澳門大學
UNIVERSIDADE DE MACAU
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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

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

1. **Shengwen Li**, Hao Gu, Annan Zhu, Jia Guo, Chenpeng Xi, Xiaosong Qiu, Ying Chen, Hui Pan, Jiangzhao Chen*, **Guichuan Xing***, **Shi Chen***. Anion-Cation Synergistic Regulation of Low-Dimensional Perovskite Passivation Layer for Perovskite Solar Cells. *Advanced Materials,* 2500988 (2025). DOI: 10.1002/adma.202500988. [2023 IF = 27.4]


ADVANCED MATERIALS

Research Article | Open Access

Anion-Cation Synergistic Regulation of Low-Dimensional Perovskite Passivation Layer for Perovskite Solar Cells

Shengwen Li, Hao Gu, Annan Zhu, Jia Guo, Chenpeng Xi, Xiaosong Qiu, Ying Chen, Hui Pan, Jiangzhao Chen, Guichuan Xing, Shi Chen

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❖ Research Stories

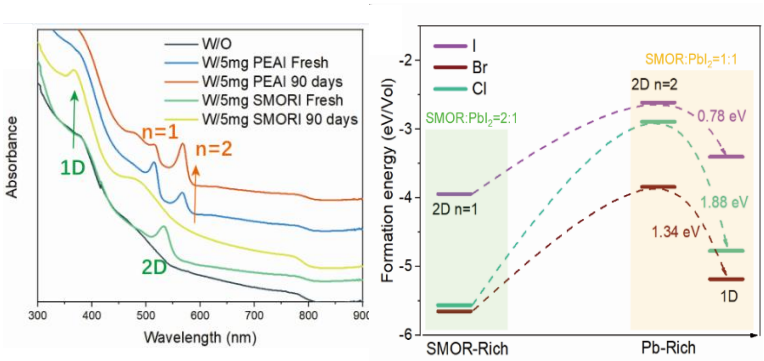
UM research team developed a Low-dimensional perovskite passivation layer by anion-cation synergistic regulation for PSCs

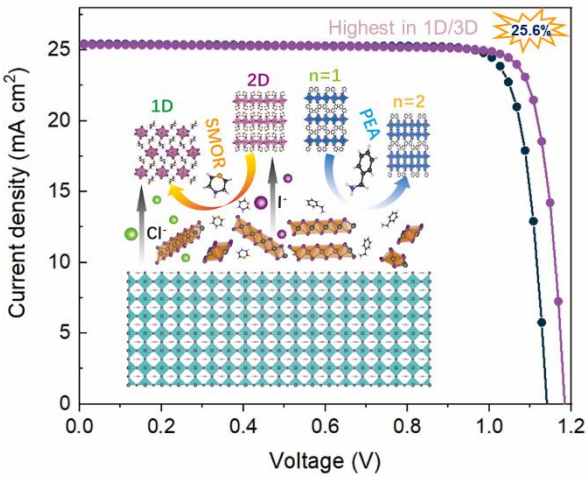
- Mixing 2D and 3D perovskites together is an effective strategy to enhance the stability of perovskite solar cells. However, during the preparation process, the in-situ intercalation reaction does not stop after the formation of the 2D layer. The gradual migration of the 2D spacer to the 3D bulk leads to an increase in the n value of the 2D phase and deviates from the optimized structural design.
- The team constructed a heteroatom ammonium ligand, thiomorpholine (SMOR), which effectively passivates the perovskite surface and forms either a 1D phase or a 2D phase depending on the cation-anion ratio and anion type. The passivation of SMOR-based 1D perovskite boosts the device efficiency to 25.6% (certified 24.7%). More importantly, the unpackaged device can maintain >80% of its initial efficiency after stable operation at 85 °C for 1000 h.
- This work provides an optimization of perovskite crystal growth and interface properties by precisely controlling the anions and cations in the passivation layer, thereby improving the charge transfer efficiency and the overall performance of the battery.

Dr. Shengwen Li (李勝文)

Prof. Guichuan Xing (邢貴川)

Prof. Shi Chen (陳石)





Shengwen Li, Hao Gu, Annan Zhu, Jia Guo, Chenpeng Xi, Xiaosong Qiu, Ying Chen, Hui Pan, Jiangzhao Chen*, **Guichuan Xing***, **Shi Chen***. Anion-Cation Synergistic Regulation of Low-Dimensional Perovskite Passivation Layer for Perovskite Solar Cells. *Advanced Materials,* 2500988 (2025). DOI: 10.1002/adma.202500988. [2023 IF = 27.4]

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❖ Ph.D. Student Thesis Oral Defenses

Xiangyue Cui of Prof. Yongqing Cai's group presented "Unraveling Phononic Properties of Tellurium-Based Nanostructures via First-Principles Calculations" in her oral defence on May 13, 2025.

Congratulations to Dr. Xiangyue Cui!

(from left) Prof. Haifeng Li (李海峰), Prof. Shi Chen (陳石), Dr. Xiangyue Cui (崔湘粵), Prof. Yongqing Cai (蔡永青), Prof. Shengyuan Yang (楊聲遠) and Prof. Jian Liu (劉劍, PKU)

❖ IAPME Master Student Graduation Banquet 2025

The Institute of Applied Physics and Materials Engineering (IAPME) hosted its very first Master Student Graduation Banquet on May 15, 2025, to honor the accomplishments of the graduating students. The event welcomed 13 academic and administrative staff members, and the graduating cohort for an evening of celebration and reflection.

Prof. Wei Ge, the Interim Director of IAPME, started the banquet with an inspiring speech addressing career development in the age of artificial intelligence. He highlighted the transformative potential of AI and encouraged graduates to proactively integrate AI-driven tools into their professional growth, urging them to seek opportunities where technology and human ingenuity intersect.

The ceremony featured the presentation of awards to exceptional students. Xin Xu (徐鑫) and Yangsen Xu (許洋森) received the Excellent Master Awards for attaining the highest academic performance in their cohort, while Hongyi Chen (陳鴻毅) was honored with the Best Research Award for demonstrating remarkable progress and innovation in their research endeavors.

(from left) Xin Xu and Prof. Wei Ge

(from left) Yangsen Xu and Prof. Hui Pan

(from left) Hongyi Chen and Prof. Handong Sun

Following the formal proceedings, attendees gathered for a group photograph, after which professors and staff engaged with students in candid conversations. These discussions explored the challenges students overcame during their studies and their aspirations for the future, deepening connections within the IAPME community.

The evening concluded with heartfelt congratulations to the graduates and appreciation for all who contributed to the event's success.

❖ Delegation from Shanghai University Visited IAPME

A delegation from Shanghai University (SHU), led by Prof. Yong Wang (王勇), Executive Dean of ULisboa School, Shanghai University, having a meeting with members of the Institute of Applied Physics and Materials Engineering (IAPME) on May 13, 2025. Prof. Hui Pan and Prof. Huaiyu Shao from IAPME, participated in the discussion.

During the visit, Prof. Pan introduced IAPME with details of research capabilities, major directions, recent outputs, and ongoing projects in advanced materials and related applications. The delegation also introduced their current development and shared points of view on related research works. Both parties have a thorough discussion on research insights, collaborations in potential areas, including student cultivation and exchanges, wish further collaboration will be carried out.