here we overcome this challenge using a non-isothermal filament catalyst lightbulb reactor that spatially separates methane activation and selective hydrocarbon transformation. This strategy achieves nearly 40% yield of ethylene and benzene, toluene and xylene, with 62% hydrogen yield. Techno-economic and life cycle analyses demonstrate the potential for economically competitive, net-zero production of value-added chemicals from methane.

Subnanometre PtSn alloyed clusters encapsulated in silicalite-1 sustain high productivity in propane dehydrogenation

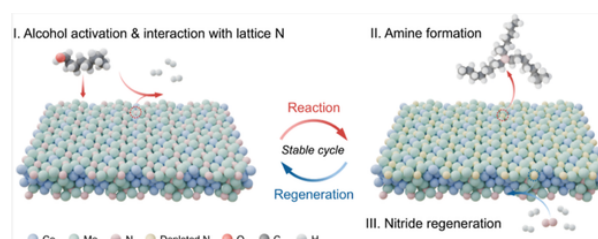
Lu S.[#], Tang Y.[#], Yao B.[#], Luo G.*[#], He Q.*[#] et al.

Propane dehydrogenation (PDH) processes typically operate at low weight-hourly space velocities, limiting propylene productivity. Here we report that subnanometre PtSn alloyed clusters encapsulated in silicalite-1 afford a catalyst with high productivity. At 165 h⁻¹, the catalyst achieved about 1 molC₃H₆ g_{catalyst}⁻¹ h⁻¹ for more than 300 hours, with >99% propylene selectivity. The distinctive electronic structures of the Pt sites break the longstanding trade-off between productivity and stability in conventional PDH catalysts.



Nat. Catal. 2026, 9, 552

J. Am. Chem. Soc. 2026, 148, 29075



Lattice Nitrogen-Mediated Amination via an N2-Rechargeable Cycle over the Co–Mo Nitride

Qian S.[#], Wang T.[#], Wang Y.[#], Yan N.*[#] et al.

Harnessing lattice nitrogen for the direct conversion of N₂ into organonitrogen compounds remains a major challenge. Here, we report a nitride-mediated looping strategy for alcohol amination using a rechargeable Co–Mo bimetallic nitride as the nitrogen carrier. The carrier reacts with alcohols to produce amines and is regenerated under a N₂/H₂ atmosphere, enabling stable cyclic operation. Using 1-octanol as the substrate, the system achieved stable trioctylamine production over five cycles. Mechanistic studies reveal that lattice N release occurs in nanoscale surface regions while the bulk structure remains stable. Kinetic analysis identifies the nucleophilic attack of lattice N on aldehyde intermediates as the rate-determining step. This work provides a strategy for N₂ activation and its conversion into value-added organonitrogen compounds.