



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

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**30 April 2025**

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## ❖ Publications (IF $\geq$ 8, and/or Nature Index; \*corresponding author)

1. **Pingshan Jia**, Junpo Guo, Qing Li, Yinan Liu, Yun Zheng, Yan Guo, Yike Huang, Yingying Shen, Lifan Long, Hebin Zhang, Rong Chen, Congcong Zhang, Zhiyuan Zhang, Jingjun Shen, Shengyang Dong, Jiangmin Jiang, Meinan Chang, Xupo Liu, Xiaobing Wang, Yuxin Tang, **Huaiyu Shao\***. Revisiting the Kinetics Enhancement Strategies of Si Anode through Deconstructing Particle-Interface-Electrode Integration. *Energy & Environmental Science*. 18, 2720-2746 (2025). DOI: 10.1039/D4EE05595K. [2023 IF=32.4]

Energy &  
Environmental  
Science



REVIEW

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[View Journal](#) | [View Issue](#)



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2025, 18, 2720

## Revisiting the kinetics enhancement strategies of Si anodes through deconstructing particle–interface–electrode integration

Pingshan Jia,<sup>†a</sup> Junpo Guo,<sup>†b</sup> Qing Li,<sup>id a</sup> Yinan Liu,<sup>a</sup> Yun Zheng,<sup>a</sup> Yan Guo,<sup>a</sup> Yike Huang,<sup>a</sup> Yingying Shen,<sup>a</sup> Lifan Long,<sup>a</sup> Hebin Zhang,<sup>a</sup> Rong Chen,<sup>a</sup> Congcong Zhang,<sup>a</sup> Zhiyuan Zhang,<sup>a</sup> Jingjun Shen,<sup>a</sup> Shengyang Dong,<sup>id a</sup> Jiangmin Jiang,<sup>a</sup> Meinan Chang,<sup>b</sup> Xupo Liu,<sup>b</sup> Xiaobing Wang,<sup>id b</sup> Yuxin Tang<sup>id c</sup> and Huaiyu Shao<sup>id \*a</sup>

## ❖ Research Stories

### UM research team reviewed the kinetics enhancement strategies of Si anode through deconstructing particle-interface-electrode integration

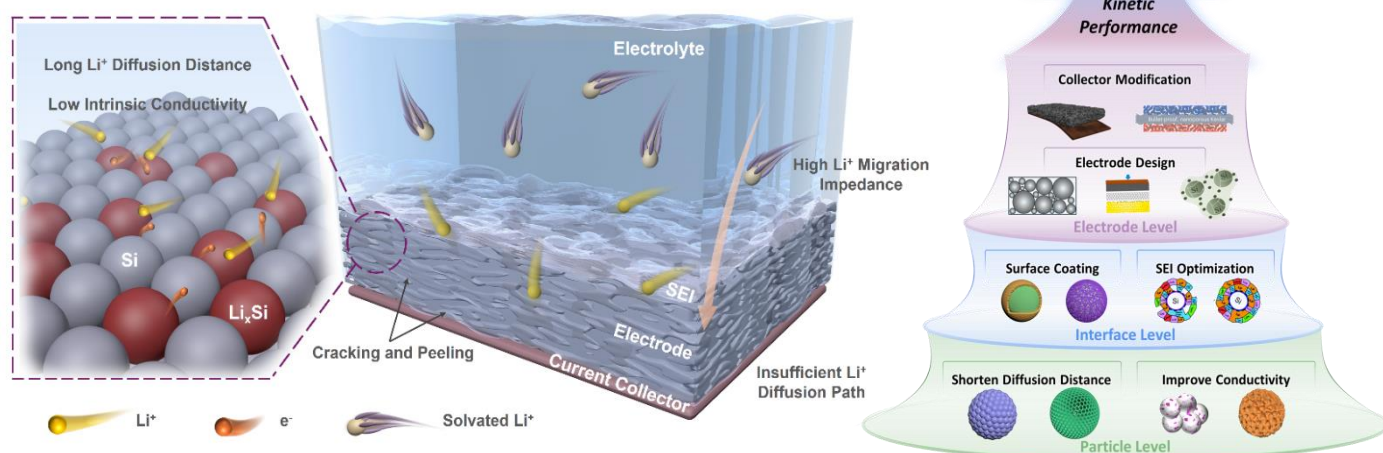
- The successive introduction of Si graphite composite anodes into the global market highlights the tremendous commercial potential of Si anodes. Good kinetics related to fast-charging capability is the central topic of next-generation Si anodes.
- The team deconstructed the particle-interface-electrode integration to attribute the key limiting factors to long  $\text{Li}^+$  diffusion distance and poor conductivity for particles, high  $\text{Li}^+$  migration impedance at the interface, and insufficient or even interrupted  $\text{Li}^+$  diffusion paths inside the electrodes. And systematically investigated the effectiveness of the strategies on progressively addressing the issues.
- Through vertically combining particle, interface, and electrode levels, the team discussed the quantitative relationships between kinetics and these strategies, identified the quantification and balance as the remaining challenges, and provided potential solutions and valuable guidance for commercial-oriented Si anode studies.



Mr. Pingshan Jia  
(賈平山)



Prof. Huaiyu Shao  
(邵懷宇)



**Pingshan Jia**, Junpo Guo, Qing Li, Yanan Liu, Yun Zheng, Yan Guo, Yike Huang, Yingying Shen, Lifan Long, Hebin Zhang, Rong Chen, Congcong Zhang, Zhiyuan Zhang, Jingjun Shen, Shengyang Dong, Jiangmin Jiang, Meinan Chang, Xupo Liu, Xiaobing Wang, Yuxin Tang, **Huaiyu Shao\***. Revisiting the Kinetics Enhancement Strategies of Si Anode through Deconstructing Particle-Interface-Electrode Integration. *Energy & Environmental Science*. 18, 2720-2746 (2025). DOI: 10.1039/D4EE05595K. [2023 IF=32.4]

Prof. Huaiyu Shao is the corresponding author of this study. The first authors are Mr. Pingshan Jia and Dr. Junpo Guo. Pingshan Jia is a Ph. D. student in IAMPE. This work was financially supported by the Science and Technology Planning Project of Shenzhen of China (Shenzhen-Hong Kong-Macao Category C) (No. SGDX20220530111004028), Macau Science and Technology Development Fund (FDCT) for funding of the Macao Centre for Research and Development in Advanced Materials (2022–2024) (Nos. 0026/2022/AMJ and 006/2022/ALC), the Natural Science Foundation of Guangdong Province (No. 2023A1515010765), the Science and Technology Planning Project of Guangdong Province of China (No. 2023A0505030001), Multi-Year Research Grant (MYRG) from University of Macau (No. MYRG-GRG2023-00140-IAPME-UMDF).



## ❖ Delegation from NJUPT visited IAPME

A delegation from Nanjing University of Posts and Telecommunications, led by Prof. Yufeng Guo (郭宇鋒), visited the Institute of Applied Physics and Materials Engineering (IAPME) on April 15, 2025. Prof. Guichuan Xing, Prof. Shuangpeng Wang, and Prof. Shi Chen from IAPME, participated in the discussion.

During the visit, Prof. Xing introduced IAPME with details of research capabilities, major directions, recent outputs, and ongoing projects in advanced materials and related applications. He also demonstrated representative prototypes of many IAPME's scientific products. Prof. Guo and other members of the delegation introduced the research directions, recent research outputs, and strengths of Nanjing University of Posts and Telecommunications. Both parties have a thorough discussion on research insights, collaborations in potential areas, and possible exchange visits. Both parties will be focusing on the solar cell, battery material, green energy, and photonic technologies, wish further collaboration will be carried out.



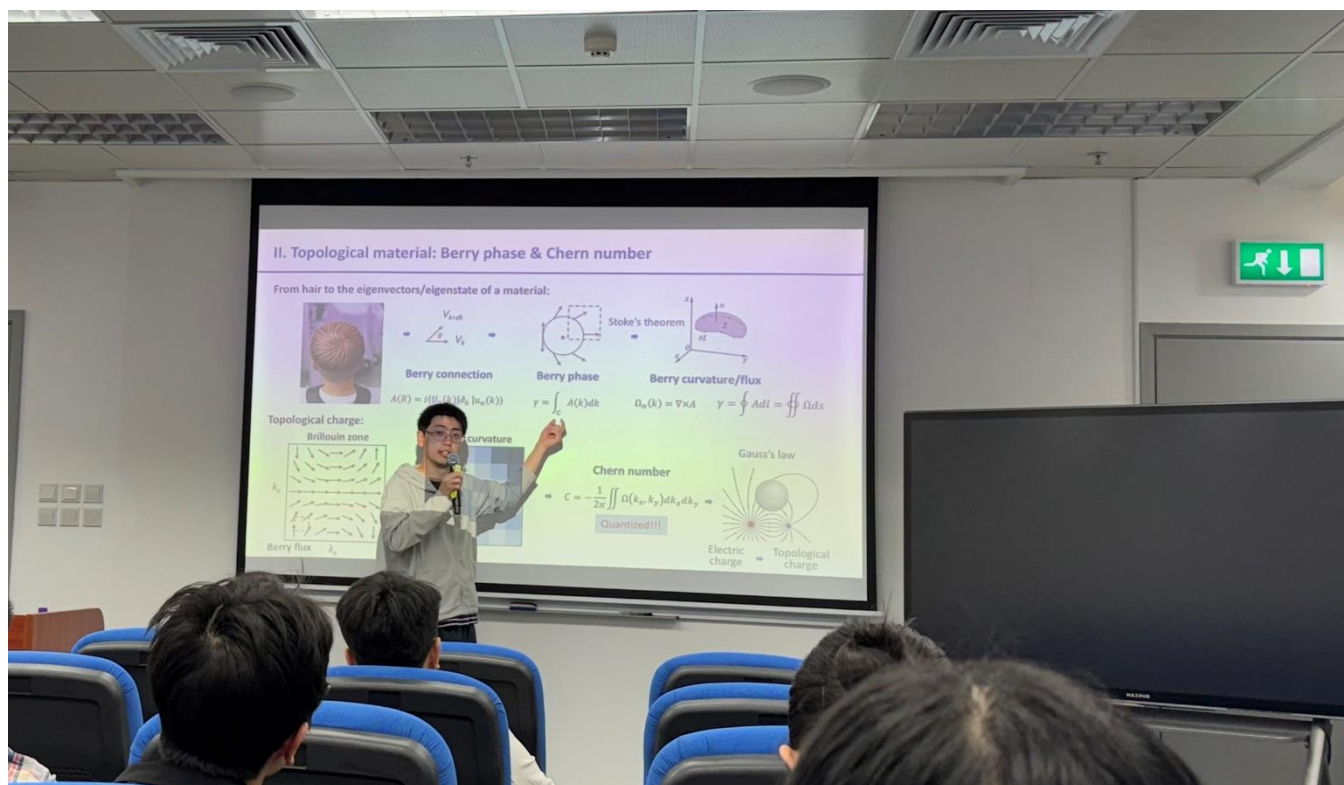
## ❖ Seminars

Invited by Prof. Hongchao Liu, Dr. Dongyang Wang (王東陽) from University of Southampton visited IAPME from 14 to 16 April 2025. Dr. Dongyang Wang received his PhD in 2018 from Tianjin University, China, and did his postdoctoral research at the Hong Kong University of Science and Technology (HKUST) from 2019 to 2023. He joined the University of Southampton in UK as an Anniversary Fellow in the October 2023 and is currently a permanent academic staff in the Optoelectronics Research Centre. Dr. Wang's research focuses on topological physics, metamaterials, and terahertz science. He has pioneered the discovery of new photonic topological phases, such as the first observation of photonic magnetic Weyl point (Nat. Phys., 2019), the first super-imaging effect with topological metamaterials (Phys. Rev. Lett., 2021, on the cover), and the intrinsic non-Abelian band topology in optical media (Phys. Rev. X, 2023). Dr. Wang's works are published at prestigious journals of Nature, Nature Physics, Nature Materials, Physical Review X, Physical Review Letters (5), Science Advances, Light Science & Applications (2).



Dr. Dongyang Wang delivered a seminar entitled ‘Topological ideas implemented with metamaterials’. At the seminar, Dr. Wang firstly introduced how the geometrical concept, especially topology, is connected to materials. Then, he demonstrated a few examples on how topological invariants can be implemented with metamaterials. Further, he showed that the topological invariants can take the form of matrix and lead to non-Abelian characteristics. In the Q&A session, Dr. Wang had a zealous interaction with the audience.

During the visit, Dr. Wang had a lab tour of IAPME. He had close discussions with some professors and PhD students. He expressed a deep impression on IAPME's research facility and achievements.



## Contact Us



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