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應用物理及材料工程研究院
INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
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IAPME Newsletter

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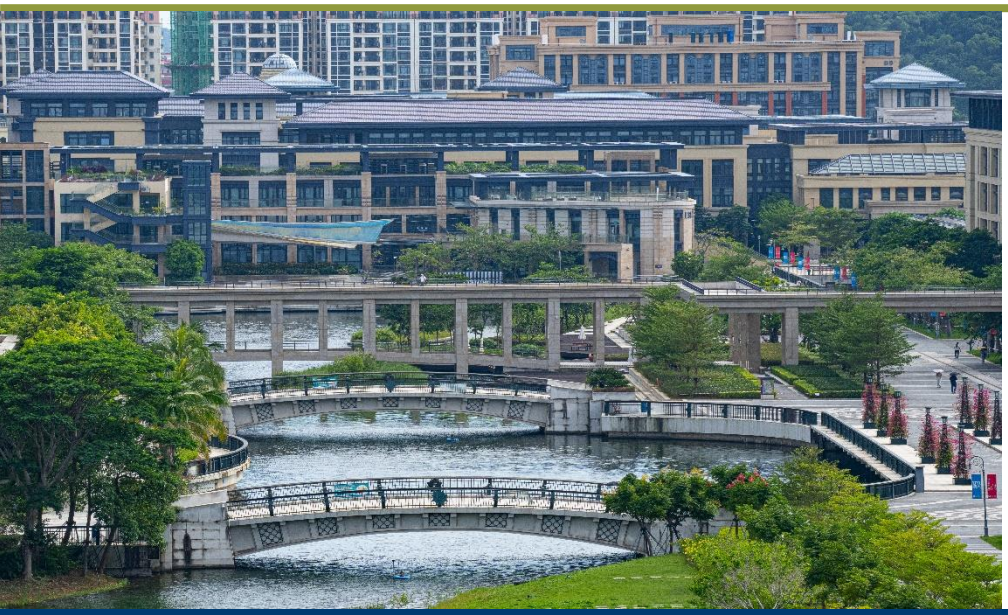

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21 May 2025

✧ Content

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

1. **Lingyun Li**, Jun Wu, Xue Wu, Zhenjian Li, Xianming Zhang, Zekun Yan, Yingqi Liang, Caishi Huang, **Songnan Qu*.** Carbon Dot-Linked Hydrogel for TAMs Transform: Spatiotemporal Manipulation to Reshape Tumor Microenvironment. Advanced Materials, 2420068 (2025). DOI: 10.1002/adma.202420068. [2023 IF=27.4]

RESEARCH ARTICLE

ADVANCED MATERIALS
www.advmat.de

Carbon Dot-Linked Hydrogel for TAMs Transform: Spatiotemporal Manipulation to Reshape Tumor Microenvironment

*Lingyun Li, Jun Wu, Xue Wu, Zhenjian Li, Xianming Zhang, Zekun Yan, Yingqi Liang, Caishi Huang, and Songnan Qu**

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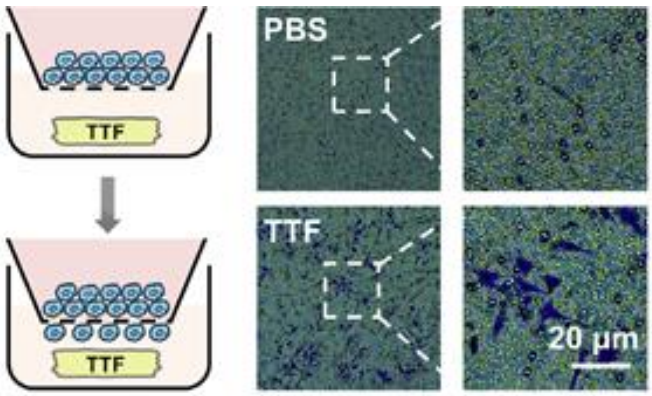
❖ Research Stories

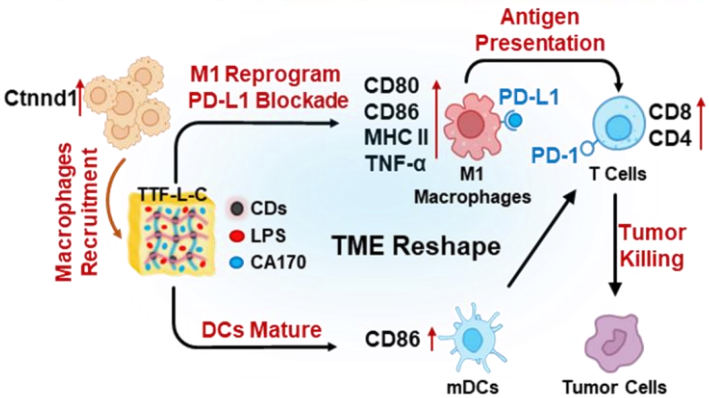
UM research team developed a carbon dot-linked hydrogel for TAMs spatiotemporal transform to reshape tumor microenvironment

- An injectable CDs-linked egg white hydrogel (TTF) was prepared via a thermally induced gelation process, in which the CDs can significantly promote macrophage migration. Loading with LPS and CA170 (TTF-L-C) can realize cascade spatiotemporal TAMs transformation to reshape TME.
- At the spatial level, TTF released CDs to induce macrophage directional migration through upregulating the macrophage migration-associated gene Ctnnd1 along with activating the Wnt/Ctnnd1/Myc pathway to enrich macrophages.
- At the cellular level, LPS reprogrammed macrophages into M1 phenotype.
- At the molecular level, CA170 blocked immune checkpoint PD-L1 expressed on the macrophage surface.
- As TTF-L-C degraded, the transformed M1-like macrophages were infiltrated into the tumor and boosted T cell activation, as well as improved dendritic cells (DCs) mature. With the activation of multiple immune cells, TTF-L-C achieved TME reshape and inhibited tumor growth and recurrence.

Lingyun Li
(李凌云)

Prof. Songnan Qu
(曲松楠)





Lingyun Li, Jun Wu, Xue Wu, Zhenjian Li, Xianming Zhang, Zekun Yan, Yingqi Liang, Caishi Huang, **Songnan Qu***. Carbon Dot-Linked Hydrogel for TAMs Transform: Spatiotemporal Manipulation to Reshape Tumor Microenvironment. Advanced Materials, 2420068 (2025).
DOI: 10.1002/adma.202420068. [2023 IF=27.4]

Prof Songnan Qu is the corresponding author of this study. The first author is Lingyun Li, a PhD student in IAPME. This work was supported by the Science and Technology Development Fund of Macau SAR (0007/2021/AKP, 0002/2024/TFP, 0139/2022/A3), University of Macau-Dr. Stanley Ho Medical Development Foundation "Set Sail for New Horizons, Create the Future" Grant 2025, the Shenzhen-Hong Kong-Macao Science and Technology Innovation Project (category C) SGDX20210823103803021, and University of Macau-Huafa Group Joint Laboratory (HF-001-2021).

❖ Ph.D. Student Thesis Oral Defenses

Zian Xu of Prof. Shi Chen's group presented "Electronic Structure Regulation of Atomic Metal-Doped Carbon Materials for High-Performance Electrocatalysis" in his oral defence on 9 May 2025.

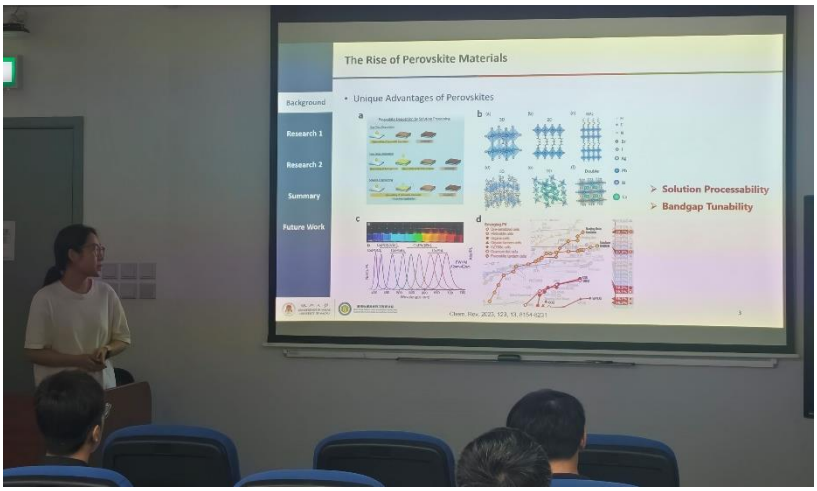
Congratulations to Dr. Zian Xu!

(from left) Prof. Kwun Nam Hui (許冠南), Prof. Huaiyu Shao (邵懷宇), Prof. Shi Chen (陳石), Dr. Zian Xu (徐子安), Prof. Guichuan Xing (邢貴川), Prof. Hsing-Lin Wang (王湘麟, SUSTech) and Prof. Yi-Yang Sun (孫宜陽, SICCAS)

❖ IAPME Student Seminar Series 2025 (2nd Round)

The Institute of Applied Physics and Materials Engineering organized the **IAPME Student Seminar Series 2025 - 2nd Round** on April 23, 2025. The event showcased innovative research conducted by our graduate students. Five PhD students presented their research findings to an audience of over 20 students and academic staff members.

Zhongheng Li (李中恒) studied the dissolution mechanism for aqueous dendrite-free Zinc-Ion batteries, followed by Yuanzhe Liang's (梁遠哲) work on flexible magnetized sensors with three-dimensional artificial structures. Chunfa Liu (劉春發) fabricated transition metal compound electrodes for industrial electrolysis of water, while Yinan Liu (劉奕男) demonstrated multifunctional interface engineering of Li13Si4 alloy additives for advanced Si-based anode pre-lithiation. Yulin Mao (毛玉麟) concluded with probing and tailoring the carrier dynamics in metal-halide perovskite. The event highlighted the institute's interdisciplinary focus on solving pressing challenges in energy, electronics, and functional materials.



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