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INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING

IAPME Newsletter

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ISSUE 50

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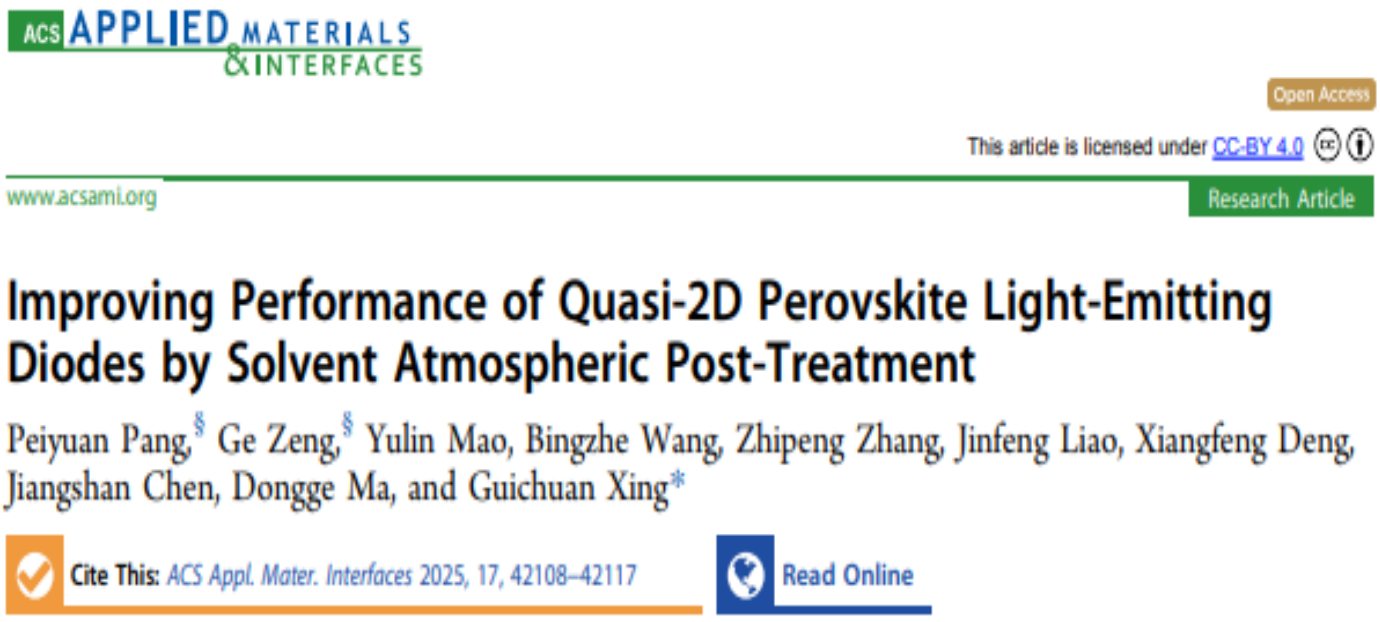
✧ Content

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

1. **Peiyuan Pang**, Ge Zeng, Yulin Mao, Bingzhe Wang, Zhipeng Zhang, Jinfeng Liao, Xiangfeng Deng, Jiangshan Chen, Dongge Ma and **Guichuan Xing***. Improving Performance of Quasi-2D Perovskite Light-Emitting Diodes by Solvent Atmospheric Post-Treatment. *ACS Applied Materials & Interfaces,* 17.29: 42108-42117 (2025). DOI: 10.1021/acsami.5c08632. [2024 IF=8.2]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www.acsami.org

Research Article

Improving Performance of Quasi-2D Perovskite Light-Emitting Diodes by Solvent Atmospheric Post-Treatment

Peiyuan Pang,§ Ge Zeng,§ Yulin Mao, Bingzhe Wang, Zhipeng Zhang, Jinfeng Liao, Xiangfeng Deng, Jiangshan Chen, Dongge Ma, and Guichuan Xing*

Cite This: *ACS Appl. Mater. Interfaces* 2025, 17, 42108−42117

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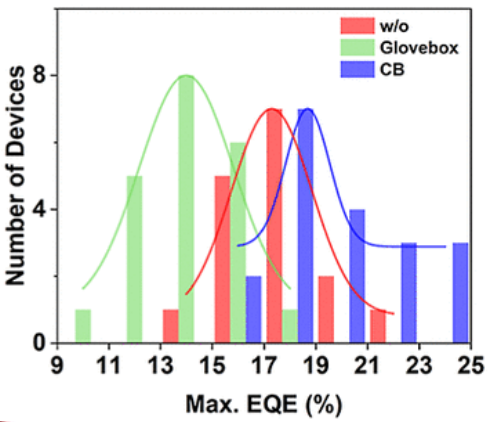
❖ Research Stories

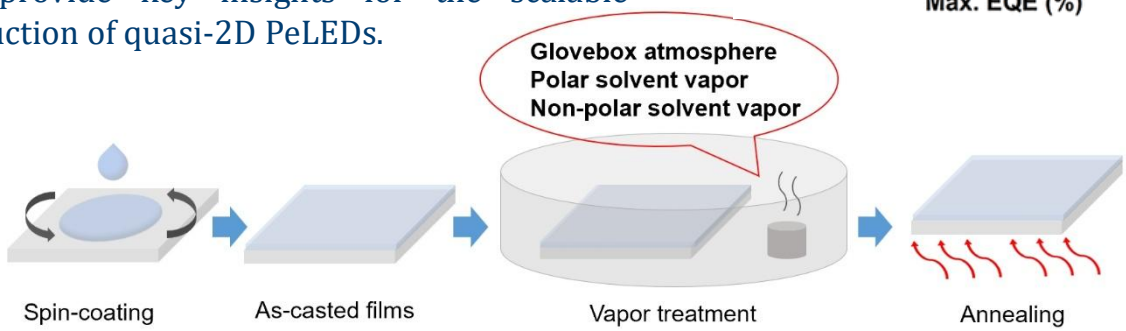
UM research team proposed a vapor treatment strategy to enhance the performance of perovskite LEDs.

- Perovskite light-emitting diodes (PeLEDs) have achieved remarkable progress in recent years, with green-emitting PeLEDs now exhibiting external quantum efficiencies (EQEs) exceeding 30%, rivaling those of organic light-emitting diodes (OLEDs). While quasi-2D perovskite structures have emerged as a promising strategy for high-efficiency PeLEDs — owing to their enhanced exciton binding energies and charge carrier confinement — their phase distribution remains a critical yet challenging factor governing device performance.
- The team demonstrate that the phase distribution in quasi-2D perovskite films is highly sensitive to the solvent atmosphere during annealing. By employing nonpolar solvent vapor post-treatment, they achieve enhanced radiative recombination efficiency, yielding PeLEDs with a maximum EQE of 24.27%. Thses findings highlight a previously overlooked aspect of perovskite film fabrication and provide key insights for the scalable production of quasi-2D PeLEDs.

Mr. Peiyuan Pang
(龐培元)

Prof. Guichuan Xing
(邢貴川)





Peiyuan Pang, Ge Zeng, Yulin Mao, Bingzhe Wang, Zhipeng Zhang, Jinfeng Liao, Xiangfeng Deng, Jiangshan Chen, Dongge Ma and **Guichuan Xing***. Improving Performance of Quasi-2D Perovskite Light-Emitting Diodes by Solvent Atmospheric Post-Treatment. *ACS Applied Materials & Interfaces,* 17.29: 42108-42117 (2025). DOI: 10.1021/acsami.5c08632. [2024 IF=8.2]

Prof. Guichuan Xing is the corresponding author of this study. The first author is Mr. Peiyuan Pang, who is a doctoral student in IAPME from 2021. This work was supported by the Science and Technology Development Fund, Macao SAR (file no. 0010/2022/AMJ, 0060/2023/RIA1, 0148/2024/RIA2, 0136/2022/A3, 0122/2024/AMJ, 006/2022/ALC), UM's research fund (file no. MYRG-GRG2023-00065-IAPME-UMDF, MYRG-GRG2024-00156-IAPME), and the Natural Science Foundation of China (62175268, 62288102, 22405010).

❖ Chinese Academy of Sciences Delegation Visits IAPME

A delegation from the Bureau of Major Science and Technology Programs, Chinese Academy of Sciences (CAS), led by Academician Junqiang Zhu (Director, 朱俊強), visited our institute on August 28, 2025.

During the visit, Prof. Songnan Qu presented an overview of the institute's development and research focus. Prof. Shuangpeng Wang and Prof. Qu further showcased the institute's recent achievements in several key areas, including high-efficiency low-cost electrolytic water hydrogen production, optoelectronic and energy storage devices, carbon dot based biomaterials, and foam concrete materials.

Academician Zhu expressed strong appreciation for the research outcomes and emphasized the importance of fostering collaboration between professors at our institute and various institutes under the Chinese Academy of Sciences.

The visit highlighted the potential for future joint efforts in advancing cutting-edge scientific research and technological applications.

❖ Upcoming Events

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IAPME Seminar

Electric-field Control of Spin in Ferroelectric vdW Heterostructures

5 September 2025

Prof. Junling WANG
City University of Hong Kong
Venue: N23-3022
Time: 14:30 - 15:30
Hosted by: Prof. Yongqing CAI

Abstract

Multiferroic materials, such as $BiFeO_3$, allow for the electric-field control of magnetization because of their magnetoelectric coupling effect. They have been studied extensively for the rich underlying physics and potential applications in spintronic devices. However, research on conventional multiferroic materials have encountered serious obstacles, e.g., small coupling coefficients of Type-I multiferroics and low temperature/high conductivity of Type-II multiferroics. Recent developments on 2D ferroelectric materials open a new paradigm in the field. Their unique layered structure allows for the coexistence of switchable polarization and high conductivity, even superconductivity. In this talk, I will discuss the unique properties of 2D ferroelectric materials and the opportunities they brought in term of electric-field control of spin and magnetization.

Biography

Prof. Junling WANG obtained his B.S. degree from Nanjing University in 1999, and Ph.D. degree from University of Maryland, College Park in 2005. After a short postdoc training at PennState University, he joined Nanyang Technological University as an Assistant Professor in 2006. He was promoted to Associate Professor with tenure in 2011 and Full Professor in 2017. In 2024, he joined City University of Hong Kong (CityU) as a Chair Professor in Physics. Prof. Wang's research activities focus on multiferroic materials. His pioneering work on $BiFeO_3$ thin films has attracted much attention in the field. His recent interests also include 2D vdW materials that possess ferroelectric and/or magnetic properties. Through materials processing, structural and electrical/magnetic characterizations, he strives to understand the fundamental physics of multiferroic materials at low dimensions and develop new materials/devices for the next generation electronics and spintronics. He has published over 170 papers in high impact journals, including Science, Science Advances, Nature Materials and Nature Communications. His work has been cited more than 20700 times with an H-index of 59 (google scholar).

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