Adelaide University

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

FACULTY OF SCIENCE 理學院

Research Centre for Carbon-Strategic Catalysis 碳戰略催化研究中心

PolyU-Adelaide University Bilateral Workshop

Advanced Catalysis, Energy Conversion and Storage

Date: 1-2 April 2026

Time: Day 1: 09:00-17:45

Day 2: 09:15-17:15

Venue: Room M1603, 16/F, Li Ka Shing Tower, The Hong Kong Polytechnic University

PREFACE

We are delighted to announce that the PolyU-Adelaide University Bilateral Workshop on Advanced Catalysis, Energy Conversion and Storage will be held on 1-2 April 2026 at The Hong Kong Polytechnic University (PolyU). Building on the strong collaborative momentum and shared research vision established between PolyU and Adelaide University (AU), this workshop aims to explore innovations in catalysis, energy conversion and energy storage—key pillars supporting the global transition toward carbon neutrality.

The workshop will bring together leading experts to discuss pressing challenges and emerging opportunities, including materials sustainability, cost reduction, and system lifecycle optimization. It will highlight cutting-edge advances essential for integrating renewable energy, maintaining grid stability, decarbonizing energy and carbon-intensive industries. Through presentations and discussions, the workshop will provide a dynamic platform for knowledge exchange and collaboration across relevant disciplines.

By bridging academia and industry, we hope the workshop will spark new ideas and partnerships that shape the future of sustainable technologies. This initiative also lays the foundation for a sustained and world-leading PolyU–AU research network dedicated to advancing catalysis and energy technologies.

We hope you will enjoy these two days of insightful presentations and stimulating discussions. May this workshop serve as a catalyst for new ideas, foster lasting collaborations, and inspire continued progress through shared knowledge and innovation.

Organizing Committee

Chairman

Prof. Wai-Yeung WONG, Raymond
Dean of Faculty of Science
Chair Professor of Chemical Technology
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Co-Chairs

Prof. Yan JIAO
Dean of School of Chemical Engineering
College of Engineering and Information Technology
Adelaide University

Prof. Lianzhou WANG
Chair Professor of Energy Materials
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. Xunjin ZHU
Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Members

Prof. Shaobin WANG
Adelaide University

Prof. Chunxia ZHAO
Adelaide University

Prof. Jingjie GE
The Hong Kong Polytechnic University

Prof. Linli XU
The Hong Kong Polytechnic University

Prof. Han YU
The Hong Kong Polytechnic University

Dr Govardhana Babu BODEDLA
The Hong Kong Polytechnic University

Dr Zelin SUN
The Hong Kong Polytechnic University

Programme Rundown

| 1 April 2026 (Wednesday)

Start Time	Particular
09:00-09:05	Welcome and Opening Address by **Prof. Wai-Yeung WONG, Raymond** by **Prof. Yan JIAO**
Session 1 - Chaired by **Prof. Lianzhou WANG**	
09:05-09:45	**Prof. Shizhang QIAO** Adelaide University *"Functional Materials for Energy Storage and Conversion"*
09:45-10:25	**Prof. Tao ZHANG** Dalian Institute of Chemical Physics *"Single-Atom Catalysis"*
10:25-10:55	Coffee Break
Session 2 - Chaired by **Prof. Shizhang QIAO**	
10:55-11:20	**Prof. Yan JIAO** Adelaide University *"Molecular Modelling of Electrocatalysts and Electrolyte for Clean Energy Conversion and Data-Driven Approaches"*
11:20-11:45	**Prof. Jingjie GE** The Hong Kong Polytechnic University *"Atomic Precision Design of Low-dimensional Transition Metal Nanocatalysts for Oxidation Reaction"*
11:45-12:10	**Prof. Jun HUANG** The University of Sydney *"Understanding and Tailoring Nanocatalysts for Efficient Carbon Transformation"*

Session 3 - Chaired by **Prof. Jingjie GE**	
14:00-14:25	**Prof. Lianzhou WANG** The Hong Kong Polytechnic University *"Semiconductor Nanomaterials for Photoelectrochemical Energy Conversion"*
14:25-14:50	**Prof. Chunxia ZHAO** Adelaide University *"Bioinspired Materials and Devices: From Biomedical Applications to Resource Recovery"*
14:50-15:15	**Prof. Wai-Yeung WONG, Raymond** The Hong Kong Polytechnic University *"Photofunctional Organometallic Materials for Solar Energy Conversion"*
15:15-15:45	Coffee Break
Session 4 - Chaired by **Prof. Shaobin WANG**	
15:45-16:10	**Prof. Yi-Chun LU** The Chinese University of Hong Kong *"Material Designs for Sustainable Aqueous Batteries"*
16:10-16:35	**Prof. Zheng-Long XU** The Hong Kong Polytechnic University *"Interfacial Chemistry of Multivalent Metal Anode Batteries: Calcium Metal"*
16:35-17:00	**Prof. Quan LI** The Chinese University of Hong Kong *"Extending the Cycle Life of Li Metal Anode"*
17:00-17:40	**Prof. Pierre BRAUNSTEIN** University of Strasbourg *"Reactivity Control by Fine-Tuning the Metal Coordination Sphere"*
17:40	End of Day 1

| 2 April 2026 (Thursday)

Session 5 – Chaired by **Prof. Chunxia ZHAO**	
09:15-09:55	**Prof. Zaiping GUO** City University of Hong Kong *“Electrode and Interface Design for High-Performance Rechargeable Batteries”*
09:55-10:20	**Prof. Xiaoguang DUAN** Adelaide University *“Catalytic Water Purification and Pollutant Upcycling”*
10:20-10:45	**Prof. David LEWIS** Adelaide University *“Sustainable Recovery of Silver from End-of-Life Solar Panels: Evaluating Green and DES-Free Leaching Systems”*
10:45-11:15	Coffee Break
Session 6 – Chaired by **Prof. Han YU**	
11:15-11:40	**Prof. Shaobin WANG** Adelaide University *“Single-Atom Catalysts for Energy and Environmental Catalysis”*
11:40-12:05	**Prof. Linli XU** The Hong Kong Polytechnic University *“Metal-Acetylide Frameworks: Design, Synthesis, Characterization and Application Studies”*
12:05-12:30	**Dr Govardhana Babu BODEDLA** The Hong Kong Polytechnic University *“Porphyrin-Based Photocatalysts: Molecular Engineering Approaches for Enhanced Photocatalytic Hydrogen Evolution”*

Session 7 – Chaired by **Prof. Xiaoguang DUAN**

14:00-14:25 **Dr Yang WANG**
The Hong Kong Polytechnic University
"From Learning to Empowering Nature: Biomimetic Interfaces for Advanced Energy Conversion and Storage"

14:25-14:50 **Dr Zelin SUN**
The Hong Kong Polytechnic University
"A Study of Ferrocene-based Metallopolymers as Organic Thermoelectric Materials"

14:50-15:15 **Prof. Xunjin ZHU**
The Hong Kong Polytechnic University
"In Situ Electropolymerizing toward Polymer Nanofilms of CoN_4 catalysts for Electrochemical CO_2 Reduction"

15:15-15:35 Coffee Break

Session 8 – Chaired by **Prof. Xunjin ZHU**

15:35-16:00 **Prof. Hin Lap YIP**
City University of Hong Kong
"Epitaxy Mimicking Interfaces and Predictive Optical Design for Perovskite Solar Cells"

16:00-16:25 **Prof. Han YU**
The Hong Kong Polytechnic University
"Material Design of Polymer Acceptors for Efficient and Stable All-Polymer Solar Cells"

16:25-17:05 **Prof. Yongfang LI**
Institute of Chemistry, Chinese Academy of Sciences (ICCAS) and Soochow University
"Narrow Bandgap Organic Acceptors for Organic Solar Cells"

17:05-17:10 Closing Remarks by **Prof. Xunjin ZHU**

17:10 End of Programme

Session 1

Chaired by Prof. Lianzhou WANG

Prof. Shizhang QIAO

Chair Professor
School of Chemical Engineering
College of Engineering and Information Technology
Adelaide University

Prof. QIAO is a Chair Professor at Adelaide University, Australia. His research expertise lies in nanostructured materials for electrocatalysis, batteries, and other new energy technologies. He has co-authored 600 papers in refereed journals with 159,000 citation times, resulting in an h-index of 205.

He is an elected Fellow of Australian Academy of Science (FAA), Australian Academy of Technological Sciences & Engineering (FTSE), Australian Laureate Fellow and ARC Industry Laureate Fellow. Prof. Qiao is the Editor-in-Chief of *EES Catalysis* (RSC) and recognized as a Clarivate Analytics Highly Cited Researcher in three categories (Chemistry, Materials Science, Environment and Ecology).

Functional Materials for Energy Storage and Conversion

Powered by renewable electricity, oxygen evolution reaction (OER) and hydrogen evolution reaction (HER) can efficiently split water into green hydrogen. A crucial step in realizing this prospect is the knowledge-guided design of optimal electrocatalysts with high activity and selectivity. In this presentation, I will talk about our recent progress in mechanism understanding and material innovation for electrocatalytic water/seawater splitting for green hydrogen production.

Aqueous zinc-based batteries (AZBs) hold significant potential for energy storage due to their low cost, high safety, impressive energy density, and environmental friendliness. However, they face major challenges for commercialization, including the lack of advanced cathode materials for AZBs and slow reaction kinetics for MSBs. For AZBs, I will introduce our latest advancements that demonstrate the exceptional durability of Zn-I_2 batteries in industrial-scale pouch cells, which are operated under conditions of high active mass loading for cathodes and limited Zn supply for anodes.

Prof. Tao ZHANG

Professor
Dalian Institute of Chemical Physics
Chinese Academy of Sciences

Prof. ZHANG's research interests are mainly focused on Single-Atom Catalysis and Catalytic Conversion of Biomass. He discovered a new process from cellulose to ethylene glycol in 2008 and has accomplished a pilot demonstration (1000 ton/year) in 2023. Particularly, in 2011, he coined the new concept “Single-Atom Catalysis” (Nature Chemistry, 2011, 3, 634), which is now one of the hot research frontiers in catalysis. He has won many important awards, such as Citation Laureates Award (2025), Future Science Prize (2024), Tang Aoqing Award (2024) of Chinese Chemical Society (CCS), Advance of Catalysis Award of the Asian-Pacific Association of Catalysis Societies (2023), Distinguished Award of CCS-Sinopec (2022), ChinaNano Award (2018), and National Invention Prize (2008). Prof. Zhang is the author or co-author of more than 600 peer-reviewed publications and 110 patents (H-index 120 and more than 70000 citations).

Single-Atom Catalysis

Single-atom catalysis has emerged as one of the most active frontiers in heterogeneous catalysis. With the great potential for maximizing the atom efficacy and offering distinctive activity/selectivity in a variety of important reactions, single-atom catalysts (SACs) have received incredibly increased attentions from both academia and industry. In this contribution, I will introduce the fast progress of SACs in the past ten years and mainly focus on the research in my group to address some of the fundamental issues about single-atom catalysis, such as the nature of the active sites in SACs, the essential role of coordination structure of single atoms in catalysis, as well as the dynamics of SACs during reaction. I wish this talk will provide an insightful understanding of the single-atom catalysis.

Session 2

Chaired by Prof. Shizhang QIAO

Prof. Yan JIAO

Dean of School of Chemical Engineering
College of Engineering and Information Technology
Adelaide University

Prof. JIAO is Dean for School of Chemical Engineering in Adelaide University. She was an Australian Research Council (ARC) Future Fellow. Prof Jiao's expertise lies in the use of computational techniques for the design of clean and sustainable energy conversion materials. She has published on leading journals such as *Nature Chemical Engineering*, *Nature Energy*, *Nature Communications*, *Journal of the American Chemical Society*. Her published works, including over 140 journal articles and a book chapter, have received over 47,000 citations and with a h-index of 81. She has been recognized as a Highly Cited Researcher in Chemistry by Clarivate Analytics since 2019.

Molecular Modelling of Electrocatalysts and Electrolyte for Clean Energy Conversion and Data-Driven Approaches

The goal of achieving zero-carbon emissions by 2050 has driven the search for alternative industry solutions that can replace the traditional fossil fuel-based economy. With the technology and infrastructure in place to produce clean electricity from renewable sources such as solar or wind, the ability to generate it on a large scale is rapidly increasing. This presents a prime opportunity for the production of carbon-free fuels and chemicals through the use of electrocatalysis. This method enables the conversion of green electricity into chemicals and fuels, and vice versa, providing a path towards a sustainable future.

A central challenge in electrocatalysis remains the design of advanced electrocatalyst materials, as well as electrolyte, that are both highly active and selective for clean energy conversion reactions. Traditionally, molecular modelling has helped address this by offering insights into reaction mechanisms and guiding material design. Increasingly, artificial intelligence is playing a transformative role in this space. AI models trained on quantum mechanical data or experimental results can rapidly screen material candidates, identify structure-performance relationships, and uncover hidden patterns that may not be obvious through conventional approaches.

My talk will highlight how we have used molecular modelling in the past for clean energy conversion reactions, the emerging shift toward machine learning, and how it is expected to drive the next wave of breakthroughs in predicting and optimising electrocatalysts and electrolytes for clean energy applications.

Prof. Jingjie GE

Assistant Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. GE is an Assistant Professor in the Department of Applied Biology and Chemical Technology at The Hong Kong Polytechnic University. She received her Ph.D. from the University of Science and Technology of China (USTC) in 2018 under the supervision of Prof. Yadong Li and Prof. Xun Hong. She then worked as a Postdoctoral Fellow and Research Assistant Professor at Nanyang Technological University and The Hong Kong University of Science and Technology, respectively. Her current research focuses on the atomic design and precise synthesis of nanomaterials and nanozymes with applications in green chemistry, sustainable energy, and the biomedical sector. She has published over 40 SCI papers, with a total citation count of over 3,500 and an H-index of 25, including those in *J. Am. Chem. Soc.*, *Angew. Chem. Int. Ed.*, *Adv. Mater.*, *Nat. Commun.*, etc. She is the Young Editorial Committee Member of *Nano Research*, *MedMat*, and *Materials Reports: Energy*.

Atomic Precision Design of Low-dimensional Transition Metal Nanocatalysts for Oxidation Reaction

The atomic design of transition-metal-based materials offers a promising approach to reducing metal use and improving catalytic performance. Since most catalytic reactions occur at surface and/or interface sites, atomically engineering these active sites is crucial for designing efficient, low-cost catalysts, which, in turn, facilitates the investigation of the relationships among material, structure, and performance. Herein, by atomically engineering low-dimensional transition-metal-based catalysts, we optimized both the oxidation activation and oxidation evolution reactions, thereby achieving superior catalytic performance. Specifically, we achieved phase engineering of atomically dispersed Fe-doped amorphous RuO_x nanosheets via amorphous–amorphous transition strategies, thereby precisely synthesizing two distinct Ru–Fe pair configurations. The A-Fe_1/RuO_x NSs with a connected tetrahedral FeO_4-octahedral RuO_6 configuration exhibited an enhanced formation of superoxide radicals during oxidative dehydrogenation reactions, resulting in remarkable catalytic activity in the synthesis of indole, indole derivatives, and quinoline. We then investigated the enhancement of the spin-polarized oxygen evolution reaction (OER) under a magnetic field by atomically designing magnetic spinel catalysts. We built a magnetism/OER activity model that provides new design principles for active OER catalysts.

Prof. Jun HUANG

Professor

School of Chemical and Biomolecular Engineering

The University of Sydney

Prof. HUANG received his PhD from University of Stuttgart in 2008. After his postdoctoral fellow at Georgia Institute of Technology and ETH Zurich, he joined the University of Sydney in 2010. He is the Academic Leader of University of Sydney – Zhejiang University Joint Lab on Sustainable Environment. His research is to develop emerging nanocatalysts for more attractive, practical, and cleaner processes using in situ characterization techniques coupled with innovative reaction engineering. He has published over 300 journal publications in high-rank Journals and has been awarded many prestigious awards including ACS Sustainable Chemistry & Engineering Lectureship Award and Australia's Most Innovative Engineer.

Understanding and Tailoring Nanocatalysts for Efficient Carbon Transformation

Efficient carbon transformation is central to achieving sustainable chemical manufacturing and net-zero emissions. This presentation highlights our recent advances in tailoring nanocatalysts to control activity, selectivity, and stability in CO_2 and CH_4 conversion. We develop highly efficient NiRu alloy catalysts, including single-atom alloy architectures, to precisely tune hydrogen activation and surface intermediate stabilization for selective CO_2 hydrogenation. By engineering metal–metal synergy and interface structures, we achieve enhanced selectivity while suppressing undesired over-reduction pathways. In parallel, we investigate isolated La single-atom catalysts for selective CH_4 transformation, revealing their role in C–H activation and oxygen mobility regulation. To address stability challenges, we systematically elucidate sintering and coke formation mechanisms in Ni-based catalysts during dry reforming of methane (DRM). Guided by operando insights, we design ultrastable catalysts with controlled metal dispersion and strong metal–support interactions, enabling long-term DRM performance. These strategies provide fundamental and practical pathways toward efficient and durable carbon upcycling technologies.

Session 3

Chaired by Prof. Jingjie GE

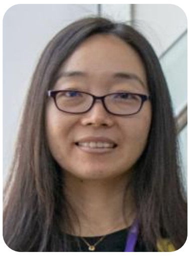
Prof. Lianzhou WANG

Chair Professor of Energy Materials
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. WANG joined The Hong Kong Polytechnic University (PolyU) as a Global STEM Chair Professor in June 2025. Before joining PolyU, he was professor and Australian Research Council Australian Laureate Fellow in the School of Chemical Engineering and Director of Nanomaterials Centre, at The University of Queensland, Australia. His research focuses on the design and application of semiconductor nanomaterials for renewable energy conversion and storage including photocatalysts for solar fuel production, low-cost solar cells and rechargeable batteries. He has published > 650 articles in high quality journals including *Science, Nature Energy, Nature Nanotech*, and others, with a H-index of 138. He is elected fellow of the Australian Academy of Science (FAA), Australian Academy of Technological Sciences and Engineering (FTSE), and Academia Europaea (MAE), and has been named on the Clarivate' Highly Cited Researchers list numerous times.

Semiconductor Nanomaterials for Photoelectrochemical Energy Conversion

Semiconductor nanomaterials hold the keys for efficient solar energy harvesting and conversion processes like photocatalysis and photoelectrochemical reactions. In this talk, we will give a brief overview of our recent progress in designing semiconductor nanomaterials for photoelectrochemical energy conversion including solar hydrogen generation and low-cost solar cells. In more details, we have been focusing on a few aspects; 1) photocatalysis mechanism, light harvesting, charge transfer and surface reaction engineering of low-cost metal oxide-based semiconductors as efficient photoelectrode for photoelectrochemical hydrogen production; 2) the working mechanism and stability improvement of perovskite quantum dots and lead-free tin-based perovskite solar cells; 3). The design of ultra-stable composites of perovskite-MOF with improved light emitting performance and catalytic performance. The resultant material systems exhibited efficient photocatalytic property and high-power conversion efficiency in solar cells, which underpin sustainable development of solar-energy conversion application.



Prof. Chunxia ZHAO

Professor
School of Chemical Engineering
College of Engineering and Information Technology
Adelaide University

Prof. ZHAO is a Professor and an Australian National Health and Medical Research Council (NHMRC) Leadership Fellow in the School of Chemical Engineering at University of Adelaide (UoA), the Deputy Director of an Australian Research Council (ARC) Centre of Excellence. Before she joined UoA, she was a group leader, ARC Future fellow, UQ Amplify Fellow at the Australian Institute for Bioengineering and Nanotechnology, The University of Queensland. She leads a research group of about 30 researchers focusing on bioinspired engineering, biomimetic nanomaterials and biomimetic devices for drug development and resource recovery. Her research has attracted total >AUD $60 M funding as Chief Investigator. She has been awarded three national prestigious fellowship (Australian Postdoctoral Fellowship 2011-2014 and ARC Future Fellowship 2015-2020, and NHMRC Leadership Fellowship 2022-2026). Prof. Zhao has published more than 170 referred articles and book chapters in international top refereed journals such as Nature Nanotechnology, PNAS, Science Advances, Nature Comm, Angewandte Chemie International Edition, ACS Nano, Small, AM, AFM, and so on. She has been focusing on innovative research as evidenced by her 10 patents, three licenses and one start-up. She has collaborated with many industry partners for translational research (Bioproton, BioCina, Cytiva, etc.) She has built extensive collaborations with scientists at top universities such as Harvard University, Brown University, etc. She serves as the Editors, Editorial Board member for several journals.

Bioinspired Materials and Devices: From Biomedical Applications to Resource Recovery

Nature has evolved an extraordinary repertoire of materials and processes with hierarchical structures and multifunctional behaviors across length scales. Inspired by these systems, our research harnesses biological principles to engineer bioinspired materials and catalytic platforms for both biomedical and resource recovery applications. We design peptides and proteins as catalysts and structure-directing agents to drive inorganic material formation, creating organic–inorganic hybrid nanomaterials. We develop modular nanoparticle platforms with tunable properties for drug delivery, precision nanomedicines and mRNA therapeutics. In parallel, drawing inspiration from natural mineralization and biomining, we develop peptide- and protein-based catalytic systems that selectively recognize and transform minerals, enabling water-based, recyclable separation of precious minerals and metals from primary and urban resources.

Prof. Wai-Yeung WONG, Raymond

Dean of Faculty of Science
Chair Professor of Chemical Technology
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. WONG obtained his B.Sc. (Hons.) and Ph.D. degrees from The University of Hong Kong. After postdoctoral works at Texas A&M University (Advisor: Prof. F. A. Cotton) and the University of Cambridge (Advisors: Profs. The Lord Lewis and P. R. Raithby), he joined Hong Kong Baptist University from 1998 to 2016 and he now works at the Hong Kong Polytechnic University as the Dean of Faculty of Science and Chair Professor of Chemical Technology. He was awarded the RSC Chemistry of the Transition Metals Award, FACS Distinguished Young Chemist Award, State Natural Science Award from China and RGC Senior Research Fellow Award, among others. His research focuses on developing multifunctional molecules and polymers for organic optoelectronics, energy science and metal-based nanomaterials. He is a Fellow of the Royal Society of Chemistry, a Foreign Member of the European Academy of Sciences and a Member of the Hong Kong Academy of Sciences.

Photofunctional Organometallic Materials for Solar Energy Conversion

Solar energy technologies have gained significant global attention as crucial facilitators for the green and sustainable development of human society and the economy. Organic materials hold great potential in solar energy conversion due to their advantages such as diverse molecular modification, pollution-free nature, low cost, solution processing, and flexible device fabrication. Our research focuses on developing new organometallic materials and investigating their performance in solar cells, solar evaporators and photocatalysis. The development of new organometallic materials opens a meaningful pathway from molecular design to improving the solar energy conversion efficiency of photo-to-electric, photo-to-thermal and photo-to-chemical processes.

Session 4

Chaired by Prof. Shaobin WANG

Prof. Yi-Chun LU

Professor
Vice-Chairman (Graduate)
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Prof. LU received her Ph.D. degree from MIT in 2012. She is a Professor at The Chinese University of Hong Kong (CUHK). She serves as the Associate Editor of Journal of Materials Chemistry A from Royal Society of Chemistry. She is Fellow of Royal Society of Chemistry, Founding Member of Young Academy of Science of Hong Kong and was the recipient of ISE Tajima Prize, Hong Kong Engineering Science and Technology Award, Xplorer Prize, IBA Early Career Award etc. Prof. Lu's research interest centers on developing fundamental understandings and material design principles for clean energy storage and conversion.

Material Designs for Sustainable Aqueous Batteries

Energy storage systems play a crucial role in the integration of renewable energy sources, which are often unstable and intermittent, such as solar and wind power. Non-aqueous lithium-ion batteries dominate the battery market due to their high energy density, which allows them to store a large amount of energy in a relatively small volume. However, these batteries have a significant drawback: they are flammable. This flammability poses a risk of catastrophic damage, especially in large-scale applications where safety is paramount. Aqueous redox flow batteries (RFBs) offer a promising alternative for scalable, safe, and long-duration energy storage. One of the key advantages of RFBs is their design flexibility, which allows for independent scaling of power and energy capacity. This makes them highly adaptable to various energy storage needs. However, the widespread adoption of all-vanadium redox flow battery is limited by the low abundance and high cost of vanadium, making them less economically viable for large-scale deployment. In this presentation, we will discuss the development of emerging flow battery systems offering low-cost and high-capacity energy storage. We will discuss innovative approaches to mitigate crossover and improve reaction kinetics, thereby making these batteries more efficient and reliable.

Prof. Zheng-Long XU

Associate Professor
Department of Industrial and Systems Engineering
The Hong Kong Polytechnic University

Prof. XU is an Associate Professor in the Department of Industrial and Systems Engineering at The Hong Kong Polytechnic University. He earned his Bachelor degree from Zhejiang University, and Ph.D. from The Hong Kong University of Science and Technology. His research at PolyU focuses on the design, fabrication, and characterization of advanced energy materials and devices, including metal rechargeable batteries and in-situ characterization tools. He has published over 100 papers in prestigious journals with H-index of 49 and total citations of over 8,200 times, and is ranked the world's top 2% scientists by Stanford University in 2021-2023.

Interfacial Chemistry of Multivalent Metal Anode Batteries: Calcium Metal

The growing electricity consumption and sustained economic growth have driven the increasing demands on energy. Due to its high energy and power densities, long cycle life, and flexible design, lithium-ion batteries (LIBs) have dominated the battery market over three decades. Nevertheless, the limited and unevenly distributed lithium reserves perturb the sustainable and large-scale supply of LIBs. Calcium metal batteries (CMBs) have been considered potentially high-energy and low-cost alternatives to commercial Li ion batteries because of the high abundance of calcium elements in the Earth’s crust. However, Ca deposition had been extremely difficult in aprotic organic electrolytes and suffer short cycle life, which are largely rooted on the ion-blocking solid electrolyte interphase. In this talk, I would like to present our recent work in understanding the failure mechanisms of calcium metal anodes and several electrolyte chemistry strategies to mitigate the interfacial challenges for propelling the advancement of sustainable calcium-based energy storage system.

Prof. Quan LI

Professor
Department of Physics
The Chinese University of Hong Kong

Prof. LI is a Professor at The Chinese University of Hong Kong. She obtained her B.S. in Chemistry from Peking University in 1997, and her PhD in Materials Science and Engineering from Northwestern University in 2001. She joined CUHK in 2002 as an Assistant Professor and was promoted to Associate Professor and Professor in 2007, and 2011, respectively. Her research interests include functional materials and structures for energy and biomedical applications, and diamond-based quantum sensing. Her work on energy materials focuses on electrode materials/architectures development for batteries.

Extending the Cycle Life of Li Metal Anode

The lithium (Li) metal battery is a highly promising candidate for high energy density applications. However, the poor long-cycle stability of the Li metal anode limits its practical implementation. In this talk, I will start with the discussion of the leading failure mechanism of Li metal anode, which turns to be the accessibility of fresh Li in the electrode. I will then discuss the impact of surface crystallographic texture on the plating/stripping characteristics of Li metal and its influence on electrode cycle performance. Specifically, (110) textured lithium facilitates not only dense lithium plating but also uniform stripping during cycling, leading to largely extended cycle life of the cell.

Prof. Pierre BRAUNSTEIN

Emeritus CNRS Research Director
University of Strasbourg

Prof. BRAUNSTEIN is Emeritus CNRS Research Director at the University of Strasbourg. He spent one year at University College London (with Profs. Sir R. S. Nyholm) and another at the TUMunich (with Prof. E. O. Fischer, Nobel Laureate). His broad research interests lie in the inorganic and organometallic chemistry of the transition and main group elements, where he has (co)authored over 650 scientific publications and review articles. Focused on fundamental research, his work has also led to diverse applications, ranging from homogeneous catalysis to cluster-derived nanoparticles for heterogeneous catalysis and nanosciences.

He is a member i.a. of the French Academy of Sciences and the German National Academy of Sciences Leopoldina and, since 2015, is Head of the Division of Chemical Sciences in the European Academy of Sciences.

Reactivity Control by Fine-Tuning the Metal Coordination Sphere

The increasing contributions of molecular chemistry to homogeneous and heterogeneous catalysis and to nanosciences largely result from the possibility to fine-tune the interactions between multifunctional ligands and metal centre(s), which allows a deeper understanding of molecular structures and reactivity. This is facilitated by the unlimited diversity of ligands available or to be created.

These aspects will be discussed, using diverse examples dealing with:

- ✓ The stabilization of underligated metal complexes with N-heterocyclic carbene ligands,
- ✓ Hemilabile hybrid P,O ligands on Pd and reversible CO_2 fixation and catalytic valorisation,
- ✓ P,C^{NHC}-P pincer ligands for C_{sp3}-H double activation.

Session 5

Chaired by Prof. Chunxia ZHAO

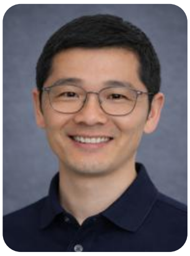
Prof. Zaiping GUO

Chair Professor of Energy Materials
Department of Materials Science and Engineering
City University of Hong Kong

Prof. GUO is a Chair Professor at the City University of Hong Kong, having joined the university in July 2025. She was an Australian Laureate Fellow in the School of Chemical Engineering at the University of Adelaide. In 2023, she was elected a Fellow of both the Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering. Her research specializes in the design and application of electrode materials and electrolytes for energy storage and conversion. Professor Guo's contributions have been recognized with numerous awards, including an ARC Queen Elizabeth II Fellowship (2010), an ARC Future Fellowship (2015), etc. She has been named a Clarivate Analytics Highly Cited Researcher every year from 2018 to 2025.

Electrode and Interface design for high performance rechargeable batteries

Energy storage is essential to realize low carbon society and there have been many challenges. Metal ion batteries are still dominating the rechargeable battery market. Materials engineering plays a key role in the field of battery research. In particular, engineering materials at various scales offers unique properties resulting in high performance electrodes in energy storage devices. Consequently, considerable efforts have been made in recent years to fulfil the future requirements of electrochemical energy storage devices. Various multi-functional hybrid electrode materials and electrolytes are currently being studied to improve energy and power densities of next generation metal-ion batteries. In this talk, I will present some of our recent progress in the synthesis of different types of hybrid electrode materials and electrolytes to enhance the electrochemical energy storage properties of metal-ion batteries.



Prof. Xiaoguang DUAN

Professor

School of Chemical Engineering

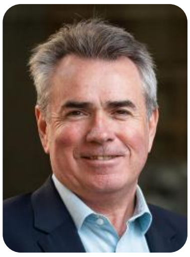
College of Engineering and Information Technology

Adelaide University

Prof. DUAN is a full Professor and ARC Future Fellow at School of Chemical Engineering, Adelaide University, Australia. His research focuses on environmental remediation, advanced oxidation technology, green catalysis, functional (nano)materials, and tumour therapies. He has published over 300 papers in Nature Water, Nature Sustainability, Nature Communications, Angew Chem Int Ed, PNAS, Environ Sci Technol, et al. He was recognized as a Highly Cited Researcher between 2020-2023, and received ACS Catalysis Early Career Award, MIT Technology Review Innovators Under 35, ES&T James J. Morgan Award, and Young Tall Poppy Award.

Catalytic Water Purification and Pollutant Upcycling

Advanced oxidation processes (AOPs) have garnered wide attention as a promising solution to the dual pressures of water pollution and carbon emissions. Unlike conventional radical-based Fenton systems that rely on intense oxidation and substantial oxidant consumption to degrade pollutants into CO_2, we discovered a new electron-transfer pathways (ETP) that offer enhanced selectivity toward micropollutants in complex water environments. The ETP regime was triggered via non-radical persulfate activation, yielding surface complexes that selectively oxidize and convert phenolic and aromatic contaminants into polymeric products under moderate conditions with stoichiometric peroxide consumption. Such a process enables selective pollutant removal alongside resource valorization into value-added products at very low chemical consumption. We investigated how metal oxides and carbon nanomaterials trigger distinct ETP pathways and revealed that catalyst structure and chemical properties are pivotal in regulating peroxide activation, thus steering the micropollutant removal toward polymer formation rather than decomposition. Through micro-field intensification and heterojunction engineering, sustained oxidation and polymerization can be driven in parallel, boosting system stability and polymer yields. This “waste-to-resource” approach renovates AOP technologies toward sustainable water treatment and resource recovery.



Prof. David LEWIS

Pro Vice Chancellor
College of Engineering and Information Technology
Adelaide University

Prof. LEWIS is Pro Vice Chancellor of the College of Engineering and IT at Adelaide University. A Chartered Chemical Engineer, he has worked across the petroleum, mining, automation, hospitality, and defence sectors before moving into senior academic leadership. His research focuses on the development and commercialisation of sustainable technologies to decarbonise industrial processes, with current emphasis on e-waste recycling. David is committed to practical, inclusive leadership and building high-performing teams. He brings strong experience in risk management, industry engagement, education, and mentoring, with a clear focus on delivering impact through strategy, quality, and operational excellence.

Sustainable Recovery of Silver from End-of-Life Solar Panels: Evaluating Green and DES-Free Leaching Systems

End-of-life photovoltaic (PV) panels represent a growing waste stream and a valuable source of critical materials, particularly silver. This study evaluates sustainable approaches for silver recovery, focusing on green solvents, including deep eutectic solvents (DESs), and compares their performance with DES-free systems using industrial reagents. While literature highlights DESs as promising, results demonstrate limited efficiency at high solid-to-liquid ratios. In contrast, DES-free systems employing water and hydrogen peroxide achieve superior leaching performance. The role of oxidizers, hydrogen bond donors, and complexing agents is assessed, providing insights into process optimisation for scalable, environmentally responsible recovery of high-value materials from PV waste.

Session 6

Chaired by Prof. Han YU

Prof. Shaobin WANG

Professor
School of Chemical Engineering
College of Engineering and Information Technology
Adelaide University

Prof. WANG obtained the degrees of BSc and MSc in Chemistry from Peking University and PhD in Chemical Engineering from the University of Queensland (Australia). He has been a John Curtin Distinguished Professor at Curtin University (Australia) and is now a Laureate Professor at the School of Chemical Engineering, the University of Adelaide (Australia). His research interests focus on nanomaterial synthesis and application for adsorption and catalysis, fuel and energy conversion and environmental remediation. He was awarded 2012 Thomson Reuters Citation & Innovation Awards in Australia and is listed as a highly cited researcher in Engineering, Chemistry and Environment & Ecology in 2016-2022. He is a co-editor of Journal of Colloid and Interface Science and an editor of Applied Catalysis B: Environmental as well as an editorial board member of several international journals.

Single-atom Catalysts for Energy and Environmental Catalysis

Energy crisis and environmental pollution are two important issues in the world. Catalytic reactions will provide efficient techniques for energy conversion and environmental remediation. Solar energy as an important energy source for Earth can be used for driving catalytic reactions to produce chemicals. Photocatalytic reaction for water splitting to hydrogen generation can be an excellent process for solar energy conversion and clean hydrogen production. Meanwhile, advanced oxidation processes have also been regarded as effective techniques for pollutant removal. However, development of high-performance catalysts is important for those catalytic processes. Single-atom catalysts (SACs) are a burgeoning class of isolated site catalysts, envisioned as promising candidates for various catalytic reactions due to the precisely tailored metal coordination environments, maximal atomic utilization efficiency, and thus low metal usage. Herein, we will report our recent progress in fabrication of different SACs for those reactions and discuss their efficiency and mechanisms.

Prof. Linli XU

Assistant Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. XU is an Assistant Professor in the Department of Applied Biology and Chemical Technology at The Hong Kong Polytechnic University (PolyU). She earned her PhD in 2010 from the Chinese Academy of Sciences (CAS) and subsequently served as an Assistant Researcher at the Technical Institute of Physics and Chemistry, CAS, from 2010 to 2017. Her research interests encompass the design and synthesis of two-dimensional carbon and carbon-rich materials, with a focus on their applications in optoelectronics, energy conversion and storage, and thermal management. To date, she has authored over 60 peer-reviewed publications in leading journals, including *Chem. Soc. Rev., J. Am. Chem. Soc., Agnew. Chem. Int. Ed., Adv. Mater.*

Metal-Acetylide Frameworks: Design, Synthesis, Characterization and Application Studies

The propensity of d_{10} Hg(II)-, d_8 Ni(II)-, Pd(II)- and Pt(II)-$(PR_3)_2$ (R = alkyl chain) units to form a moiety with alkynyl units makes them attractive building blocks for two-dimensional (2D) metal-acetylide frameworks (MAFs). Both few-layer and multi-layer 2D nanosheets can be generated depending on the types of interface-assisted approaches and their bulks can be prepared by the one-pot method. The 2D nanosheets with different topological structures, pore sizes, surface areas and advanced functionalities can be prepared by using different monomers with diverse electronic, optical and catalytic properties. The relationship between the performance of MAFs and their well-defined nanostructures will be elucidated, with a major focus on studying the effects of transition metals and ligands in activating their optical and catalytic properties. The properties and catalytic performance can be fine-tuned through chemical modification of the chromophores. The proposed work can produce a new class of 2D carbon-rich materials and provide a design concept for developing efficient nonlinear optical materials and photo-/electro-catalysts.

Dr Govardhana Babu BODEDLA

Research Assistant Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Dr BODEDLA obtained his B.Sc. and M.Sc. degrees from Acharya Nagarjuna University (ANU), and a Ph.D. from the Indian Institute of Technology Roorkee (IITR), India. He worked as a Postdoctoral Researcher at Hong Kong Baptist University and at The Hong Kong Polytechnic University. Since 2023, he has been working as a Research Assistant Professor at the Department of Applied Biology and Chemical Technology, The Hong Kong Polytechnic University. His current research interests focus mainly on the rational design and synthesis of tetrapyrrolic macrocycle-based materials for photocatalytic and electrocatalytic applications.

Porphyrin-Based Photocatalysts: Molecular Engineering Approaches for Enhanced Photocatalytic Hydrogen Evolution

The conversion of solar energy into hydrogen (H_2) via photocatalytic water splitting is a promising strategy for sustainable energy, as H_2 is an efficient energy carrier. Photocatalytic systems (PS) for H_2 production typically comprise a photocatalyst, cocatalyst, and sacrificial donors, with the photocatalyst being crucial for enhancing photocatalytic H_2 evolution (PHE). Porphyrin-based photocatalysts are particularly attractive due to their strong UV-visible light absorption and tunable optoelectronic properties, which can be modified by altering peripheral substituents or metal centers. Our group has focused on improving the PHE of porphyrin PSs through structural modifications, including: (i) introducing chromophores at peripheral positions and inserting various metals into the porphyrin ring; (ii) designing self-assembled porphyrin small molecules with defined morphologies; (iii) developing porphyrin molecules for cocatalyst-free PHE; and (iv) creating A-π-D-π-A porphyrins for enhanced visible-to-near-infrared light harvesting.

Session 7

Chaired by Prof. Xiaoguang DUAN

Dr Yang WANG

Research Assistant Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Dr WANG is currently a Research Assistant Professor at The Hong Kong Polytechnic University. He obtained his Ph.D. in Organic Chemistry from the University of Chinese Academy of Sciences. His research focuses on the design and fabrication of bioinspired functional materials, particularly quantum dots and covalent organic frameworks, for solar energy conversion and electrochemical storage. He has published his research in leading international journals, including Nature Communications, Journal of the *American Chemical Society, Angewandte Chemie International Edition, and Advanced Materials*.

From Learning to Empowering Nature: Biomimetic Interfaces for Advanced Energy Conversion and Storage

Addressing the global challenge of efficient energy conversion and storage is pivotal for a sustainable future. This presentation will highlight our recent work on the rational design and construction of bioinspired functional materials for energy applications. Focusing on the synergistic combination of quantum dots (QDs) and covalent organic frameworks (COFs), we emulate natural photosynthetic principles to achieve efficient light-harvesting, charge separation, and mass transport. Our strategy involves precise interface engineering to create ordered structures, which demonstrate enhanced performance in artificial photosynthesis for solar fuel production. This approach is further extended to improve stability and efficiency in energy storage devices, such as aqueous zinc-ion batteries. This biomimetic approach offers a versatile pathway toward sustainable and high-performance energy technologies.

Dr Zelin SUN

Research Assistant Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Dr SUN completed her PhD studies at Tokyo Metropolitan University. In 2019, she joined the Hong Kong Polytechnic University Shenzhen Research Institute as a Postdoctoral Fellow, and in 2021 moved to ABCT at PolyU as a Research Fellow. Since 2023, she has been a RAP at PolyU. She has published 13 first- or corresponding-author papers in journals including *Nano Letters*, *Sci China Chem*, and *J. Mater. Chem. A*. Her research focuses on organic materials for clean energy, including thermoelectrics and CO_2 reduction. Today's talk highlights organic thermoelectric materials, covering organometallic polymer design, device fabrication, and thermoelectric performance.

A Study of Ferrocene-based Metallopolymers as Organic Thermoelectric Materials

Organic thermoelectric (OTE) materials are highly promising for flexible, wearable energy-harvesting applications, yet their performance often lags behind inorganic counterparts due to challenges in optimizing electronic properties. This work addresses these limitations by incorporating redox-active ferrocene (Fc) units into conjugated polymers to enhance thermoelectric behavior. Fc units act as internal charge modulators to dynamically tune carrier concentrations. We systematically investigated the thermoelectric properties of these Fc-containing polymers through a multi-pronged approach, including backbone and side-chain engineering to optimize molecular stacking, as well as the strategic introduction of stable radicals to refine doping efficiency. Our results demonstrate that integrating metallocene units provides a unique mechanism to balance the trade-off between electrical conductivity and the Seebeck coefficient. This study offers a promising molecular design strategy for achieving high-performance OTE materials through precise redox modulation and structural tailoring.

Prof. Xunjin ZHU

Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. ZHU earned his Bachelor’s in Chemical Engineering from Wuhan Institute of Technology in 1997 and a Master’s in Organic Chemistry from Wuhan University in 2002. He completed his PhD in Chemistry at Hong Kong Baptist University in 2006. Following post-doctoral research at the University of Texas at Austin and Georgia Institute of Technology, Prof. Zhu joined Hong Kong Baptist University in 2010, advancing to Associate Professor. Since 2024, he has been a Professor in the Department of Applied Biology and Chemical Technology at The Hong Kong Polytechnic University, focusing on advanced porphyrin materials for energy conversion and storage.

In Situ Electropolymerizing toward Polymer Nanofilms of CoN_4 catalysts for Electrochemical CO_2 Reduction

Cobalt-porphyrin (CoP) and cobalt-phthalocyanine (CoPc) catalysts for CO_2 electroreduction often face challenges such as agglomeration and poor conductivity. To overcome these, we developed EP-CoP and CoPc-PEDOT nanofilms through thiophene-based functionalization and in-situ electropolymerization. This approach enhances durability, charge transfer, and catalytic performance. In a flow cell, EP-CoP achieves >92% CO Faradaic efficiency at 160 mV overpotential and maintains 98.6% efficiency at 310 mA cm^{-2}. CoPc-PEDOT reaches 460 mA cm^{-2} with >99% efficiency in alkaline media and retains over 90% efficiency across 50–500 mA cm^{-2} under strongly acidic conditions. These catalysts demonstrate high activity, stability, and scalability for industrial CO_2 reduction.

Session 8

Chaired by Prof. Xunjin ZHU

Prof. Hin Lap YIP

Professor
Department of Materials Science and Engineering
City University of Hong Kong

Prof. YIP is a professor in the Department of Materials Science and Engineering at City University of Hong Kong (since 2021) and has served as Associate Director of the Hong Kong Institute for Clean Energy. His research focuses on advanced optoelectronic materials for optoelectronic devices, with 300+ publications and 50,000+ citations (H-index >110), and he has been named a Clarivate Highly Cited Researcher 12 times from 2014-2025. His honors include RGC Senior Research Fellow, Optica Fellow, Fellow of the Royal Society of Chemistry and the Hong Kong Institution of Engineers, he also received the Hong Kong Science and Technology Award 2023-2024.

Epitaxy-Mimicking Interfaces and Predictive Optical Design for Perovskite Solar Cells

Perovskite solar cells are governed by interfaces and optics: interfacial chemistry controls extraction, recombination, and stability, while optical design sets absorption, optical modulation (color tuning), and tandem current matching. In this talk, I present an epitaxy-mimicking, molecularly matched interface strategy—implemented with tailored self-assembled monolayers (SAMs)—to reduce interfacial losses, improve robustness, and enable high-performance interconnection layers for monolithic tandems. I then show how high-throughput optical simulations coupled with genetic optimization optimize multilayer stacks for targeted efficiency and spectral/visual appearance control. Finally, I highlight how this combined interface-and-optics toolkit enables new device functions, including color-tunable and infrared-reflective building-integrated photovoltaics.

Prof. Han YU

Assistant Professor
Department of Applied Biology and Chemical Technology
The Hong Kong Polytechnic University

Prof. YU joined the Department of Applied Biology and Chemical Technology at the Hong Kong Polytechnic University as an assistant professor and independent Principal Investigator (PI) in February 2025. He graduated with a bachelor's degree from Peking University in 2017. He then earned his PhD degree in 2021 under the supervision of Prof. He Yan. From 2021 to 2023, Prof. Yu performed as a post-doc at HKUST. Prof. Yu is appointed as a research assistant professor at HKUST from 2024 to 2025. Prof. Yu's research interest focuses on the development of high-performance polymer/organic materials for efficient and stable photovoltaic technique.

Material Design of Polymer Acceptors for Efficient and Stable All-Polymer Solar Cells

Organic solar cells (OSCs) have attracted considerable attention from both academia and industry due to their portability, transparency, flexibility, and facile fabrication. Owing to the extensive research efforts devoted to material development and device optimization, the power conversion efficiencies (PCEs) of OSCs based on small-molecular acceptors (SMAs) have exceeded 20% recently. Despite that, the device stability issue still remains a critical factor that limits the commercialization of OSCs. To this end, all-polymer solar cells (all-PSCs), which employ both polymeric donors and acceptors have attracted attention due to their additional advantages of robust mechanical toughness, and excellent light/thermal stability. With the development of Y-series polymerized-SMAs, the all-PSCs have realized decent efficiencies of over 19%. Here we report multiple design strategies for high-performance polymer acceptors, including end-group fluorination, vinylene-linkage conformational locking, core-to-core coupling and ternary complementary strategies, which will strengthen the absorption and morphology properties of the active layer, thus achieving simultaneous enhancement in device efficiency and stability. Throughout precise control of the intramolecular charge transfer effect and intermolecular interaction, our all-PSCs can be also fine-tuned to fulfill various application circumstance, such as semitransparent photovoltaics and indoor photovoltaics, to the pressing demand of the ecosystem of Internet-of-Things.

Prof. Yongfang LI

Professor

Institute of Chemistry, Chinese Academy of Sciences (ICCAS) and Soochow University

Prof. LI is a professor in ICCAS from 1993 and in Soochow University from 2012. He received his Ph. D. degree from Fudan University in 1986, then did his postdoctoral research at ICCAS from 1986 to 1988. His present research field is photovoltaic materials and devices for organic solar cells and perovskite solar cells. He has published more than 1000 research papers and the published papers have been cited by others for more than 96,000 times with H-index of 156. He was awarded the Second-Grade National Award of China on Natural Sciences for two times (in 1995 and 2018).

Narrow Bandgap Organic Acceptors for Organic Solar Cells

Organic solar cells (OSCs) have attracted great attention in recent years, because of their advantages of simple device structure, light weight and capability to be fabricated into flexible and semitransparent devices. The key photovoltaic materials of OSCs are *p*-type conjugated polymer donors and *n*-type organic semiconductor (*n*-OS) acceptors. Power conversion efficiency (PCE) of the OSCs has been promoted to over 20% recently, benefitted from the development of the low bandgap *n*-OS small molecule acceptors (SMAs).

Here I will report our recent research progress on the new narrow bandgap *n*-OS SMAs, the polymerized SMAs (polymer acceptors) and the giant molecule acceptors (GMAs) based on the SMAs, as well as the polymer donors matching with the narrow bandgap acceptors. In addition, I will report our new results on the perovskite/organic tandem solar cells (TSCs) with the wide bandgap perovskite solar cell as front cell and narrow bandgap OSC as rear cell.

PolyU-Adelaide University Bilateral Workshop

Advanced Catalysis, Energy Conversion and Storage

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