

澳門大學 UNIVERSIDADE DE MACAU UNIVERSITY OF MACAU





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# 23 October 2024

# ♦ Content

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# Publications (IF≥10; \*corresponding author)

- Jun Wu, Josh Haipeng Lei, Moxin Li, Aiping Zhang, Yuan Li, Xiao Liang, Senio Campos de Souza, Zhen Yuan, Chunming Wang, Guokai Chen, Tzu-Ming Liu\*, Chu-Xia Deng\*, Zikang Tang\*, and Songnan Qu\*. Carbon Dots Crosslinked Egg White Hydrogel for Tissue Engineering. *Advanced Science*, 2404702 (2024). DOI:10.1002/advs.202404702. [2023 IF=14.3]
- 2. Jinxian Feng, Chunfa Liu, Lulu Qiao, Keyu An, Sen Lin, Weng Fai Ip, and Hui Pan\*. Electrolyte-Assisted Structure Reconstruction Optimization of Sn-Zn Hybrid Oxide Boosts the Electrochemical CO2-to-HCOO– Conversion. *Advanced Science*, 2407019 (2024). DOI:10.1002/advs.202407019. [2023 IF=14.3]



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# Research Stories

#### UM research team successfully develops carbon dots crosslinked egg white hydrogel for tissue engineering application

- A CDs crosslinked chicken egg white hydrogel (CEWH) scaffold was synthesized, exhibiting a lower-density and stretchable network structure. The introduction of CDs as cross-linkers promotes the unfolding and connection of protein peptide chains. Our work presents an effective approach for developing proteins-based hydrogels.
- The lower-density structure of the CEWH scaffold facilitates the continuous ingrowth of inflammatory cells in vivo. This allows for constant regulation of the immune microenvironment at the implantation area. Besides, the CDs cross-linking strategy extends in vivo degradation period of material, aligning with hair follicles regeneration cycle.
- As a result, CEWH induces the aggregation of M2 macrophages, allowing hair follicles to re-enter growth phase from resting phase. Further, promoted skin restoration by CEWH also verified.



Dr. Jun Wu



(from left) Prof. Zikang Tang and Prof. Songnan Qu



Jun Wu, Josh Haipeng Lei, Moxin Li, Aiping Zhang, Yuan Li, Xiao Liang, Senio Campos de Souza, Zhen Yuan, Chunming Wang, Guokai Chen, Tzu-Ming Liu\*, Chu-Xia Deng\*, **Zikang Tang**\*, and **Songnan Qu**\*. Carbon Dots Crosslinked Egg White Hydrogel for Tissue Engineering. *Advanced Science*, 2404702 (2024). DOI:10.1002/advs.202404702. [2023 IF=14.3]

Prof Songnan Qu (UM-IAPME), Prof Zikang Tang (UM-IAPME), Prof Chu-Xia Deng (UM-FHS) and Prof Tzu-Ming Liu (UM-FHS) are the corresponding authors of this study. The first authors are Jun Wu (UM-IAPME), Haipeng Lei (UM-FHS), and Moxin Li (UM-FHS). This project was funded by Science and Technology Development Fund of Macau SAR (0139/2022/A3, 0128/2020/A3, 0131/2020/A3, 0007/2021/AKP, 006/2022/ALC, 0002/2021/AKP and 0120/2020/A3), FDCT Funding Scheme for Postdoctoral Researchers 2021 (0037/2021/APD), University of Macau (MYRG2020-00164-IAPME, MYRG-CRG2022-00009-FHS and MYRG-GRG2023-00053-FHS-UMDF), the Research and Development Grant for Chair Professor Fund from the University of Macau (CPG2020-00026-IAPME), Shenzhen-Hong Kong-Macao Science and Technology Innovation Project (Category C) SGDX20210823103803021.



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# Research Stories

#### UM research team developed strategy of reconstruction optimization by tuning electrolyte for CO2 reduction

- Reconstructions of Cu-incorporated Sn-Zn oxide in different electrolyte (KHCO<sub>3</sub>, NaHCO<sub>3</sub> and  $K_2SO_4$ ) and the mechanism of CO<sub>2</sub>-to-formate conversion improvement are investigated.
- The Cu-incorporated Sn-Zn oxide was fabricated by facial Sn-Zn hybrid oxide enables excellent  $\rm CO_2$ -to-HCOO<sup>-</sup> conversion in KHCO<sub>3</sub> with a HCOO<sup>-</sup> Faraday efficiency ~89%, a yield rate ~0.58 mmol cm<sup>-2</sup> h<sup>-1</sup> and a stability up to ~ 60 hours.
- Sn-SnO<sub>2</sub>/ZnO, ZnO encapsulated Sn-SnO<sub>2</sub>/ZnO, and Sn-SnO<sub>2</sub>/Zn-ZnO are reconstructed in KHCO<sub>3</sub>, NaHCO<sub>3</sub> and K<sub>2</sub>SO<sub>4</sub>, respectively through element dissolution and redeposition.
- The KHCO<sub>3</sub> and NaHCO<sub>3</sub> introduce oxygen vacancy and the K<sub>2</sub>SO<sub>4</sub> triggers Zn<sup>0</sup> formation in the reconstructed structures.
- The  $KHCO_3$  makes the increased positive charge on the Zn and Sn sites of Sn-SnO<sub>2</sub>/ZnO.
- The reconstructed Sn-SnO<sub>2</sub>/ZnO • enhances the charge transportation, promote the CO<sub>2</sub> adsorption and the adsorption optimize configuration, accumulate the enhancing protons bv water adsorption/cleavage and limit the hydrogen evolution.





Dr. Jinxian Feng

Prof. Hui Pan



Formate Faraday efficiencies in different electrolyte.



Scheme of reconstructions in different electrolyte.

**Jinxian Feng**, Chunfa Liu, Lulu Qiao, Keyu An, Sen Lin, Weng Fai Ip, and **Hui Pan\***. Electrolyte-Assisted Structure Reconstruction Optimization of Sn-Zn Hybrid Oxide Boosts the Electrochemical CO2-to-HCOO–

Conversion. *Advanced Science*, 2407019 (2024). DOI:10.1002/advs.202407019. [2023 IF=14.3] Prof. Hui Pan is the corresponding author of this study. The first author is Dr. Jinxian Feng, who got PhD from IAPME. Dr. Feng is supported by the UM Postdoctoral Fellow (UMPF) scheme. This work was supported by the Science and Technology Development Fund (FDCT) from Macau SAR (0050/2023/RIB2, 0023/2023/AFJ, 006/2022/ALC, and 0111/2022/A2), Multi-Year Research Grants (MYRG-GRG2023-00010-IAPME and MYRG2022-00026-IAPME) from Research & Development Office at University of Macau, and Shenzhen-Hong Kong-Macao Science and Technology Research Programme (Type C) (SGDX20210823103803017) from Shenzhen.



# IAPME Team Won the 3-on-3 Basketball Competition

The "2024 UM Sports Fest" is jointly organized by Office of Sports Affairs (OSA) and UMSU Sports Association (UMSU SPA), and the 3-on-3 Basketball Competition (Staff Category) is one of the competitions for the UM staff.

On 16 Oct., the IAPME team, including Prof. Binmeng Chen, Prof. Shen Lai, Prof. Haomin Song, Alvin Su and Jimmy Chang, participated the 3on-3 Basketball Competition (Staff Category) of the "2024 UM Sports Fest" and won the champion.

Congratulations to the IAPME team!



(from left) Wilson Hoi(LIB), Prof. Haomin Song, Prof. Binmeng Chen, Prof. Shen Lai, Alvin Su and Jimmy Chang



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# Upcoming Events

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# Exploration and optimization on the structural properties of cathode materials based on neutron scattering methods



25 October 2024 Prof. Yinguo XIAO Peking University Shenzhen Graduate School Venue: N23-6009 Time: 15:00 - 16:00

#### Abstract

Although the research on the cathode materials for lithium-ion and sodium-ion batteries has attracted extensive interest, the deep understanding on their structural properties and the insight into their structural evolution are still lack. By taking advantages of sensitive, penetrative and nondestructive properties of neutrons, we adopted ex-situ and in-operando neutron diffraction techniques to explore the structural characteristics of cathode materials of lithium and sodium-ion batteries, especially the structural evolution of cathodes during cycling in real time. It is revealed that structural defects formed in cathodes and they varied upon charging and discharging. Moreover, the visualization of the ion migration pathway in cathode indicated that ions diffused via different hopping paths at different states of charge. Based on the relationship between structural and electrochemical properties of cathode materials, we modified and optimized the performances of cathodes by adopting different synthesis procedures, which are of scientific and practical significance. Besides of the research on cathode materials, the construction progress of Peking University High Resolution Neutron Diffractometer at China Spallation Neutron Source will also be presented.

Hosted by: Prof. Haifeng LI

#### Biography

Prof. Yinguo Xiao received his Ph.D. degree from Institute of Physics, Chinese Academy of Sciences, China in 2006. He was a postdoctoral fellow from 2007 to 2009 and a research scientist from 2009 to 2014 at Juelich Research Centre (Forschungszentrum Jülich), Germany. He was promoted to tenured staff scientist in Juelich Research Centre since 2015. In 2017, he joined Peking University Shenzhen Graduate School, China, as an associate professor. His research interests are on research and development of energy materials, magnetic materials, and characterization of complex materials using X-ray and neutron scattering techniques. He is also in charge of designing and constructing the Peking University High Resolution Neutron Diffractometer at the China Spallation Neutron Source. Presently, he is responsible for the National Key R&D Program of China, projects supported by the National Natural Science Foundation of China, and projects supported by department of science and technology of Guangdong province and Shenzhen city. To date, he has published over 160 peerreview papers and 3 book chapters in the research areas of materials and neutron science.

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## **Contact Us**



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