澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

應用物理及材料工程研究院
INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING

IAPME Newsletter

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✧ Content

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澳門大學應用物理及材料工程研究院（IAPME）& 物理及化學系（DPC）& 馬萬祺羅柏心書院（MLC）2026跨年迎春晚會圓滿舉辦：團結協作，共譜新篇章！

辭舊迎新，繼往開來。2026年1月30日晚，澳門大學應用物理及材料工程研究院（IAPME）、科技學院物理及化學系（DPC）與馬萬祺羅柏心書院（MLC）聯合舉辦的“騏驥馳騁 勢不可擋”跨年迎春晚會在W33書院禮堂隆重舉行。晚會彙聚了澳門大學270餘位教授、博士、碩士、本科生以及工作人員，共同慶祝過去一年的豐碩成果，展望充滿希望的2026年。

在本屆新年晚會中，IAPME教授們用各種參與方式表達了對此研究院最大規模師生集體互動活動的極大支持。其中，親臨現場的IAPME教授們有：澳門大學研究副校長兼IAPME代院長葛偉教授，UCLA材料科學與工程教授兼IAPME顧問裴啟兵教授，IAPME副院長孫漢東教授，科技學院物理及化學系主任邢貴川教授，曲松楠教授、邵懷宇教授、許冠南教授、周胤寧教授、李清教授、宋昊旻教授，湯軼蕊博士，以及晚會導演孫國星教授。其中，曲松楠教授和李清教授親自登臺獻唱，邵懷宇教授的兩位女兒帶來精彩舞蹈表演，宋昊旻教授花費大量時間訓練兩場合唱，湯軼蕊博士幫忙錄製節目，孫國星教授負責整場晚會的籌備工作。兩位負責一線組織工作的副導演向洋洋、劉逸凡同學及合唱指揮龔怡然同學，則分別來自孫國星教授、周冰朴教授及孫鵬展教授的課題組。

MLC院長楊柳教授、副院長馮家維博士、及書院導師陳耀揚博士，為晚會排練及正式上演提供了自始至終全方位的保障和支援。此外，科技學院土木與環境工程系主任周萬歡教授、人文學院勵松青教授、王思豪教授與王珊教授、社會科學學院洪澤教授、健康科學學院李蓓教授、研究服務及知識轉移辦公室劉禹汐博士、訪問學者清華大學日新書院應文玉老師、 MLC樓層助理包容老師等十餘位教授嘉賓均蒞臨現場出席。

晚會伊始，澳門大學研究副校長兼IAPME代院長葛偉教授發表致辭。他祝賀IAPME、DPC和MLC在過去一年取得的顯著成就，並鼓勵師生們在新的一年裡，繼續發揚團結協作、銳意進取的精神，不斷突破創新，為澳門乃至國家的發展貢獻力量。

（葛偉教授開幕致辭）

晚會以充滿活力和希望的合唱節目《夜空中最亮的星》拉開帷幕，在喚醒青春回憶的《同桌的你》合唱聲中結束。由來自不同課題組同學組成的合唱團，在宋昊旻教授的帶領下，用歌聲傳遞著對新年的美好祝願。合唱團成員包括來自孫國星教授課題組的李亞彪、陳彥如、熊國慶、武小江、李雪、李亞森和向洋洋，陳斌猛教授課題組的劉通源、周一帆、于佳樂、楊子軒和郭順帆，邵懷宇教授課題組的龍立芬、陳榕和蔣藝婷，蔡永青教授課題組的邱康燕和吳東釗，王雙鵬教授課題組的蔣靜，劉宏超教授課題組的付愛，孫鵬展教授課題組的指揮龔怡然，以及鋼琴伴奏DPC本科生何樂。龔怡然同學還奉獻了一段精彩的小提琴串燒《你若綻放光芒》，其精湛的演奏技巧和深情的演繹引得全場陣陣掌聲。許多成員表示，通過參與合唱團的排練和演出，他們不僅提高了藝術修養，更重要的是結識了來自不同課題組的朋友，增進了彼此的瞭解和交流，這種跨課題組的合作，促進了IAPME學生之間團結協作的良好氛圍。

（從左至右、從上至下）：合唱團開場表演《夜空中最亮的星》；
龔怡然小提琴串燒《你若綻放光芒》；鋼琴何樂；合唱團結束表演《同桌的你》

獨唱節目同樣亮點紛呈。曲松楠教授以IAPME過去一年的主要新聞為背景視頻，深情演唱了《當我想起你》。李清教授用清新的歌聲帶來《一路生花》，祝福同學們科研順利。IAPME博士畢業生，即將擔任香港科技大學助理教授的李雲健博士帶來的獨唱《這就是愛》，以其深情的演繹和高超的演唱技巧，將現場氣氛推向高潮。來自陳斌猛教授課題組的畢桐和許祖華，分別在微寒的臘月夜晚給我們帶來了溫暖的歌《暖暖》與《歲月裡的花》。在精彩的獨唱節目中，邢貴川教授課題組的馮子昊帶來了一段吉他彈唱《刻在我心底的名字》，用溫暖的歌聲觸動了在場每一位觀眾的心弦。

（從左至右、從上至下）：曲松楠教授《當我想起你》；李清教授《一路生花》；
李雲健教授《這就是愛》；許祖華《歲月裡的花》；
畢桐《暖暖》；馮子昊吉他彈唱《刻在我心底的名字》

晚會上，除了動人心弦的合唱和獨唱，還有活力四射的舞蹈和樂隊表演。邵懷宇教授兩位千金邵銘愛、邵銘伊與其在珠海微舞藝術團的隊友周潔、黃芷萱、王嘉鑫、黃俊莉、馬櫻菲和黃梓涵帶來了充滿動感的現代舞《It's my rules》等舞蹈串燒，她們的精彩舞姿，贏得了觀眾的陣陣喝彩。此外，孫國星教授課題組的李雪帶來了優美典雅的民族舞《盛世》，展現了中華傳統文化的魅力；陳斌猛教授課題組的朱嘉陽則用充滿力量的街舞《黑怕》，點燃了全場的熱情。MLC本科生TIEMSIN JAMES LEMUEL DRLA CRUZ、焦苑琳、郭靖瑤帶來的團隊舞蹈《舞蹈串燒》，更是將多種舞蹈風格巧妙融合，展現了青春活力與團隊默契。

（從左至右、從上至下)：珠海微舞藝術團《It's my rules》舞蹈串燒；
李雪民族舞《盛世》；朱嘉陽街舞《黑怕》；MLC團隊舞蹈《舞蹈串燒》

接著，MLC本科生高翊宸、馬梓航、萬溥叡、唐詩傑、柏菀陽帶來了充滿青春活力的歌曲《第一天》，為晚會注入了新的能量。隨後，孫國星教授課題組的博士後李翔和陳斌猛教授課題組的博士生于佳樂聯手DPC樂隊的何樂、吳岳洋、李欣祺、施羽軒、郝一鳴，分別帶來了經典歌曲《只是太愛你》和《反方向的鐘》，將現場氣氛推向了高潮。

（從上至下、從左至右）：MLC樂隊《第一天》；DPC樂隊《只是太愛你》；
李翔&于佳樂《反方向的鐘》

在歌舞節目精彩紛呈之間，晚會迎來了同樣備受期待的小品環節。由孫國星教授及其課題組成員李翔、李雪、于清露、李亞森共同呈現的小品，以春晚經典作品《不差錢》為藍本，巧妙融入組會討論與科研日常。作品以詼諧的語言和富有張力的表演，將科研過程中遇到的困惑、堅持與成長生動呈現，笑點與思考並存，贏得了觀眾的熱烈反響。節目還特別邀請優秀畢業生登臺交流，其中包括來自李宗津教授、孫國星教授及陳斌猛教授課題組的明星（現任東南大學教授）以及李雲健（即將任職香港科技大學助理教授）。兩位嘉賓結合自身經歷分享科研心得與成長體會，為在場師生送上真摯的祝福和鼓勵。此外，來自DPC的本科生鄧雲天、劉一鳴、張競好、彭有家、潘泓名、陳永銳、陳漢隆共同出演的原創小品《天啟四騎士》，以“本科老油條”與大一新生之間的逗趣互動展開，以輕鬆幽默的方式呈現本科生初涉科研的懵懂與迷茫，為整場晚會增添了濃厚的青春活力。

（從上至下）：孫國星教授課題組《組會》；DPC學生《天啟四騎士》

在節目表演中還穿插了多項互動遊戲，將現場氣氛不斷推向高潮。其中既有全場觀眾共同參與的“數錢”趣味挑戰，大家以手機掃碼加入遊戲，比拼手速與反應力，歡笑聲此起彼伏。也有通過抽取幸運觀眾參與的Switch體感羽毛球對決，輕鬆有趣的競技體驗讓臺上台下都沉浸在歡呼與熱烈的互動之中。

（從左至右、從上至下）：互動環節《數錢》&《Switch體感遊戲》

此外，晚會還設置了溫馨感人的特別環節。螢幕播放了往屆畢業生——邵懷宇教授課題組的郭燕和徐鑫、曲松楠教授課題組的王黎明和張蕙琦、周冰朴教授課題組的戴子憶和李雨薇、李宗津教授及孫國星教授課題組的劉仁俊和孫雪靜專程錄製的新年視頻祝福，他們在鏡頭前回望校園時光，寄語母校與師長，真摯情感引發現場共鳴。此外，MLC學生代表也為參與晚會的老師們獻上了親筆書寫的春聯，將敬意與祝福融入筆墨，為熱鬧的現場增添溫暖的年味。

（從左至右）：特別環節《畢業生新春祝福視頻》；MLC學生代表送春聯

所有節目精彩呈現之後，晚會以全場投票評選“我最喜愛的節目”作為溫馨而富有參與感的收尾環節。師生們通過線上系統選出了心目中的前十五名節目。隨後，孫國星教授、邢貴川教授、Gary FUNG教授、孫漢東教授和葛偉副校長依次為獲獎團隊頒發獎狀與獎品，既充分肯定了各節目的亮眼表現，也進一步激發了大家的參與熱情與榮譽感。同時，前十名獲獎節目的代表還各自抽取了一名幸運觀眾並送出精美禮品，讓榮耀與好運在現場流動。最後，在《難忘今宵》的悠揚旋律中，全體演職人員與觀眾一同登上舞臺合影留念，為這場洋溢著歡樂與溫情的晚會畫上圓滿句號。

（從左至右、從上至下）：互動環節《最喜歡的節目評選》；晚會結束合影留念。

感謝為此次晚會辛勤付出的所有演職人員，以及澳門物理學會的贊助；感謝到場出席的各位嘉賓、教授、行政人員及觀演學生們。祝願各位2026年“騏驥馳騁 勢不可擋”，期待明年再聚！讓我們一起祝願：2026年，澳門大學更加蓬勃發展，澳門特區更加興旺穩定，偉大祖國更加繁榮昌盛！

晚會參與人員名單

總導演：	孫國星 教授				
副導演：	向洋洋（孫國星教授課題組）		劉逸凡（周冰樸教授課題組）		
節目顧問：	宋昊旻 教授				
主持人：	李亞森（孫國星教授課題組）		畢　桐（陳斌猛教授課題組）		
行政支持：	馮　崢 先生	蘇勁華 先生	陳凱茵 女士		
	湯軼蕊 博士	陳家欣 女士	陳耀揚 博士		
出席嘉賓：	葛偉 教授（副校長兼IAPME代院長）				
	（IAMPE）	裴啟兵 教授	孫漢東 教授		
	曲松楠 教授	邢貴川 教授	陳　銳 教授		
	許冠南 教授	邵懷宇 教授	孫國星 教授		
	李　清 教授	宋昊旻 教授	周胤寧 教授		
	湯軼蕊 博士				
	（MLC）				
	應文玉 老師	楊　柳 教授			
	包　容 老師	馮家維 博士			
	（FAH）				
	王　珊 教授	勵松青 教授	王思豪 教授		
	周萬歡 教授（FST）		洪　澤 教授（FSS）		李　蓓 教授（FHS）
	劉禹汐（RSKTO）				
工作人員：	李雨薇（周冰樸教授課題組）		唐近朱（孫國星教授課題組）		
	（DPC本科生）	陳昕儀	區芷嫣	李　瑤	何諾恒
	王詩絢	區梓浩	潘熙睿	潘駿鱗	
	（MLC本科生）	孔慧兒	裴子希	王子嘉	陳錦天
	王厚水	陳與翊	張恒睿	謝梓妍	于馨媛
演出人員：	曲松楠 教授	孫國星 教授	李　清 教授		
	（孫國星教授課題組）	李亞彪	陳彥如	熊國慶	武小江
	李亞森	于清露	李　雪	李　翔	向洋洋
	（陳斌猛教授課題組）	許祖華	劉通源	周一帆	朱嘉陽
	于佳樂	楊子軒	畢　桐	郭順帆	
	（邵懷宇教授課題組）	龍立芬	陳　榕	蔣藝婷	
	（蔡永青教授課題組）	邱康燕	吳東釗		
	馮子昊（邢貴川教授課題組）		蔣　靜（王雙鵬教授課題組）		
	龔怡然（孫鵬展教授課題組）		付　愛（劉宏超教授課題組）		
	（DPC本科生）	何　樂	李欣祺	郝一鳴	蘇　嘯
	施羽軒	吳嶽洋	鄧雲天	劉一鳴	張競好	彭有家
	潘泓名	陳永銳	陳漢隆		
	（MLC本科生）	TIEMSIN JAMES LEMUEL DRLA CRUZ			
	焦苑琳	郭靖瑤	高翊宸	馬梓航	萬溥叡	柏苑陽
	吳佳盛	薛皓文	戴卓桓		
	（特邀嘉賓）	李雲健 教授	明　星 教授		
	邵銘愛	邵銘伊	周　潔	黃芷萱	王嘉鑫	黃俊莉
	馬櫻菲	黃梓涵			

❖ Publications (IF≥8, and/or nature Index; *corresponding author)

1. **Lun Li**, **Di Liu**, Zhichao Yu, Youpeng Cao, Chengcheng Zhong, Chunfa Liu, Jiao Yang, Wendi Zhang, Weng Fai Ip, **Hui Pan***. Dynamic evolution of high-valence metals in high-entropy systems enabling highly enhanced oxygen evolution reaction. *Journal of Energy Chemistry, 115,595-605* (2025). DOI: 10.1016/j.jechem.2025.12.008. [2024 IF=14.9]

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Dynamic evolution of high-valence metals in high-entropy systems enabling highly enhanced oxygen evolution reaction

Lun Li[a,1], Di Liu[a,1], Zhichao Yu[a], Youpeng Cao[a], Chengcheng Zhong[a], Chunfa Liu[a], Jiao Yang[a], Wendi Zhang[a], Weng Fai Ip[b], Hui Pan[a,b,*]

2. **Ruifeng Zheng**, **Shengwen Li***, Yulin Mao, Yulin Wang, Dongchen Qi, Hui Pan, Guichuan Xing, **Shi Chen***. Crystallization and energy level optimization by halide-substituted phenethylammonium based 2D perovskite additives for perovskite solar cells. *Chemical Engineering Journal*, 172435 (2025). DOI: 10.1016/j.cej.2025.172435. [2024 IF = 13.2]

Chemical Engineering Journal
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Crystallization and energy level optimization by halide-substituted phenethylammonium based 2D perovskite additives for perovskite solar cells

Ruifeng Zheng [a], Shengwen Li [a] ✉, Yulin Mao [a], Yulin Wang [a], Dongchen Qi [b], Hui Pan [a], Guichuan Xing [a], Shi Chen [a] ✉

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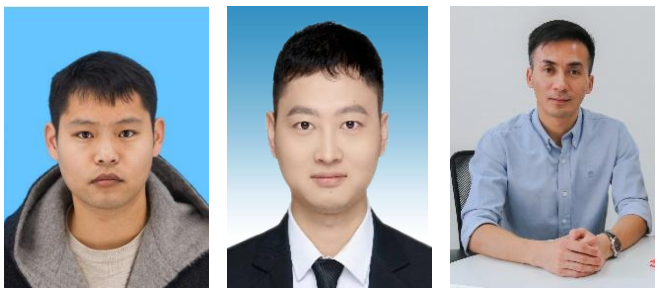
❖ Research Stories

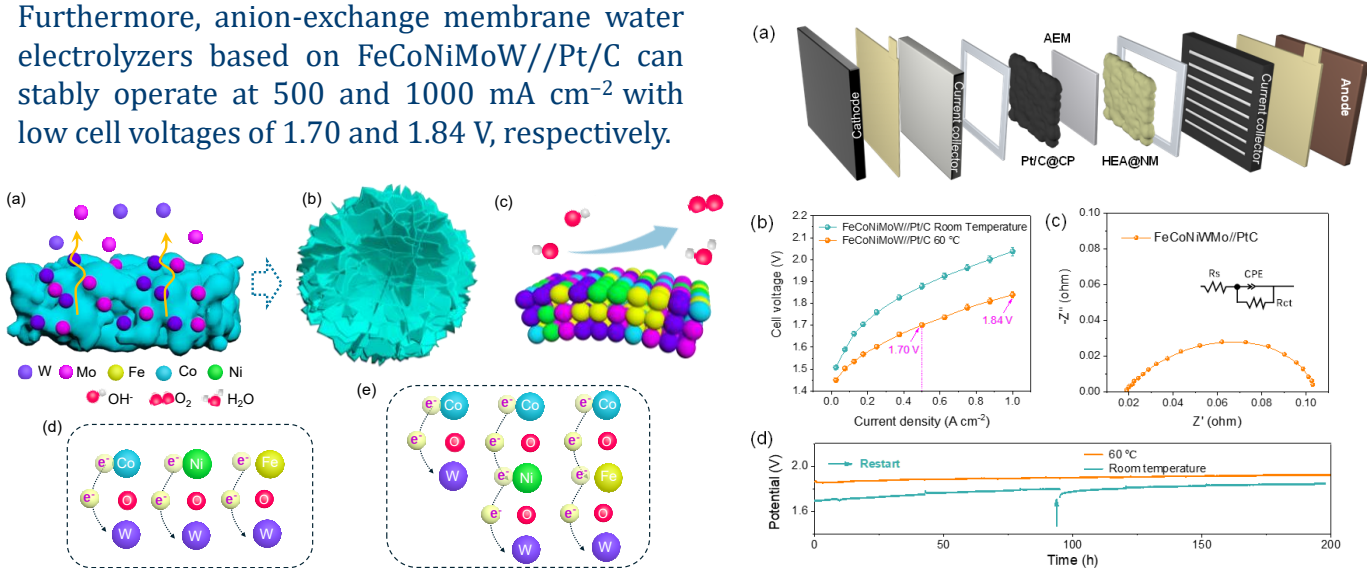
UM Research Team Studied Dynamic Evolution of High-valence Metals in High-entropy Systems for Oxygen Evolution Reaction

- Electrochemical water splitting, powered by renewable electricity, is a sustainable method for producing hydrogen, offering a carbon-neutral alternative to fossil fuel-based approaches.
- The team studied dynamic evolution of high-valence metals in high-entropy systems for oxygen evolution reaction. In-situ and ex-situ characterizations reveal that the dynamic electro-dissolution behavior of Mo^{6+} and W^{6+} species in FeCoNiMoW pre-catalyst leads to fast formation of catalytic-active (Mo, W) co-incorporated metal oxyhydroxides, which play a key role in the OER performance. This leaching process enables structural reconstruction, while concurrently optimizing the adsorption of the oxygen intermediate.
- Furthermore, anion-exchange membrane water electrolyzers based on FeCoNiMoW//Pt/C can stably operate at 500 and 1000 mA cm^{-2} with low cell voltages of 1.70 and 1.84 V, respectively.



Mr. Lun Li (李倫) | Dr. Di Liu (劉地) | Prof. Hui Pan (潘暉)

- The cost of the electric bill using this catalyst is notably low, at only $0.88 per kg, which is significantly below target of $2.00 per kg set by the U.S. Office of Clean Energy (OCE) for 2026.



Lun Li, **Di Liu**, Zhichao Yu, Youpeng Cao, Chengcheng Zhong, Chunfa Liu, Jiao Yang, Wendi Zhang, Weng Fai Ip, **Hui Pan***. Dynamic evolution of high-valence metals in high-entropy systems enabling highly enhanced oxygen evolution reaction. *Journal of Energy Chemistry, 115,595-605* (2025). DOI: 10.1016/j.jechem.2025.12.008. [2024 IF=14.9]

Prof. Hui Pan is the corresponding author of this study. The first authors are Mr. Lun Li, Ph.D. student in the IAPME, and Dr. Di Liu, a post-doctoral fellow in the IAPME. This work was supported by the Science and Technology Development Fund from Macau SAR (FDCT) (0111/2022/A2, 0050/2023RIB2, 0023/2023/AFJ, 0002/2024/TFP, and 0087/2024/AFJ) and the Multi-Year Research Grants (MYRG-GRG2025-00007-IAPME and MYRG-GRG2024-00038-IAPME) from the Research & Development Office at the University of Macau. The DFT calculations were performed at the High Performance Computing Cluster (HPCC) of Information and Communication Technology Office (ICTO) at the University of Macau.

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IAPME Newsletter

ISSUE 72

4 February 2026

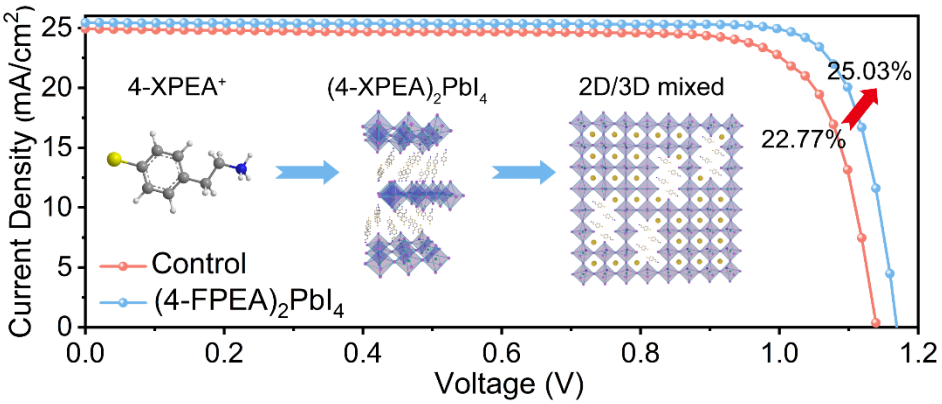
UM Research Team Studied Crystallization and energy level optimization by halide-substituted phenethylammonium based 2D perovskite additives for perovskite solar cells

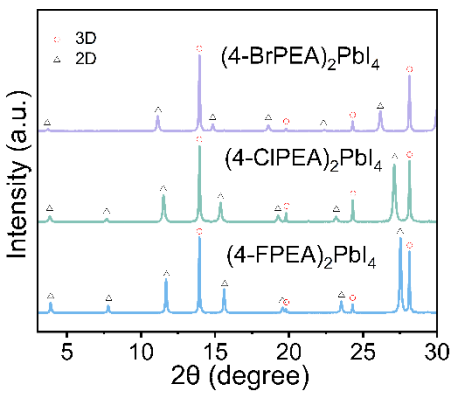
- Two-dimensional (2D) perovskites derived from phenethylammonium iodide (PEAI) and its halogenated derivatives are commonly employed as surface passivation layers in high performance perovskite solar cells. In contrast, their application as additives to the perovskite precursor, enabling a simpler, single-step incorporation, has been less extensively explored.
- The team investigated three halide-substituted PEAI derivatives as spacer cations for 2D perovskite additives in the precursor solution. Devices fabricated with 0.5 mol% $(4\text{-FPEA})_2PbI_4$ additive achieved a maximum power conversion efficiency (PCE) of 25.03 %, with an open-circuit voltage (V_{OC}) of 1.17 V and a fill factor (FF) of 84.37 %, with improvement in thermal, humidity, light and N2 storage stability.
- The research provides an understanding for the effect of 2D perovskites or the spacer cations on the 3D perovskite in additive engineering.

Mr. Ruifeng Zheng
(鄭瑞豐)

Dr. Shengwen Li
(李勝文)

Prof. Shi Chen
(陳石)





Ruifeng Zheng, **Shengwen Li***, Yulin Mao, Yulin Wang, Dongchen Qi, Hui Pan, Guichuan Xing, **Shi Chen***. Crystallization and energy level optimization by halide-substituted phenethylammonium based 2D perovskite additives for perovskite solar cells. *Chemical Engineering Journal*, 172435 (2025). DOI: 10.1016/j.cej.2025.172435. [2024 IF = 13.2]

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IAPME Newsletter

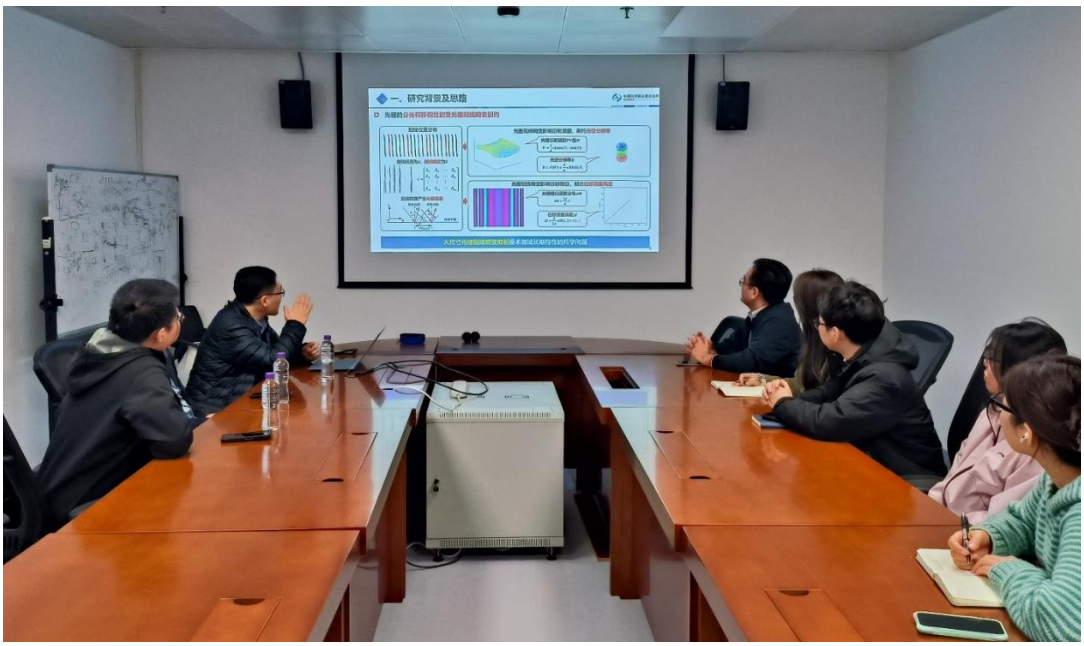
ISSUE 72

4 February 2026

❖ IAPME Seminar Series Features CIOMP Prof. Wenhao Li on High-Precision Large-Area Diffraction Gratings

On January 21, 2026, our Institute welcomed Prof. Wenhao Li (李文昊) from the Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP), Chinese Academy of Sciences (CAS), as part of the IAPME Seminar Series. The visit, initiated by Prof. Songnan Qu, included an impressive academic lecture on large-area, high-precision diffraction grating technologies.

Prof. Li is a distinguished researcher in optical engineering. He is the recipient of the Youth Science Fund (Class A) from the National Natural Science Foundation of China (NSFC) and serves as the Chief Scientist of a Key Research and Development Program under China's Ministry of Science and Technology. His academic contributions include over 100 publications in leading journals such as *Light: Science & Applications*, as well as more than 50 patents, including five U.S. patents. As first author, he has been recognized with several major honors, notably the First Prize for Technological Invention from the China Instrument and Control Society and the First Prize for Scientific and Technological Progress of Jilin Province.



During his lecture, Prof. Li provided students with a clear and engaging overview of the fundamental principles and historical development of diffraction gratings. He highlighted a series of original breakthroughs achieved by his research group in high-precision grating displacement measurement technologies and the design and fabrication of large-area, high-precision gratings. Prof. Li emphasized that the gratings produced by his team demonstrate significantly higher precision compared to the latest commercial products available globally, positioning their work at the forefront of advanced grating technology. He also introduced the capabilities and ongoing projects of the CIOMP Grating Center, one of China's leading platforms for large-scale precision optical fabrication.

Following the seminar, Prof. Qu briefed Prof. Li and his delegation on the development history of our Institute, as well as the current research areas of the institute's academic staff. Both parties engaged in constructive discussions on potential future cooperation, laying the groundwork for deeper collaboration in optical engineering and related technologies.

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IAPME Newsletter

ISSUE 72

4 February 2026

❖ IAPME Seminar Examines Multi-Scale Modeling for Electrochemical CO_2 Reduction

On January 21, 2026, addressing the global momentum toward sustainable energy solutions, our Institute hosted an academic seminar featuring Prof. Yaqiong Su (蘇亞瓊) of Xi'an Jiaotong University. His presentation, titled "*Multi-Scale Modeling of Electrochemical CO_2RR*", offered a deep exploration into the theoretical foundations and emerging insights of electrochemical carbon dioxide reduction. The session was chaired by Prof. Hui Pan and attracted a wide audience of researchers, institute members, and students.

Electrochemical CO_2 reduction (eCO_2RR) is widely regarded as a promising pathway for converting greenhouse gases into valuable fuels and chemical feedstocks. Despite its potential, many mechanistic questions—particularly those concerning the catalyst–electrolyte interface under operating conditions—remain insufficiently understood. Prof. Su, a leading scholar in theoretical chemistry and computational catalysis, addressed these challenges through rigorous multi-scale modeling approaches.

Prof. Su received his Master's degree from Xiamen University and his Ph.D. from Eindhoven University of Technology. He is currently a Distinguished Professor and Principal Investigator at the School of Chemistry, Xi'an Jiaotong University, with research spanning theoretical chemistry, computational catalysis, and spectroscopic electrochemistry.

During his talk, Prof. Su emphasized the complexity of dynamic interactions occurring at active catalytic sites during eCO_2RR.

> "While eCO_2RR holds immense promise, the dynamic interplay between active sites and the surrounding chemical environment under real reaction conditions has been elusive," he noted.

He demonstrated how constant-potential simulations and molecular dynamics modeling can uncover the evolution of active sites and clarify their influence on reaction efficiency. A central highlight of the presentation was his explanation of the "activity origin" of C_2+ products, which are essential for industrial-scale carbon utilization. Prof. Su identified intermediate CO coverage as a critical factor governing product selectivity—a finding that may guide the rational design of next-generation electrocatalysts.

The seminar also introduced an innovative coarse-grained modeling framework for evaluating how electrolyte mass transport affects electrochemical performance. Visualizations from Prof. Su's simulations vividly connected atomic-scale behavior with macroscopic catalytic outcomes, underscoring the value of integrated multi-scale computational strategies for advancing green chemistry.

A lively Q&A session concluded the event, with participants inquiring about potential applications in renewable energy storage, electrosynthesis, and industrial decarbonization. Reflecting on the seminar's significance, Prof. Pan remarked:

> "In an era of climate urgency, Prof. Su's work provides the theoretical backbone for practical innovations that could transform Macau's role in Asia's green economy."

The seminar not only offered valuable insights into frontier research on intelligent modeling of catalytic systems but also strengthened academic exchanges and opened pathways for future collaboration in sustainable materials and energy research.

❖ Upcoming Events

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UM 1981–2026
篤行致遠
奮進新程
Strive Forward and Achieve Beyond

IAPME Seminar

Cascade Relationships Among Karst Critical Zone Structure, Hydrological Processes and Ecological Functions and Their Implications for Ecological Restoration

6 February 2026

Prof. Xianli XU
Chinese Academy of Sciences
Venue: N23-1004b
Time: 10:30 – 11:30
Hosted by: Prof. Guoxing SUN

Abstract

Southwest China's karst region, characterized by a subtropical humid climate with abundant rainfall, suffers from severe vegetation degradation and rocky desertification due to shallow soils and highly fractured bedrock, which lead to rapid hydrological processes and extremely low water-holding capacity—hindering sustainable socio-economic development. Based on long-term field observations and critical zone ecohydrological modeling, this study reveals a cascade relationship among the physical structure, hydrological processes, and ecological functions of the karst critical zone. Findings show that the unique subsurface structure promotes rapid water leakage, resulting in less plant-available water and generally poorer vegetation growth compared to non-karst areas. Accordingly, we propose a scientific restoration strategy: "restructure–regulate–enhance"—emphasizing that ecological restoration should go beyond increasing vegetation cover and instead optimize species selection based on plant hydraulic traits, while leveraging vegetation recovery to improve soil quality and thickness. This integrated approach enhances the critical zone's capacity for water retention and soil conservation, supporting watershed-scale ecological restoration and high-quality development.

Biography

Prof. Xianli XU is a researcher, Doctoral Supervisor, Director of the Department of Science and Technology Management and Planning at the Institute of Subtropical Agriculture, Chinese Academy of Sciences With long-term research focus on eco-hydrology and soil and water conservation, landscape ecology and ecological restoration, he has presided over more than 10 important projects including the National Key R&D Program and key projects of the National Natural Science Foundation of China, published over 100 academic papers, and won the First Prize of Science and Technology Award of the Soil and Water Conservation Society of China (ranked first). He has also been honored with the "Zhu Liyuehua Excellent Teacher Award" of the University of the Chinese Academy of Sciences, "Excellent Graduate Supervisor of Guangzhou Education Base" of the Guangzhou Branch of the Chinese Academy of Sciences, Expert with Special Government Allowance of the State Council, Talent Program of the Chinese Academy of Sciences, and Leading Talent in Scientific and Technological Innovation of Hunan Province.

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Strive Forward and Achieve Beyond

IAPME Seminar

New Technologies and Ideas for Ecological Restoration in South China

6 February 2026

Prof. Mingguo ZHENG
Guangdong Academy of Sciences

Venue: N23-1004b
Time: 11:30 – 12:30
Hosted by: Prof. Guoxing SUN

Abstract

Ecological restoration constitutes a vital component of ecological civilization construction in China. Existing ecological restoration technologies generally rely on engineering measures, which are characterized by large construction volumes, high costs and significant environmental disturbance. Taking South China as the research area, this study has developed a series of low-cost green technologies, mainly including gully erosion control, ecological restoration of historically abandoned rare earth mines, and vegetation restoration on high and steep rocky slopes.This lecture consists of three parts: ecological restoration of soil underlying surfaces – flexible soil and water conservation technologies and their applications; ecological restoration of rocky underlying surfaces; and the development of soil-based nutrient soil and its implications for geological disaster prevention and control.

Biography

Prof. Mingguo ZHENG is a researcher at the Institute of Eco-Environmental and Soil Sciences, Guangdong Academy of Sciences. His research focuses on soil and water conservation and ecological restoration, remote sensing information extraction, soil improvement and degraded land remediation, vegetation restoration in harsh sites, as well as soil and ecosystem carbon sequestration. He has a long-standing research experience in soil and water processes and their associated environmental issues. Recently, his research mainly centers on the remediation of collapsing gullies and eroded degraded land in southern China, vegetation restoration and soil carbon pool responses in red soil regions, ecological restoration of historically abandoned mines, and resource utilization of industrial solid waste. He serves as a member of the Soil Erosion Professional Committee, Collapsing Gully Control Professional Committee and Engineering Greening Professional Committee of the Chinese Society of Soil and Water Conservation, and also a member of the Hydrology and Sediment Professional Committee of the Chinese Society of Hydropower Engineering. He has won the Second Prize of Science and Technology Progress Award of the Chinese Society of Soil and Water Conservation and the First Prize of Surveying and Mapping Science and Technology Progress Award, among other honors. He has published more than 40 SCI-indexed papers, presided over 4 General Program projects of the National Natural Science Foundation of China and 1 Guangdong Provincial Local Standard project, and compiled a number of consulting reports for the Guangdong Provincial Government.

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