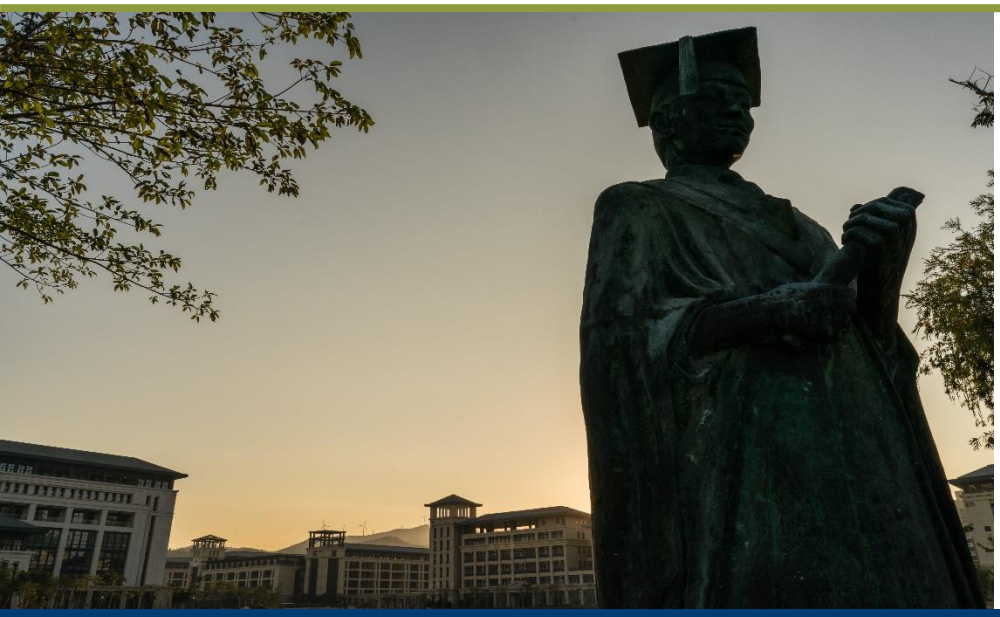
澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

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

https://iapme.um.edu.mo/



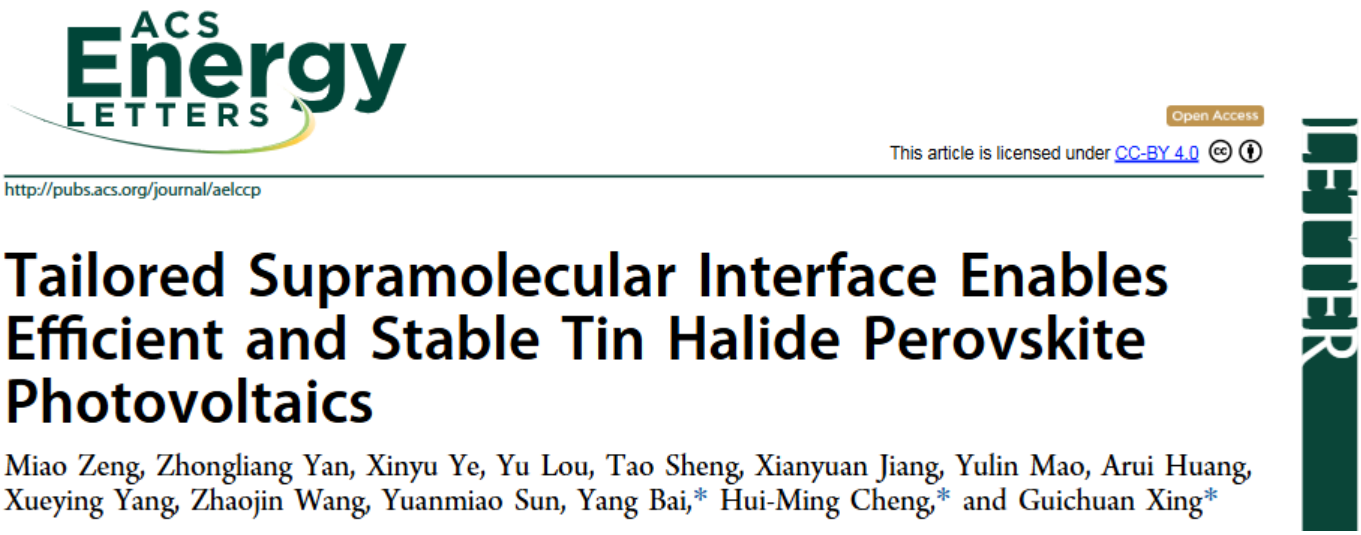
ISSUE 25

12 March 2025

✧ Content

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

1. **Miao Zeng,** Zhongliang Yan, Xinyu Ye, Yu Lou, Tao Sheng, Xianyuan Jiang, Yulin Mao, Arui Huang, Xueying Yang, Zhaojin Wang, Yuanmiao Sun, Yang Bai*, Hui-Ming Cheng*, **Guichuan Xing***. Tailored Supramolecular Interface Enables Efficient and Stable Tin Halide Perovskite Photovoltaics. *ACS Energy Letters,* 10, 1357-1365 (2025). DOI:10.1021/acsenergylett.5c00034. [2023 IF=19.5]



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

ISSUE 25

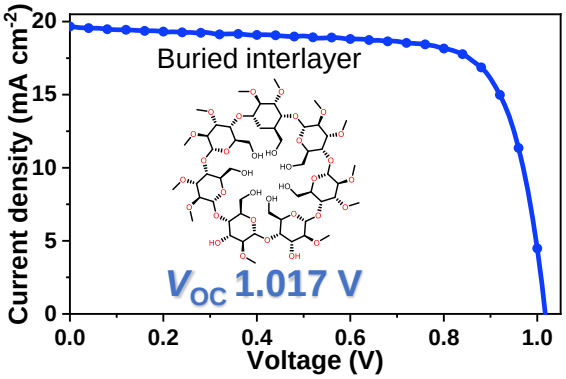
12 March 2025

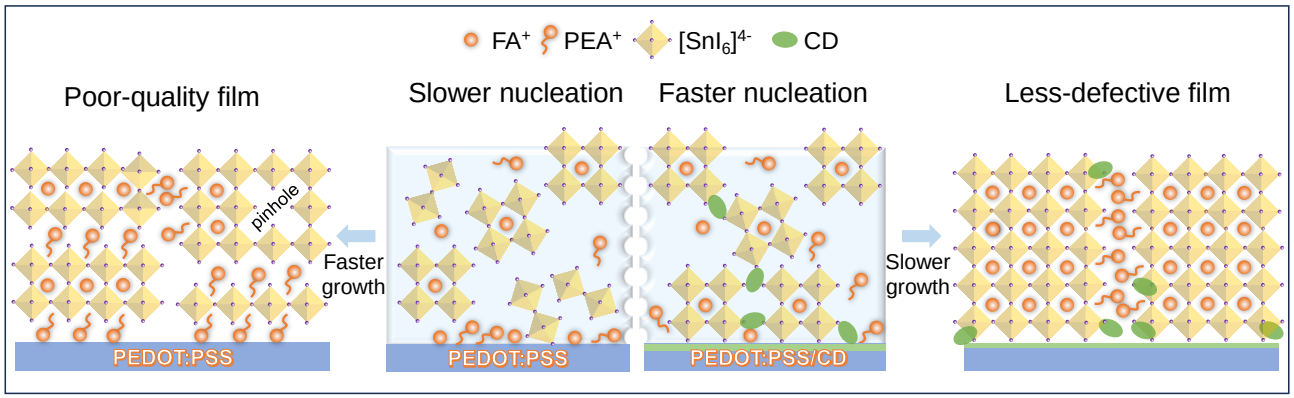
❖ Research Stories

UM research team developed Supramolecular Interface Enables Efficient and Stable tin PSCs

- Tin perovskite has received considerable attention in recent years due to its heavy-metal-free character and ideal light-harvesting materials. However, the quality of tin-based perovskite films is afflicted by the adverse crystallization process of slow nucleation and rapid growth.
- The team introduce the 3D polydentate methyl-β-cyclodextrin interface to achieve effective crystallization regulation. The tin perovskite solar cell (PSC) with such supramolecular interlayer achieve an efficiency of 14.94%, with a new record V_{OC} of up to 1.017 V. The unencapsulated device also presents an outstanding stability to maintain approximately 100% after nearly 4000 h storage.
- This work not only offers a facile and sustainable strategy to address the crystallization of tin perovskites, but also draws new attention to the biocompatible supramolecule and buried interactions in efficient, low-toxicity tin-containing perovskite optoelectronics.

Ms. Miao Zeng and Prof. Guichuan Xing
(曾苗) (邢貴川)





Miao Zeng, Zhongliang Yan, Xinyu Ye, Yu Lou, Tao Sheng, Xianyuan Jiang, Yulin Mao, Arui Huang, Xueying Yang, Zhaojin Wang, Yuanmiao Sun, Yang Bai*, Hui-Ming Cheng*, **Guichuan Xing***. Tailored Supramolecular Interface Enables Efficient and Stable Tin Halide Perovskite Photovoltaics. *ACS Energy Letters*, 10, 1357-1365 (2025). DOI:10.1021/acsenergylett.5c00034. [2023 IF=19.5]

This work was supported by National Natural Science Foundation of China (52302333), Guangdong Basic and Applied Basic Research Foundation (2023A1515012788) and Shenzhen Science and Technology Program (KQTD20221101093647058, KJZD20231025152759001). The authors acknowledge the Science and Technology Development Fund, Macao SAR (File no. FDCT-0082/2021/A2, 0010/2022/AMJ, 0060/2023/RIA1, 0136/2022/A3, 006/2022/ALC, 0122/2024/AMJ, EF044/IAPME-HG/2022/MUST), UM's research fund (File no. MYRG2022-00241-IAPME, MYRG-GRG2023-00065-IAPME-UMDF, MYRG-CRG2022-00009-FHS), the research fund from Wuyi University (EF38/IAPME-XGC/2022/WYU), and the Natural Science Foundation of China (61935017, 62175268, 62288102, 22405010).

❖ Visits

Invited by Professor Hui Pan, Prof. Qing Guo (郭慶) from Xi'an Jiaotong University, visited IAPME from 24 to 26 February 2025. Prof. Guo received her Bachelor Degree in LanZhou University in 2014, and Ph.D. in Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, under the guidance of Academician Li-Zhu Wu in 2019.

Currently, Prof. Guo is an Assistant Professor of the School of Chemistry at Xi'an Jiaotong University. She hosted and participated in several National Natural Science Foundation of China. Her achievements include the publication papers in scientific literature, including Chem, Angew. Chem. Int. Ed., ACS Catal., J. Mater. Chem. A, and so on. Her research interests are primarily in solar-light-driven redox reactions based on II-VA semiconductor nanocrystals and halide perovskite, including H2 evolution, CO2 reduction and organic synthesis.

Prof. Guo delivered a seminar titled “Current research on fine structure regulation of semiconductors towards artificial photosynthesis”. Her talk focused on semiconductor materials that convert H_2O and CO_2 into high-value chemicals and solar fuels through artificial photosynthesis. The key challenges in semiconductor-based artificial photosynthesis systems are few active sites and sluggish charge-carrier dynamics, which lead to low efficiency and selectivity. By finely regulating the material structure, introducing catalytic active sites, and promoting charge-carrier dynamics, she has achieved efficient and highly selective conversion of solar energy into chemical energy. In the Q&A session, Prof. Guo had a zealous interaction with the audience.

During the visit, Prof. Guo had a lab tour of IAPME. She had close discussions with some professors and PhD students. She expressed a deep impression on IAPME’s research facility and achievements.