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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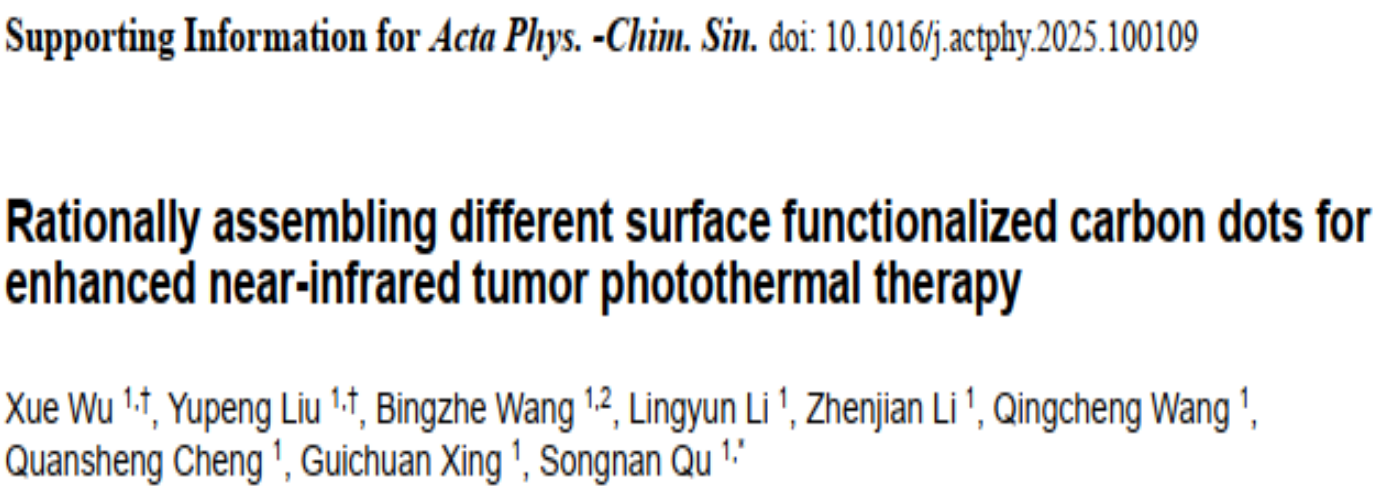
   a. IAPME Mini-Symposium

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

1. **Xue Wu**, **Yupeng Liu**, Bingzhe Wang, Lingyun Li, Zhenjian Li, Qingcheng Wang, Quansheng Cheng, Guichuan Xing, **Songnan Qu***. Rationally assembling different surface functionalized carbon dots for enhanced near-infrared tumor photothermal therapy. *Acta Physico-Chimica Sinica*, 100109 (2025). DOI: 10.1016/j.actphy.2025.100109. [2024 IF=13.5]



Supporting Information for *Acta Phys. -Chim. Sin.* doi: 10.1016/j.actphy.2025.100109

Rationally assembling different surface functionalized carbon dots for enhanced near-infrared tumor photothermal therapy

Xue Wu [1,†], Yupeng Liu [1,†], Bingzhe Wang [1,2], Lingyun Li [1], Zhenjian Li [1], Qingcheng Wang [1], Quansheng Cheng [1], Guichuan Xing [1], Songnan Qu [1,*]

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❖ Research Stories

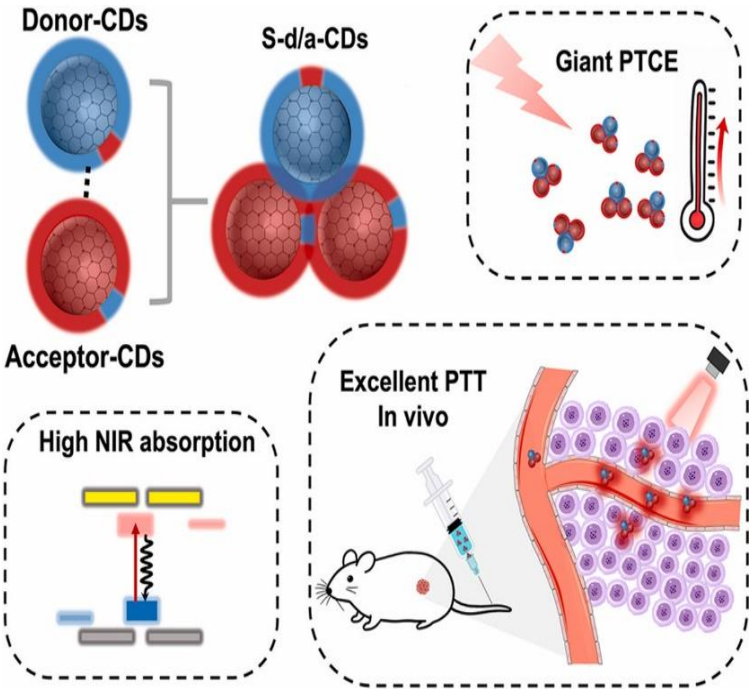
UM research team developed Donor-Acceptor carbon dot assemblies for high-efficiency NIR photothermal therapy

- The study creates hybrid carbon dots (S-d/a-CDs) by combining electron-donating and electron-withdrawing components. The enhanced near-infrared absorption through hydrogen bonding assemble , enabling better light-to-heat conversion.
- S-d/a-CDs achieve 65.8% photothermal efficiency under 740nm light - among the highest reported. They maintain stability for weeks and effectively kill tumor cells (86.6% efficiency) without harming healthy tissue.
- In mice, the particles quickly reach tumors and completely eliminate them after one light treatment, with no cancer regrowth for 90 days. This metal-free approach shows strong potential for safe, effective cancer treatment.

Ms. Xue Wu
(吳雪)

Dr. Yupeng Liu
(劉鈺鵬)

Prof. Songnan Qu
(曲松楠)



Xue Wu, **Yupeng Liu**, Bingzhe Wang, Lingyun Li, Zhenjian Li, Qingcheng Wang, Quansheng Cheng, Guichuan Xing, **Songnan Qu***. Rationally assembling different surface functionalized carbon dots for enhanced near-infrared tumor photothermal therapy. *Acta Physico-Chimica Sinica*, 100109 (2025). DOI: 10.1016/j.actphy.2025.100109. [2024 IF=13.5]

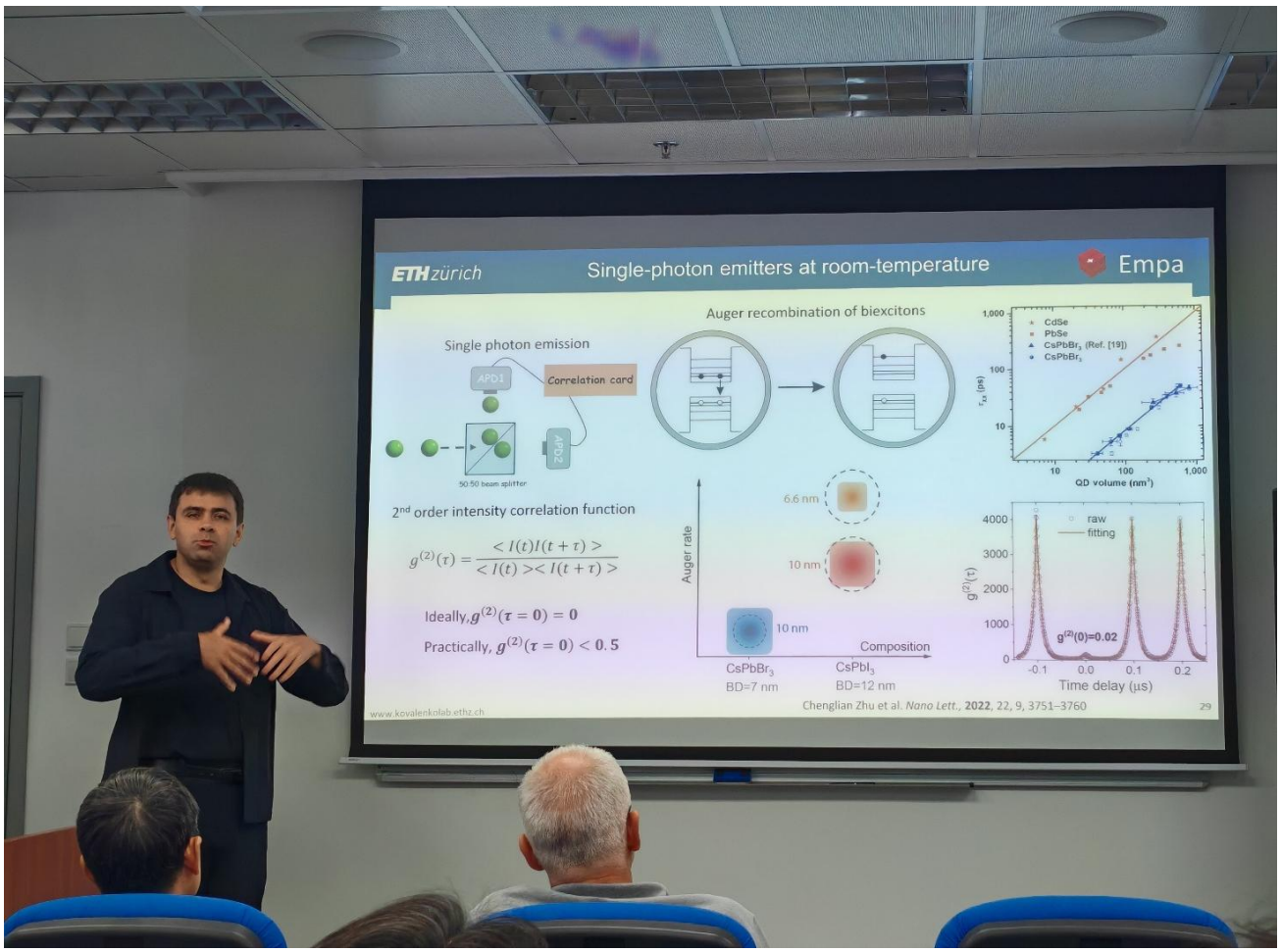
This work was financially supported by the Science and Technology Development Fund of Macau SAR (0139/2022/A3, 0002/2024/TFP, 0007/2021/AKP, 0004/2023/AKP), the University of Macau – Dr. Stanley Ho Medical Development Foundation "Set Sail for New Horizons, Create the Future" Grant 2025 (SHMDF-OIRFS/2025/001), and the National Natural Science Foundation of China (62205384).

❖ IAPME Mini-Symposium

On 24 June, a mini-symposium on solution processable materials and devices was held at IAPME. Organized by Prof. Handong Sun, the symposium featured three distinguished scientists from ETH Zürich (Prof. Maksym V. Kovalenko and Prof. Maryna I. Bodnarchuk) and the City University of Hong Kong (Prof. Andrey L. Rogach) who deliver seminars. Meanwhile three professors (Prof. Guichuan Xing, Prof. Songnan Qu and Prof. Shuangpeng Wang) from IAPME showcased their recent research findings during the symposium.

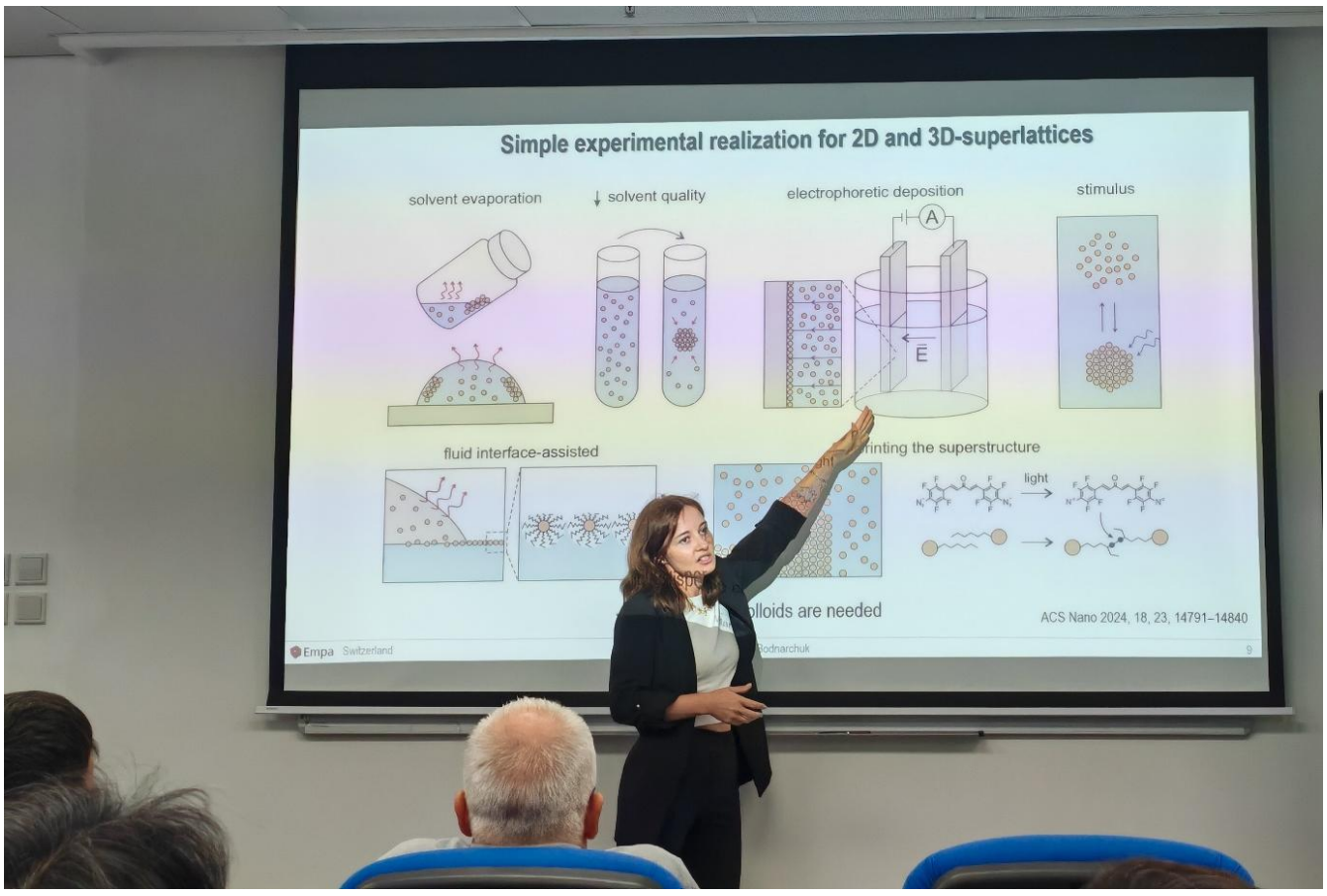
(From left) Prof. Songnan Qu (曲松楠), Prof. Guichuan Xing (邢貴川), Prof. Pengzhan Sun (孫鵬展), Prof. Maksym V. Kovalenko, Prof. Andrey L. Rogach, Prof. Maryna I. Bodnarchuk, Prof. Handong Sun (孫漢東), Prof. Shuangpeng Wang (王雙鵬) and Prof. Tianhua Ren (任天華)

Prof. Maksym V. Kovalenko studied chemistry at the Chernivtsi National University in Ukraine and completed his doctoral studies at the University of Linz, Austria. He then had postdoctoral training at the University of Chicago, USA (2008-2011). Currently, he serves as the head of the Institute of Inorganic Chemistry. He is also an Associate editor of the Chemistry of Materials and ACS Materials Au. The research activities of Prof. Kovalenko and his group focus on chemistry, physics and applications of inorganic solid-state materials and nanostructures.



During the talk, Prof. Kovalenko first introduced the discovery of colloidal perovskite quantum dots. He then presented the interesting physical and chemistry properties of the novel materials. He also demonstrated the fascillating applications of those materials as classical and quantum light emitters.

Prof. Maryna I. Bodnarchuk received her PhD degree in natural sciences from the Johannes Kepler University Linz (Austria) in 2009. She then worked as a postdoctoral fellow at the University of Chicago. In 2011 she joined the Laboratory of Inorganic Chemistry of ETH Zürich as a Marie Heim-Vögtlin fellow and then as an Ambizione Energy fellow (junior PI) supported by SNSF. In 2016, she was appointed as group leader in the laboratory of Thin Films and Photovoltaics at Empa. During her talk, Prof. Bodnarchuk introduced self-assembly and characterization of novel inorganic nanostructures. These mesostructures exhibit superfluorescence, characterized by high excitation density, by emission pulses with ultrafast radiative decay. The presentation futher extended to the most recent work, wherein nano crystals (NCs) are co-assembled with molecular entities or plasmonic NCs.



Prof. Andrey L. Rogach is a Yeung Kin Man Chair Professor in Photonics Materials at the Department of Materials Science and Engineering, and the Founding Director of the Centre for Functional Photonics (CFP) at City University of Hong Kong. He received his Diploma in Chemistry (1991, with honors) and Ph.D. in Physical Chemistry (1995) from the Belarusian State University in Minsk. From 2002–2009 he held a tenured position of a lead staff scientist at the Department of Physics and Centre for NanoScience of the University of Munich, Germany, where he completed his habilitation. He joined City University of Hong Kong as a Full Professor in 2009 and has been advanced to Chair Professor in 2012. During his talk, Prof. Rogach shared his research findings regarding the the synthesis and characterization of core-shell metal halide perovskite nanocrystals. He further domonstrated the application of lead-free CsSnI3 perovskites for efficient and rather stable near-infrared LEDs.