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NEWSLETTER

2025
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RESEARCH

Shanghai University is one of China's 'Project 211' universities and has also been selected for another national excellence initiative - the 'Double First-Class' University Construction Initiative. It is a comprehensive university with 31 faculties/colleges covering the disciplines of Philosophy, Economics, Law, Education, Literature, History, Science, Engineering, Medicine, Management, Arts and a number of emerging cross-disciplines, with an enrolment of over 40,000 students.

Like the city of Shanghai, SHU has undergone dramatic changes in recent decades, becoming a multicultural community with tremendous opportunities and resources. Relying on the contribution of excellent faculty members and diligent students, it has established collaborations with 263 universities and research institutions in 55 countries and regions, and will continue to deepen its exchanges and collaborations with academic partners around the world in an open and inclusive manner.

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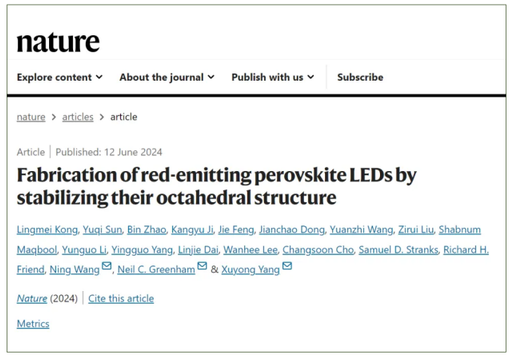
機電工程與自動化學院楊緒勇教授研究團隊在《*Nature*》發表最新研究成果

Professor YANG Xuyong's research team from the Key Laboratory of Advanced Display and System Applications, Ministry of Education, School of Mechatronic Engineering and Automation, Shanghai University, in collaboration with partner institutions, has recently published a landmark study in the high-impact journal *Nature*. The paper, titled "Fabrication of red-emitting perovskite LEDs by stabilizing their octahedral structure," introduces a novel strategy for improving the efficiency of red perovskite LEDs through octahedral structure stabilization.

Shanghai University is the primary and first-signing institution of this study, with Professor Yang Xuyong as the corresponding author. Professor Wang Ning from Jilin University and Professor Neil C. Greenham from the University of Cambridge are co-corresponding authors. The first author of the paper is Kong Lingmei, a PhD student (class of 2021) under Professor Yang Xuyong at Shanghai University.

Light-emitting diodes (LEDs) are key components of next-generation display technologies and a cornerstone of the new-generation information technology industry. Perovskite LEDs, an emerging display technology, offer high color purity, a wide color gamut, simple fabrication processes, and low cost, making them a hot research topic in optoelectronics.

While green perovskite LEDs, one of the three primary colors in display applications, have progressed rapidly, red perovskite LEDs (620–650 nm) face major performance bottlenecks. In particular, their poor spectral stability under high bias voltage poses a significant challenge, hindering their application in full-color perovskite LED displays.


nature

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Article | Published: 12 June 2024

Fabrication of red-emitting perovskite LEDs by stabilizing their octahedral structure

Lingmei Kong, Yuqi Sun, Bin Zhao, Kangyu Ji, Jie Feng, Jianchao Dong, Yuanzhi Wang, Zirui Liu, Shabnum Maqbool, Yunguo Li, Yingguo Yang, Linjie Dai, Wanhee Lee, Changsoon Cho, Samuel D. Stranks, Richard H. Friend, Ning Wang ✉, Neil C. Greenham ✉ & Xuyong Yang ✉

Nature (2024) | Cite this article

Metrics

機電工程與自動化學院新顯教育部重點實驗室楊緒勇教授研究團隊與合作單位團隊關於“穩定鈣鈦礦八面體實現高效紅光 LED”最新研究成果，以“Fabrication of red-emitting perovskite LEDs by stabilizing their octahedral structure”為題在國際頂尖期刊《*Nature*》上發表。上海大學為第一署名單位，上海大學楊緒勇教授為論文通訊作者，吉林大學的王甯教授和劍橋大學的 Neil C. Greenham 教授為共同通訊作者，楊緒勇教授指導的上海大學 2021 級博士生孔令媚同學為文章第一作者。

發光二極體（LED）是新型顯示技術的核心部件，更是新一代資訊技術產業之首。鈣鈦礦發光二極體（LED）作為最新興起的顯示技術，具有高色純度、廣色域、加工工藝簡單、低成本等優勢，是國內外光電器件領域的研究熱點。目前，作為顯示三基色之一的綠光鈣鈦礦 LED 的發展十分迅速，而關鍵的紅光鈣鈦礦 LED（620–650 nm）性能遭遇瓶頸，尤其在高偏壓下光譜穩定性差，制約了鈣鈦礦 LED 在全彩顯示領域的應用。

Article Link: https://www.nature.com/articles/s41586-024-07531-9

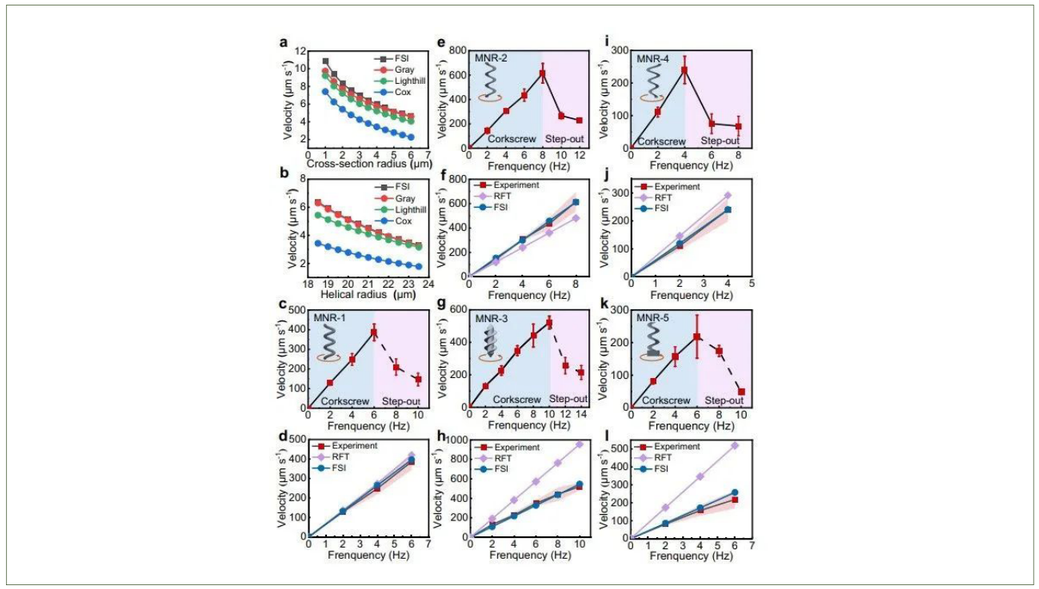
A. Prof. ZHANG Bing and his team published their latest research in *Nature Communications*

機自學院張兵副教授團隊在《*Nature Communications*》發表最新研究成果

The Intelligent Energy-based Tumor Ablation Laboratory at the School of Mechatronic Engineering and Automation, Shanghai University, in collaboration with East China University of Science and Technology and the University of Saskatchewan, Canada, has recently published a study titled "Comprehensive modeling of corkscrew motion in micro-/nano-robots with general helical structures" in *Nature Communications*.

Shanghai University is the first-signing institution of this study. Dr. Hu, Ningning (Shanghai University) is the first author, while Associate Professor Zhang, Bing (Shanghai University), Associate Professor Yin, Ruixue (East China University of Science and Technology), and Dr. Ding, Lujia (University of Saskatchewan, Canada) serve as co-corresponding authors.

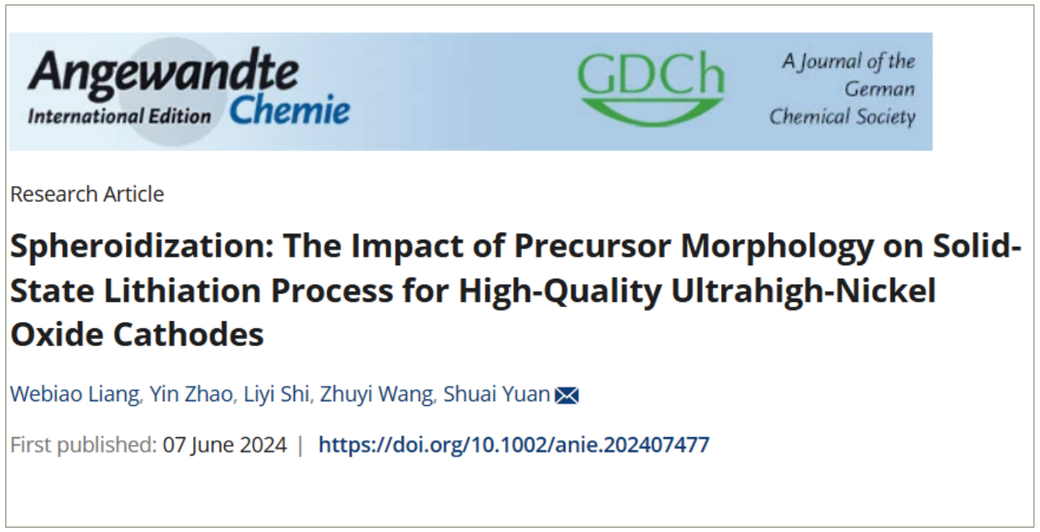
機自學院智慧腫瘤能量消融實驗室聯合華東理工大學和加拿大薩斯喀徹爾大學在《*Nature Communications*》發表題為"Comprehensive modeling of corkscrew motion in micro-/nano-robots with general helical structures"的研究論文，上海大學為本文第一署名單位，上海大學胡甯甯博士為論文第一作者，上海大學張兵副教授、華東理工大學殷瑞雪副教授、加拿大薩斯喀徹爾大學丁路佳博士為共同通訊作者。



Article Link: https://doi.org/10.1038/s41467-024-51518-z

Prof. YUAN Shuai and A. Prof. ZHAO Yin published their latest research in *Angewandte Chemie International Edition*.

理學院袁帥研究員和趙尹副研究員在《*Angewandte Chemie International Edition*》發表最新研究成果


Angewandte International Edition Chemie

GDCh A Journal of the German Chemical Society

Research Article

Spheroidization: The Impact of Precursor Morphology on Solid-State Lithiation Process for High-Quality Ultrahigh-Nickel Oxide Cathodes

Webiao Liang, Yin Zhao, Liyi Shi, Zhuyi Wang, Shuai Yuan

First published: 07 June 2024 | https://doi.org/10.1002/anie.202407477

Researchers YUAN Shuai and ZHAO Yin from the Nanoscience and Technology Research Center, College of Sciences, Shanghai University, have recently published a study titled "Spheroidization: The Impact of Precursor Morphology on Solid-State Lithiation Process for High-Quality Ultrahigh-Nickel Oxide Cathodes" in the high-impact journal *Angewandte Chemie International Edition*.

Lithium-ion batteries (LIBs) with high energy density, long cycle life, and superior safety are in high demand in the new energy sector. Ultrahigh-nickel layered oxides LiNixCoyMn1-x-yO2 (NCM, x ⩾ 0.9) are highly promising cathode materials, offering both high energy density and lower cost. The Shanghai University team offers new insights into the lithiation reaction of ultrahigh-nickel $NCM(OH)_2$ precursors, demonstrating how the sphericity of precursor particles influences both the lithiation process and the electrochemical properties of ultrahigh-nickel layered cathode materials.

理學院納米科學與技術研究中心袁帥研究員和趙尹副研究員在《*Angewandte Chemie International Edition*》上發表題為"Spheroidization: The Impact of Precursor Morphology on Solid-State Lithiation Process for High-Quality Ultrahigh-Nickel Oxide Cathodes"最新研究成果。高能量密度、長迴圈壽命、高安全性的鋰離子電池是新能源領域的重大需求。超高鎳層狀氧化物 LiNixCoyMn1-x-yO2（NCM，x ⩾ 0.9）具有較高能量密度和較低成本，是一種極具應用前景的鋰離子電池正極材料。上海大學團隊等對超高鎳 NCM(OH)2 前驅體的鋰化反應過程提出了新見解，揭示了 NCM(OH)2 前驅體顆粒的球形度對鋰化過程及超高鎳層狀正極材料電化學性能的影響機制。

Article Linkr: https://doi.org/10.1002/anie.202407477

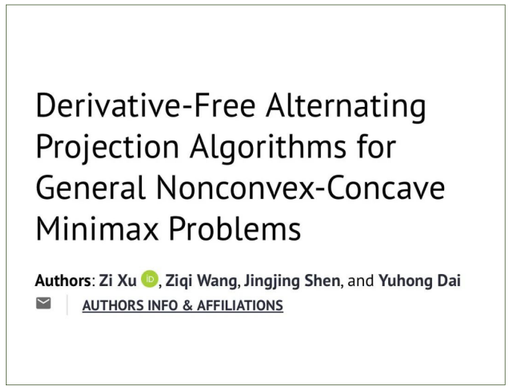
Prof. XU Zi and her team published their latest research in *SIAM Journal on Optimization*

理學院徐姿教授團隊在《*SIAM Journal on Optimization*》發表最新研究成果

Professor XU Zi from the Department of Mathematics, College of Sciences at Shanghai University, along with her collaborators, recently published a research article titled "Derivative-free Alternating Projection Algorithms for General Nonconvex-Concave Minimax Problems" in the prestigious journal *SIAM Journal on Optimization*.

In this work, the researchers focused on zeroth-order algorithms for solving nonconvex-concave minimax problems, where the objective function is nonconvex in one variable and concave in the other. They proposed the Derivative-free Alternating Projection Algorithm (ZO-AGP), incorporating a zeroth-order (gradient-free) approach tailored to the nonconvex-concave setting. This algorithm was shown to have concrete theoretical guarantees, providing an upper bound on the number of function evaluations or oracle calls needed to achieve approximate stationary points. Additionally, the team introduced the Zero-Order Block Alternating Proximal Gradient (ZO-BAPG) algorithm for handling block-wise nonsmooth nonconvex-concave minimax problems, establishing similar oracle-call and iteration complexity guarantees for this setting as well. These two algorithms represent a significant pioneering step in developing zeroth-order methods with complexity guarantees for such challenging problem classes.

Ultimately, this research advances zeroth-order optimization techniques, with practical implications for fields such as machine learning and operation research.



理學院數學系徐姿教授團隊及其合作者在國際運籌優化頂級期刊《*SIAM Journal on Optimization*》上發表題為"Derivative-free Alternating Projection Algorithms for General Nonconvex-Concave Minimax Problems"最新論文。

本項工作提出了無導數交替隨機梯度投影（ZO-AGP）算法用於求解非凸－凹極小極大問題，並且證明了 ZO-AGP 算法獲得近似穩定點的函數值計算或調用次數的上限。進一步，本項工作還提出了零階塊交替隨機鄰近梯度 (ZO-BAPG) 算法求解分塊非光滑非凸－凹極小極大問題，並且證明了 ZO-BAPG 算法獲得近似穩定點的函數值計算或調用次數的上限。ZO-AGP 和 ZO-BAPG 是分別求解這兩類問題的首個具有複雜度保證的零階算法。本項研究將推動優化演算法在機器學習等領域的發展。

Article Link: https://epubs.siam.org/doi/10.1137/23M1568168

Prof. LENG Gangsong received the 2020 Paul Erdős Award of WFNMC

理學院冷崗松教授獲頒 2020 年度世界數學競賽聯盟（WFNMC）保羅・厄爾多斯獎

At the 15th International Congress on Mathematical Education (ICME-15) in Sydney, Australia, Professor Leng Gangsong from the Department of Mathematics, College of Sciences, was honored with the 2020 Paul Erdős Award by the World Federation of National Mathematics Competitions (WFNMC).

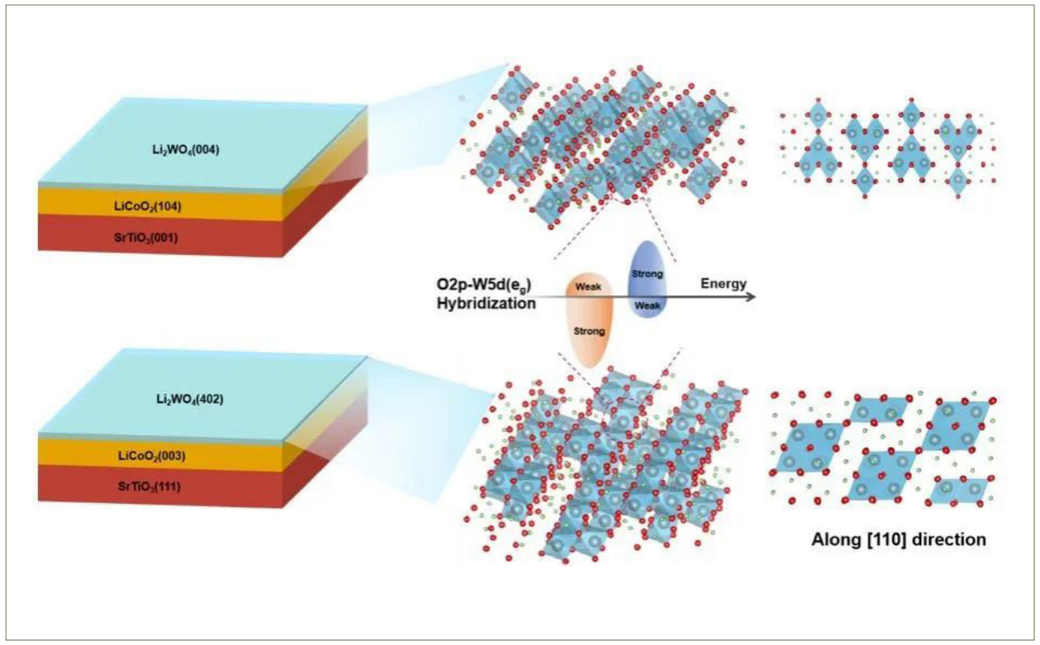
Founded in 1984, WFNMC is committed to advancing mathematics competitions and related activities to enrich students' mathematical learning experiences. The Paul Erdős Award, named after the renowned mathematician Paul Erdős (1913－1996), recognizes individuals who have made exceptional contributions to mathematics competitions worldwide.

在澳大利亞悉尼舉辦的第 15 屆國際數學教育大會（ICME-15）上，理學院數學系冷崗松教授獲頒 2020 年度世界數學競賽聯盟（WFNMC）保羅・厄爾多斯獎（Paul Erdős Award）。WFNMC 成立於 1984 年，致力於推廣數學競賽和相關活動，以豐富學生的數學學習體驗。其頒發的保羅・厄爾多斯獎（Paul Erdős Award）以著名數學家 Paul Erdős (1913-1996) 命名。

Article Link: https://news.shu.edu.cn/info/1013/133025.htm
https://www.wfnmc.org/erdleng.html

NING Yuanjie published his latest research in *Chemical Engineering Journal*

理學院物理系甯苑傑在《*Chemical Engineering Journal*》發表最新研究成果



Ning Yuanjie, a master's student at the Shanghai Key Laboratory of High Temperature Superconductors, Institute for Quantum Science and Technology, Department of Physics, Shanghai University, along with collaborators, recently published a research paper titled "Orientation-dependent Electronic Structure of Li_2WO_2 Films Epitaxially Grown on $LiCoO_2$ by Spontaneous Lithiation" in *Chemical Engineering Journal*.

上海大學理學院物理系上海市高溫超導重點實驗室碩士研究生甯苑傑與合作者在《*Chemical Engineering Journal*》發表題為《Orientation-dependent Electronic Structure of Li2WO4Films Epitaxial Grown on LiCoO2by Spontaneous Lithiation》的研究論文。

Article Link: https://www.sciencedirect.com/science/article/pii/S1385894724057887

LIU Zefei published his latest research in *Physical Review E*

理學院碩士生劉澤飛在《*物理評論 E*》發表最新研究成果

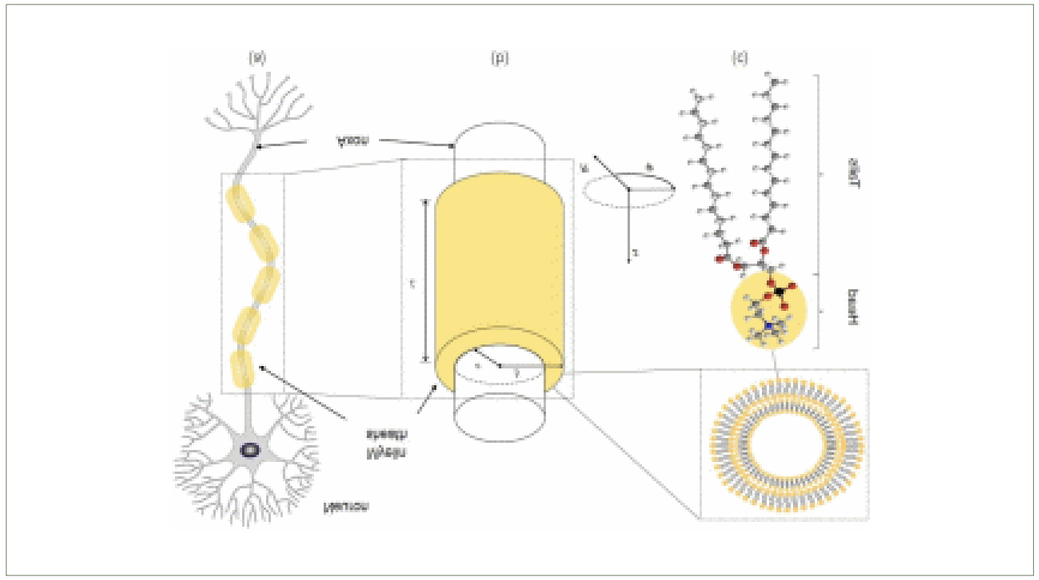
LIU Zefei, a master's student in Quantitative Life Sciences at the Department of Physics, College of Sciences, Shanghai University, under the supervision of Professor Chen Yongcong, has proposed a groundbreaking hypothesis: neural myelin in the brain may generate quantum-entangled photon pairs. This discovery offers a new perspective on the synchronization mechanism of neuronal activity.

This research, conducted in collaboration with Shanghai University's College of Sciences and Sichuan University's School of Bioengineering, has been published in *Physical Review E*. The study immediately drew international attention, with Dr. Karmela Padavic-Callaghan, a science journalist at Newscientist.com, interviewing the authors on the eve of publication and covering the findings. The study also sparked interest in domestic media, with platforms such as Douyin and Toutiao reporting on the research.

This work introduces an intriguing new function of myelin, suggesting that it may act as a generator of quantum-entangled photon pairs.

Article Link: https://link.aps.org/doi/10.1103/PhysRevE.110.024402

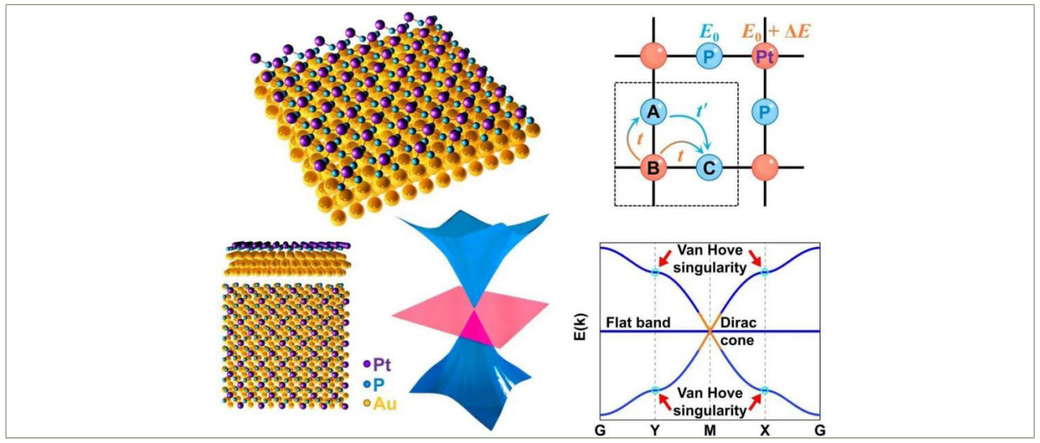
理學院物理系定量生命科學碩士生劉澤飛在導師陳永聰教授指導下，首次提出大腦中的神經髓鞘可以產生量子糾纏的光子對，這一發現可能為理解大腦神經活動的同步機制提供了新的線索。該研究成果由上海大學理學院和四川大學生物工程學院合作完成，已在《*物理評論 E*》雜誌上發表。其第一時間受到美國科普網站 Newscientist.com 關注，物理學科記者 Dr. Karmela Padavic-Callaghan 在文章發表前夜採訪作者並做了新聞報導，國內抖音和今日頭條等也跟進相關報導。這項研究提出了髓鞘可能具有的另一項功能——作為量子糾纏光子對的生成源。



SUN Shuo, ZHANG Lingfeng, YIN Xinmao published their latest research in *Advanced Materials*

理學院孫碩副教授、張凌峰副研究員和尹鑫茂教授在《*Advanced Materials*》發表最新研究成果

Associate Professor Sun Shuo, Associate Researcher Zhang Lingfeng, and Professor Yin Xinmao from the Department of Physics, College of Sciences, and the Shanghai Key Laboratory of High-Temperature Superconductors, Shanghai University, have recently published a study titled "Realization of a 2D Lieb Lattice in a Metal-Inorganic Framework with Partial Flat Bands and Topological Edge States" in *Advanced Materials*, a top-tier journal in condensed matter physics and materials science.



This study presents the first successful synthesis of Lieb lattice materials based on metal-inorganic frameworks, demonstrating that the system exhibits unique electronic characteristics, such as flat bands and Dirac cones. And scanning tunneling microscopy and spectroscopy fully corroborates the structural morphology and the presence of electronic flat bands. These findings offer prospects for exploring strongly correlated phases interplayed with topology.

理學院物理系、上海市高溫超導重點實驗室的孫碩副教授、張凌峰副研究員和尹鑫茂教授在凝聚態物理及材料領域期刊《*Advanced Materials*》(IF=27.4)上發表題為《Realization of a 2D Lieb Lattice in a Metal-Inorganic Framework with Partial Flat Bands and Topological Edge States》的研究成果。本研究首次基于金属－无机框架成功制备了 Lieb 晶格材料，揭示该体系具有平带和狄拉克锥等独特的电子特性。并通过扫描隧道显微镜和隧道谱技术验证了 Lieb 晶格的形貌及其电子平带。这些发现为探索强关联相与拓扑相互作用提供了广阔的前景。

Article Link: https://onlinelibrary.wiley.com/

doi/10.1002/adma.202405615

Prof. ZHU Ying and WANG Lihua published their latest research in *Journal of the American Chemical Society*

理學院諸穎、王麗華研究員在"*Journal of the American Chemical Society*"發表最新研究成果

Researchers ZHU Ying and WANG Lihua from the College of Sciences, Shanghai University, in collaboration with Professor Fan Chunhai from Shanghai Jiao Tong University, have recently published a study in the high-impact journal *Journal of the American Chemical Society* (JACS). The paper introduces a nanoparticle surface engineering strategy termed the "invisibility cloak," "enabling highly efficient tumor-targeted nanoparticle delivery in vivo.

At the core of this research is a DNA molecular layer serving as a biodegradable coating for nanoparticles. This DNA layer not only adsorbs anti-phagocytic proteins (such as histidine-rich glycoproteins) from serum, creating a functional "invisibility" effect in the liver, but also triggers tumor-specific uptake through DNA degradation in the tumor microenvironment.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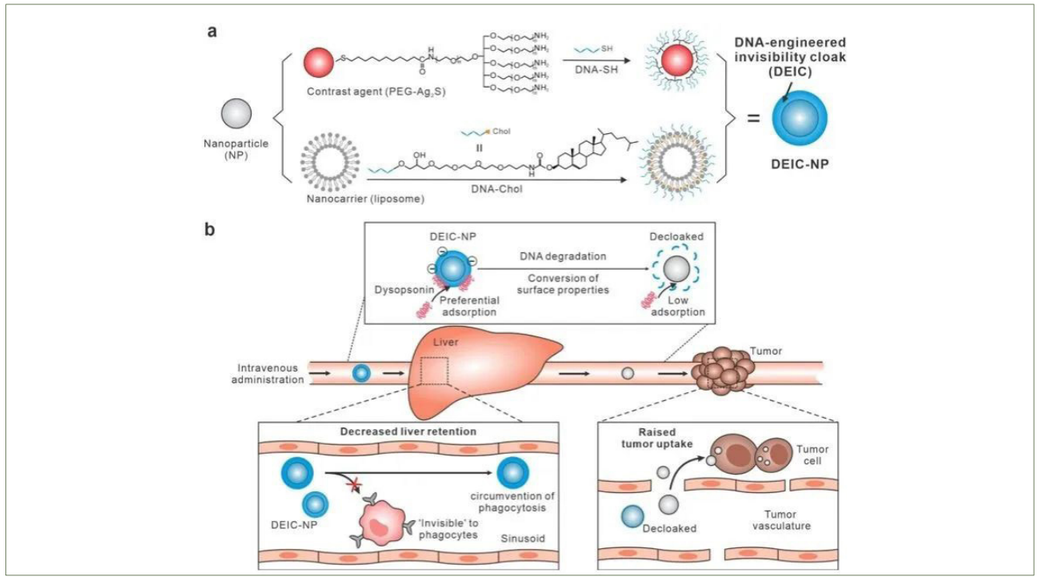
ARTICLE | August 28, 2024

DNA-Engineered Degradable Invisibility Cloaking for Tumor-Targeting Nanoparticles

Yan Zhao, Junjun Hou, Linjie Guo, Shitai Zhu, Xiaoling Hou, Shuting Cao, Mo Zhou, Jiye Shi, Jiang Li, Kai Liu, Hongjie Zhang, Lihua Wang*, Chunhai Fan*, and Ying Zhu*

理學院諸穎研究員、王麗華研究員與上海交通大學樊春海教授合作，在"*Journal of the American Chemical Society*"發表相關研究成果。團隊開發了一種名為"隱形斗篷"的納米粒子表面工程技術，成功實現了納米粒子在體內的高效腫瘤靶向遞送。這項研究的核心是利用 DNA 分子層作為納米粒子的可降解塗層。這一層 DNA 不僅能吸附血清中的抗吞噬蛋白（如富含組氨酸的糖蛋白），從而在肝臟中提供功能性的"隱形"效果，還能在腫瘤環境中通過 DNA 降解來觸發腫瘤特異性攝取。



Article Link: https://pubs.acs.org/doi/10.1021/jacs.4c09479

LI Dongxia won the Grünwald–Letnikov Prize for the best academic paper

理學院李常品教授指導的博士生李東霞榮獲 Grünwald–Letnikov 最佳學生理論文章獎

At the 12th International Conference on Fractional Differentiation and its Applications (ICFDA 2024, July 9–12, University of Bordeaux, France), Li Dongxia, a PhD student under the supervision of Professor Li Changpin from the Department of Mathematics, College of Sciences, won the Grünwald–Letnikov Award for Best Student Paper (theory).

This achievement adds to the accolades of Professor Li Changpin's team, building on their previous success at the 6th International Conference on Fractional Differentiation and Its Applications (ICFDA 2012), where they received the Riemann–Liouville Award for Best FDA Paper (theory).

在法國波爾多大學舉辦的第 12 屆國際分數階微分及其應用國際會議 (ICFDA

2024, July 9–12, University of Bordeaux, France) 上，理學院數學系李常品教授指導的博士生李東霞榮獲 Grünwald–Letnikov 最佳學生理論文章獎（Grünwald–Letnikov

Awards: Best Student Papers theory），這是繼李常品教授團隊在第 6 屆國際分數階微分及其應用會議 (ICFDA 2012) 上榮獲 Riemann–Liouville 理論文章獎 (Riemann–Liouville Award: Best FDA Paper (theory)) 之後獲得的又一獎項。

Article Link: https://news.shu.edu.cn/info/1013/133235.htm

Prof. LI Ruifei and Prof. LI Hui led the teams to publish their latest research in *Environmental Science & Technology*.

環化學院李瑞飛、李輝研究團隊在《*Environmental Science & Technology*》發表最新研究成果

Researchers LI Ruifei and LI Hui from the School of Environmental and Chemical Engineering at Shanghai University have published their latest study in *Environmental Science & Technology*. The paper, titled "Synergistic Reduction in Air Pollutants and Health Benefits under China's Dual-Carbon Policy" examines how China's carbon emissions trading system influences air pollutant emissions and public health, providing valuable insights for policymakers.

The study clarifies the role of end-of-pipe control technology improvements and their impact on emission reduction, offering strategic recommendations for the air pollution control industry. By incorporating health co-benefits into technological pathways, the research suggests an optimized approach to formulating China's Dual-Carbon strategy. Additionally, improvements in wind and solar resources can further promote renewable energy utilization, creating positive feedback for China's energy transition.

The study establishes a "3E Synergistic Pathway," which not only accelerates carbon peak achievement but also reduces air pollutant emissions and associated health burdens.

環化學院李瑞飛、李輝研究團隊在《*Environmental Science & Technology*》上發表題為"Synergistic Reduction in Air Pollutants and Health Benefits under China's Dual-Carbon Policy"最新論文。本研究分析了中國碳排放交易體系的經濟政策如何影響大氣污染物排放和人類健康，幫助決策者更加完善政策的制定；明確末端控制技術的改進及其對減排的影響，為大氣污染行業的發展提供有效建議；將健康協同效益納入技術途徑有助於優化"雙碳"路徑的制定，風能和太陽能資源的改善可以進一步促進可再生能源的利用，為我國的能源結構轉型創造積極的回饋；建立了"3E 協同路徑"，不僅可以促進更早地實現碳達峰，還能減少大氣污染物排放和相關的健康負擔。

Articlelink: https://pubs.acs.org/doi/10.1021/acs.est.4c03073

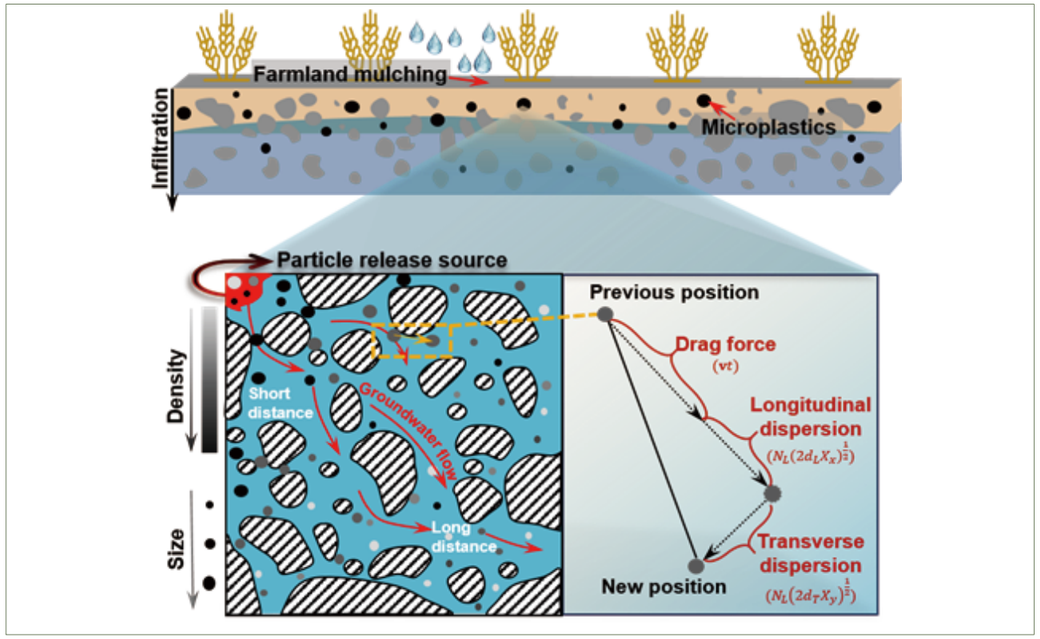
A. Prof. WEI Yaqiang and Prof.LI Hui led their teams to publish the latest research in *Environmental Science & Technology*

環化學院魏亞強副研究員、李輝研究員團隊在環境領域國際頂級期刊《*Environmental Science & Technology*》發表最新研究成果

Associate Researcher Wei Yaqiang and Researcher Li Hui, along with their research team from the School of Environmental and Chemical Engineering, Shanghai University, have recently published a cover article titled "Modeling of Microplastics Migration in Soil and Groundwater: Insights into Dispersion and Particle Property Effect" in the high-impact journal *Environmental Science & Technology*.

This study introduces an enhanced dispersion-drag coupling model, which couples microplastic dispersion dynamics and particle properties to model complex soil-groundwater interactions and predict microplastic migration in heterogeneous and variably saturated environments.

環化學院魏亞強副研究員、李輝研究員團隊在環境領域國際頂級期刊《*Environmental Science& Technology*》發表題為《Modeling of Microplastics Migration in Soil and Groundwater: Insights into Dispersion and Particle Property Effect》的封面研究論文。本研究構建出一種改進的針對土壤－地下水交互作用影響下的微塑膠粒子遷移模型技術——彌散－曳力耦合模型，該模型耦合了微塑膠彌散作用與粒子屬性，以捕捉複雜的土壤－地下水相互作用，並預測微塑膠在非均質和變飽和環境下的遷移過程。



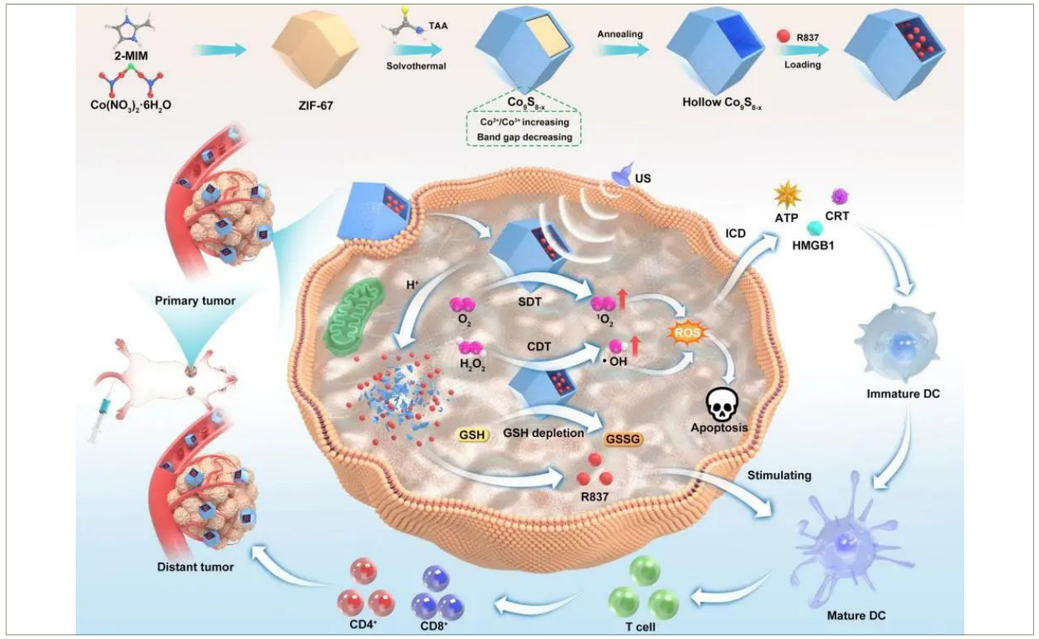
Article Link: https://pubs.acs.org/doi/10.1021/acs.est.4c05202

CAI Jinming published his research in *Advanced Functional Materials*

環化學院碩士研究生蔡金明在 *Advanced Functional Materials* 发表最新研究成果

Cai Jinming, a master's student at the School of Environmental and Chemical Engineering, Shanghai University, under the supervision of Professors Pan Dengyu and Geng Bijiang, recently published a study titled "Defect Engineering of Biodegradable Sulfide Nanocage Sonozyme Systems Enables Robust Immunotherapy against Metastatic Cancers," as the first author in *Advanced Functional Materials*.

環化學院碩士研究生蔡金明在導師潘登余和耿弼江的指導下，以第一作者身份在《*Advanced Functional Materials*》（IF：18.5）發表題為"Defect Engineering of Biodegradable Sulfide Nanocage Sonozyme Systems Enables Robust Immunotherapy against Metastatic Cancers"的研究論文。

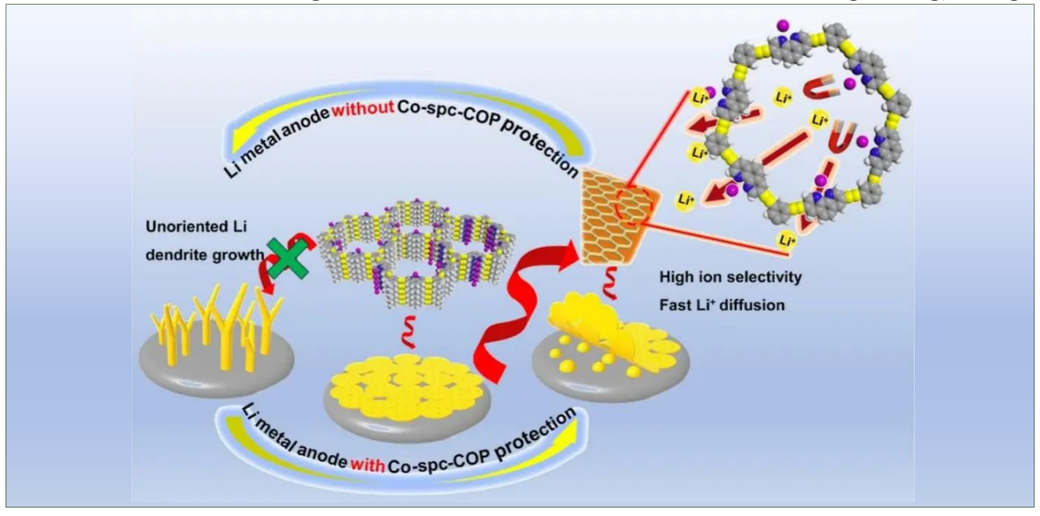


Article Link: https://doi.org/10.1002/adfm.202411064

LU Xiaomeng published her research in *Angewandte Chemie International Edition*

環化學院博士研究生路曉萌在《*Angewandte Chemie International Edition*》發表研究成果

PhD student Lu Xiaomeng from the School of Environmental and Chemical Engineering, Shanghai University, has recently published a study on lithium metal batteries in the high-impact journal *Angewandte Chemie International Edition*. The paper, titled "sp-Carbon-Conjugated Organic Polymer as Multifunctional Interfacial Layers for Ultra-Long Dendrite-Free Lithium Metal Batteries," was conducted with Shanghai University as the sole institution, under the supervision of Professor Wang Yong.



Lithium metal is regarded as a promising anode material for next-generation lithium metal batteries due to its high theoretical specific capacity (3860 mAh g^{-1}) and low electrochemical potential (−3.04 V vs SHE). However, its practical application is severely limited by uncontrolled lithium dendrite growth, caused by non-uniform lithium deposition. This study reveals that engineering a protective interfacial layer on the lithium metal anode effectively mitigates these challenges, paving the way for safer and more durable lithium metal batteries.

環化學院博士研究生路曉萌在國際知名期刊《*Angewandte Chemie International Edition*》上發表了題目為"sp-Carbon-Conjugated Organic Polymer as Multifunctional Interfacial Layers for Ultra-Long Dendrite-Free Lithium Metal Batteries"鋰金屬電池領域的最新研究成果，研究工作以上海大學為唯一完成單位，指導教師為王勇教授。鋰金屬具有較高的理論比容量（3860 mAh g-1）和較低的電化學電位（-3.04 V vs SHE），已成為未來鋰金屬電池的理想負極材料。然而，由於鋰沉積不均勻，鋰金屬負極面臨著不可控的鋰枝晶生長問題，嚴重阻礙了其實際應用。研究發現，在鋰金屬負極構建保護層能夠有效解決這些問題。

Article Link: https://doi.org/10.1002/anie.202320259

LU Xiaomeng published her another research in *Angewandte Chemie International Edition*

環化學院博士研究生路曉萌在《*Angewandte Chemie International Edition*》發表另一项研究成果

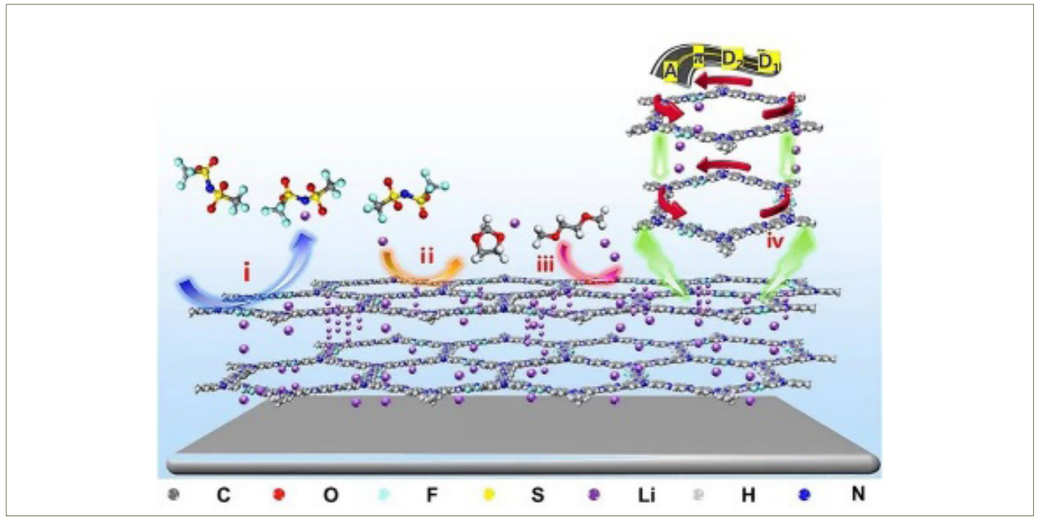
PhD student Lu Xiaomeng from the School of Environmental and Chemical Engineering, Shanghai University, has recently published a study on lithium metal batteries in the high-impact journal *Angewandte Chemie International Edition*. The paper, titled "Covalent Triazine-Based Frameworks with Donor-Donor-π-Acceptor Structures for Dendrite-Free Lithium Metal Batteries," was conducted with Shanghai University as the sole institution, under the supervision of Professor Wang Yong.

Traditional covalent organic polymers—constructed from a single node and a single linker (two monomers) —have been employed in lithium metal batteries to mitigate dendrite growth. However, their limited structural diversity constrains their functionality, resulting in suboptimal dendrite suppression. To address this challenge, this study introduces a single node with two linkers (multiple monomers) within the covalent organic framework (COF) pores, fine-tuning the framework structure to introduce new functionalities and enhance overall battery performance.

環化學院博士研究生路曉萌在《*Angewandte Chemie International Edition*》發表了題目為"Covalent Triazine Based Frameworks with Donor-Donor-π-Acceptor Structures for Dendrite-Free Lithium Metal Batteries"鋰金屬電池領域的最新研究成果，研究工作以上海大學為唯一完成單位，指導教師為王勇教授。

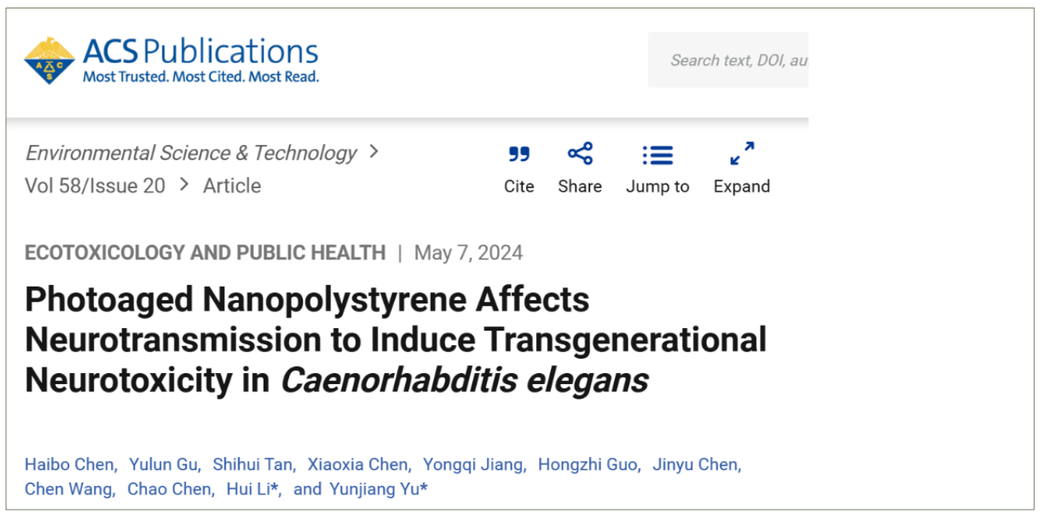
儘管由單一拓撲節點與兩個連接基元（多種反應單體）構成的傳統共價有機聚合物在鋰金屬電池領域的應用在一定程度上緩解了鋰金屬電池面臨的枝晶生長問題，但是有限的結構組成單元限制了其功能的多樣化，導致了其枝晶抑制效果有限。因此，除了在框架結構中引入鈷金屬以實現共價有機聚合物結構和功能的多樣化以調節負極表面的電子結構外，通過將單一拓撲節點與兩個連接基元（多種反應單體）共同組合到共價有機框架孔中有望進一步調整共價有機材料的結構，從而產生新的有益功能，實現性能的提升。

Article Link: https://doi.org/10.1002/anie.202409436



Prof. LI Hui led his team to publish their latest research in *Environmental Science & Technology*

環境與化學工程學院李輝研究員團隊在《*Environmental Science & Technology*》發表最新研究成果



Researcher LI Hui and his team from the School of Environmental and Chemical Engineering, Shanghai University, have recently published a study titled "Photoaged Nanopolystyrene Affects Neurotransmission to Induce Transgenerational Neurotoxicity in Caenorhabditis elegans." This research offers crucial theoretical insights into the environmental fate of microplastics and their associated ecological and health risks.

環境與化學工程學院李輝研究員團隊在環境領域期刊《Environmental Science & Technology》（IF:10.8）發表題為"Photoaged Nanopolystyrene Affects Neurotransmission to Induce Transgenerational Neurotoxicity in Caenorhabditis elegans"的研究論文。本研究將為科學認識微塑膠的環境行為與生態環境健康風險提供重要的理論依據。

Article Link: https://doi.org/10.1021/acs.est.4c02755

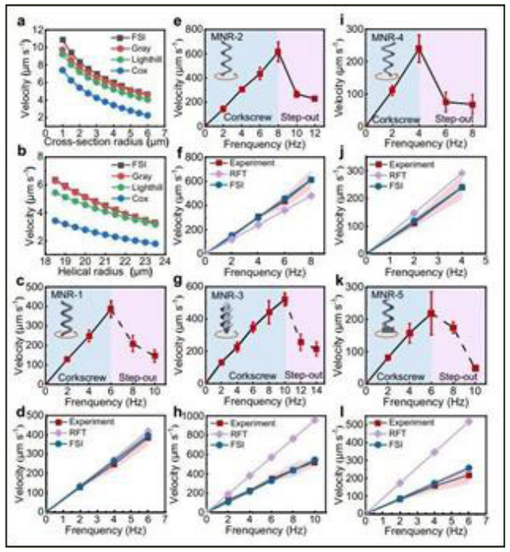
A. Prof. ZHANG Bing and his team published their latest research in *Nature Communications*

機自學院張兵副教授團隊在《*Nature Communications*》發表最新研究成果

The Intelligent Tumor Energy Ablation Laboratory at the School of Mechatronics Engineering and Automation, Shanghai University, in collaboration with East China University of Science and Technology and the University of Saskatchewan, Canada, has recently published a study titled "Comprehensive modeling of corkscrew motion in micro-/nano-robots with general helical structures" in *Nature Communications*.

Shanghai University is the first-signing institution of this study. Dr. Hu Ningning (Shanghai University) is the first author, while Associate Professor Zhang Bing (Shanghai University), Associate Professor Yin Ruixue (East China University of Science and Technology), and Dr. Ding Lujia (University of Saskatchewan, Canada) serve as co-corresponding authors.

機自學院智慧腫瘤能量消融實驗室聯合華東理工大學和加拿大薩斯喀徹爾大學在《*Nature Communications*》發表題為"Comprehensive modeling of corkscrew motion in micro-/nano-robots with general helical structures"的研究論文，上海大學為本文第一署名單位，上海大學胡甯甯博士為論文第一作者，上海大學張兵副教授、華東理工大學殷瑞雪副教授、加拿大薩斯喀徹爾大學丁路佳博士為共同通訊作者。



Article Link: https://doi.org/10.1038/s41467-024-51518-z

Prof. ZHONG Yunbo led his team to publish their latest research in *Advanced Materials*

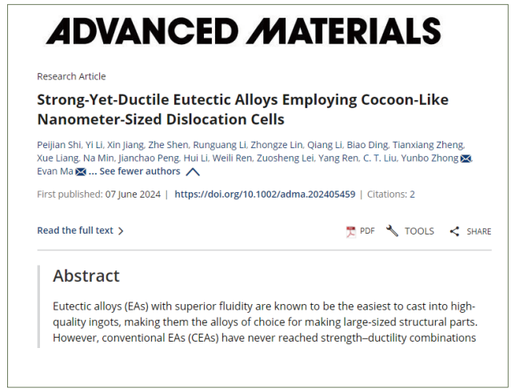
材料學院鐘雲波教授團隊在《*Advanced Materials*》發表最新研究成果

The “Supernormal Metallurgy and Manufacturing for Metallic New Materials (STM)” research team, led by Professor Yunbo Zhong from the School of Materials Science and Engineering at Shanghai University, has recently published a paper titled “Strong-yet-ductile eutectic alloys employing cocoon-like nanometer-sized dislocation cells” in *Advanced Materials*.

High-entropy alloys (HEAs), characterized by multiple principal elements, have emerged as a new paradigm in designing materials with enhanced strength and toughness. These multi-principal-element alloys offer a broader compositional design space than traditional ones. However, increasing the number of principal elements often reduces alloy fluidity and exacerbates segregation during solidification. Even complex and time-consuming thermomechanical treatments may not eliminate such casting defects, posing significant challenges in manufacturing large components with ideal microstructures and uniform compositions.

Eutectic high-entropy alloys (EHEAs) provide a novel approach to addressing these issues. Due to the absence of a solid-liquid two-phase region (i.e., mushy zone) during solidification, eutectic reactions facilitate the coupled growth of uniform lamellar structures, effectively suppressing chemical segregation, shrinkage porosity, and other casting defects. This design concept offers promising prospects for the engineering applications of materials.

This study focused on traditional eutectic alloys, utilizing a simpler NiFeAl alloy composition instead of multi-principal-element alloys. This approach balances fabrication processes and manufacturing costs while achieving synergistic improvements in performance.


ADVANCED MATERIALS

Research Article

Strong-Yet-Ductile Eutectic Alloys Employing Cocoon-Like Nanometer-Sized Dislocation Cells

Peijian Shi, Yi Li, Xin Jiang, Zhe Shen, Runguang Li, Zhongze Lin, Qiang Li, Biao Ding, Tianxiang Zheng, Xue Liang, Na Min, Jianchao Peng, Hui Li, Weili Ren, Zuosheng Lei, Yang Ren, C. T. Liu, Yunbo Zhong, Evan Ma ... See fewer authors

First published: 07 June 2024 | https://doi.org/10.1002/adma.202405459 | Citations: 2

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Abstract

Eutectic alloys (EAs) with superior fluidity are known to be the easiest to cast into high-quality ingots, making them the alloys of choice for making large-sized structural parts. However, conventional EAs (CEAs) have never reached strength–ductility combinations

材料學院鐘雲波教授領銜的“高性能結構功能材料超常冶金與製備”研究團隊在《*Advanced Materials*》上發表題為“Strong-yet-ductile eutectic alloys employing cocoon-like nanometer-sized dislocation cells”最新論文。

基於多主元的高熵合金（HEAs）逐漸成為設計強韌性材料的新範式，與傳統合金相比，這種多主元合金具有更為廣闊的成分設計空間。然而，隨著主元數的增加，在提升強度的同時也不可避免地降低了合金的流動性，加劇了凝固時的偏析。即便採用複雜且耗時的機械熱處理也難以完全消除這種鑄造缺陷，對於製造理想微觀結構和組織均勻的大型構件帶來了重重挑戰。共晶高熵合金（EHEAs）為解決上述困境提供了新的思路，由於共晶反應在凝固過程中不存在固液兩相區（即糊狀區），而是通過均勻雙相層片的耦合生長，有效地抑制了化學成分偏析、縮孔等鑄造缺陷。因此，共晶高熵合金的設計理念為材料的工程應用提供了廣闊的前景。本研究以傳統共晶合金為研究物件，使用成分簡單的 NiFeAl 合金代替多主元合金，在兼顧製備工藝和製造成本的基礎上達到了性能的協同提升。

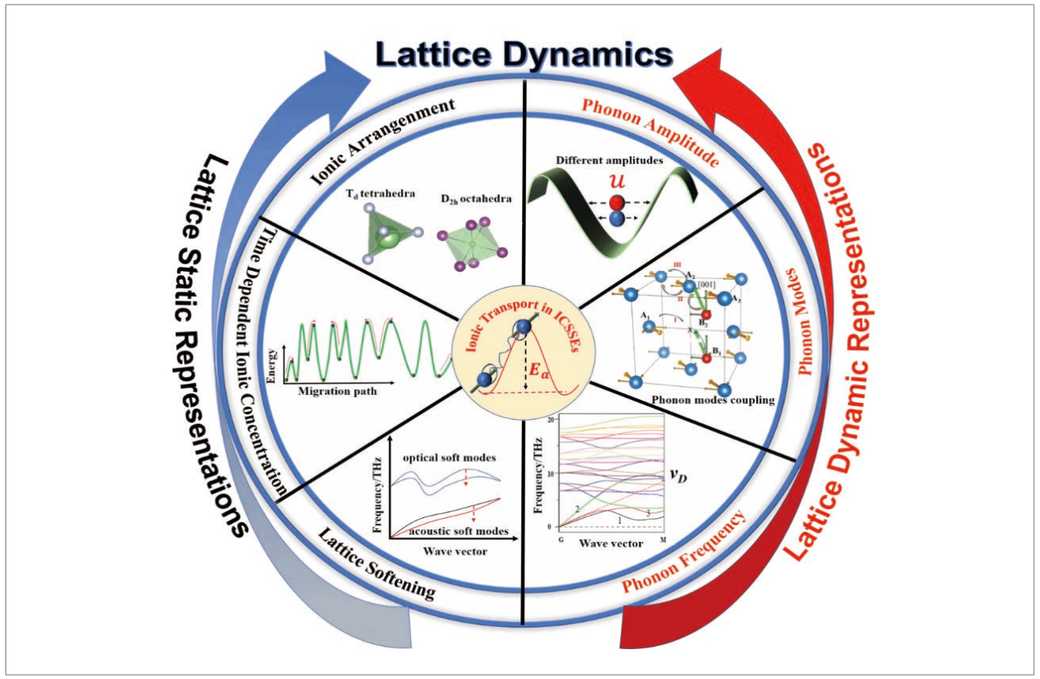
Article Link: https://doi.org/10.1002/adma.202405459

SONG Tao published his research in *Advanced Energy Materials*

材料學院博士研究生宋濤在《*Advanced Energy Materials*》發表研究成果

SONG Tao, a doctoral candidate from the School of Materials Science and Engineering at Shanghai University, has published a paper titled “Renewing fundamental understanding of ionic transport in inorganic crystalline solid-state electrolytes from the perspective of lattice dynamics” in *Advanced Energy Materials* (Impact Factor: 24.4). This research innovatively categorizes the factors influencing ionic transport in inorganic crystalline solid-state electrolytes into static lattice factors and dynamic lattice factors based on their variability in ionic transport. The study critically reviews the individual and combined effects of these factors on ionic transport behavior, enhancing the understanding of ionic transport mechanisms and promoting the design and development of inorganic crystalline solid-state electrolytes.

材料學院博士研究生宋濤以第一作者在國際能源材料頂級期刊《*Advanced Energy Materials*》（影響因數：24.4）發表題為“Renewing fundamental understanding of ionic transport in inorganic crystalline solid-state electrolytes from the perspective of lattice dynamics”的論文。該研究根據各因素在離子輸運中的可變性，創新性地將無機固態晶體電解質中離子輸運的影響因素劃分為晶格靜態因素和動態因素，批判性地評述了各因素對於離子輸運行為的單獨及綜合影響，有助於加深對離子輸運行為的理解，並推動無機固態晶體電解質的設計和研發。

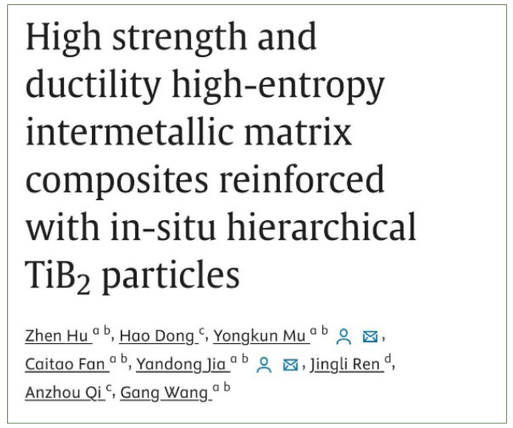


Article Link: https://doi.org/10.1002/aenm.202302440

HU Zhen published her latest research in *Composites Part B: Engineering*

材料学院胡珍在《*Composites Part B: Engineering*》發表最新研究成果

HU Zhen from the School of Materials Science and Engineering has recently published pioneering research in the journal *Composites Part B: Engineering*, introducing the extension of high-entropy alloy (HEAs) concepts into the realm of intermetallic compound systems (High-Entropy Intermetallic Compounds, HEIMCs). To achieve superior mechanical performance, the research team successfully synthesized a new class of HEIMCs featuring in-situ TiB2 nanoparticles using the advanced spark plasma sintering (SPS) technique. The developed material, with the specific composition Ni-43.9Co-22.4Fe-8.8Al-10.7Ti-11.7B-2.5, exhibits an ordered L12 intermetallic matrix structure ((Ni, Co, Fe)3(Al, Ti, Fe)) and a hexagonal close-packed (HCP) TiB2 nanophase reinforcement, whose average particle size is 28.05 ± 0.13 nm.


High strength and ductility high-entropy intermetallic matrix composites reinforced with in-situ hierarchical TiB_2 particles

Zhen Hu [a b], Hao Dong [c], Yongkun Mu [a b], Caitao Fan [a b], Yandong Jia [a b], Jingli Ren [d], Anzhou Qi [c], Gang Wang [a b]

Thanks to the intrinsic high-strength characteristics of the ordered L12 intermetallic matrix and the tailored heterogeneous distribution of TiB2 reinforcement, the material demonstrates an exceptionally high tensile strength of approximately 1.4 GPa. Furthermore, the study reveals that the dispersed TiB2 nanoparticles significantly hinder crack propagation through their synergistic interaction with unique disordered interfaces at the particle boundaries. These disordered interfaces, measuring between 5 and 10 nm in width, are crucial in delaying crack fractures and enhancing strain-hardening rates during plastic deformation. The developed HEIMCs overcome common limitations of conventional intermetallic compounds, such as brittleness, and achieve an excellent balance of strength and ductility. This breakthrough research offers a clear roadmap for designing next-generation in-situ reinforced HEIMCs with exceptional mechanical properties.

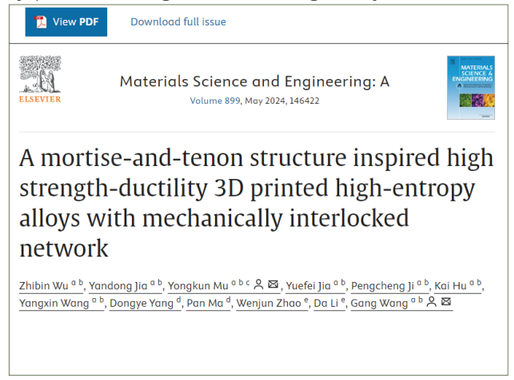
材料学院胡珍在《*Composites Part B: Engineering*》發表了高熵合金（HEAs）的概念擴展到了金屬間化合物系統的最新研究成果。為尋求材料更卓越的性能，團隊通過火花等離子燒結（SPS）技術成功製備了一種新型並含有原位合成 TiB2 納米顆粒的 Ni-43.9Co-22.4Fe-8.8Al-10.7Ti-11.7B-2.5 HEIMCs。所得到的 HEIMCs 塊材具有有序的 L12 結構的金屬間化合物基體 (Ni, Co, Fe)3(Al, Ti, Fe) 和六方密堆結構 (HCP) 的 TiB2 納米結構增強相，增強相的平均尺寸為 28.05 ± 0.13 nm。由於 L12 金屬間化合物基體的固有高強度和 TiB2 增強的異質分佈，HEIMCs 表現出了約 1.4 GPa 的優異抗拉強度。同時，團隊研究發現 TiB2 納米顆粒在阻礙裂紋傳播和與顆粒介面上的獨特無序介面協同作用方面起到了關鍵作用。團隊還在 HEIMCs 中發現了獨特的無序介面，其平均寬度在 5-10nm 範圍內，可延緩斷裂和提高塑性變形時的應變硬化速率。團隊製備的 HEIMCs 克服了傳統金屬間化合物通常存在的局限性，並提供出色的強度和延展性平衡。這項研究結果有望為設計具有優異力學性能的原位增強 HEIMCs 提供清晰的思路。

Article Link: https://doi.org/10.1016/j.compositesb.2024.111556

WU Zhibin published his research in *Materials Science and Engineering: A*

材料学院吴智濱在 *Materials Science and Engineering: A* 上發表最新研究成果

Wu Zhibin from Shanghai University has recently published a groundbreaking study in *Materials Science and Engineering: A* (2024), addressing the development of flexible, high-performance materials. The study highlights how designing unique heterogeneous structures provides an effective strategy to resolve the longstanding trade-off between strength and ductility. Drawing inspiration from the architectural versatility and mechanical creativity of traditional dovetail joints, the research team engineered a novel Mechanical Interlocking Network (MIN) in 3D-printed high-entropy alloys (HEAs). The structural crosslinking at the subgrain level not only mirrors the mechanical interlocking of dovetail joints but also replicates their ability to enhance the mechanics of the MIN structure.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Materials Science and Engineering: A

Volume 899, May 2024, 146422

A mortise-and-tenon structure inspired high strength-ductility 3D printed high-entropy alloys with mechanically interlocked network

Zhibin Wu [a b], Yandong Jia [a b], Yongkun Mu [a b c], Yuefei Jia [a b], Pengcheng Ji [a b], Kai Hu [a b], Yangxin Wang [a b], Dongye Yang [d], Pan Ma [d], Wenjun Zhao [e], Da Li [e], Gang Wang [a b]

The designed MIN structure delivers superior structural stability, effectively redistributing stress during deformation to grain boundaries, which prevents stress concentration and mitigates catastrophic fractures caused by crack propagation. These innovative features enabled the alloy to achieve an outstanding tensile strength of nearly 1200 MPa alongside a remarkable elongation of approximately 28%. The superior mechanical properties of the alloy stem from several key mechanisms, including strengthening and hardening effects induced by heterogeneous deformation, dislocation entanglement, the presence of high-density stacking faults, and the formation of robust Lomer-Cottrell locks. These findings showcase the potential of integrating MIN heterogeneous structures to significantly enhance the mechanical performance of HEAs, opening the door to creating high-performance materials with versatile manufacturability.

材料学院吴智濱在 *Materials Science and Engineering: A*（2024）上發表製造靈活性的高性能材料的開發的最新研究成果。設計特殊的非均勻結構已被證明是突破強度和塑性矛盾的有效策略。在這項工作中，團隊從榫卯接頭的建築完整性和機械獨創性（傳統工藝的標誌）中汲取靈感，在 3D 列印的高熵合金（HEA）中設計了一種新穎的機械互鎖網路（MIN）。亞晶交聯不僅在結構上模仿了接頭，而且再現了其改變 MIN 力學性能的功能。MIN 結構提供了優異的結構穩定性，並在變形過程中分散了晶界處的應力，從而避免了應力集中及其導致的裂紋擴展引起的災難性斷裂。該合金的抗拉強度近 1200 MPa，延伸率約為 28%，其卓越性能歸因於一系列潛在機制，包括異質變形誘導的強化和硬化效應、位錯纏結、高密度堆垛層錯以及 Lomer-Cottrell 鎖的形成。這些現象證明了引入 MIN 異質結構增強 HEA 的力學性能的可行性，該研究促進了具有製造靈活性的高性能材料的開發。

Article Link: https://doi.org/10.1016/j.msea.2024.146422

FAN Caitao published his research in *Virtual and Physical Prototyping*

材料学院範才濤在 *Virtual and Physical Prototyping* 發表最新研究成果

Fan Caitao from Shanghai University has recently published groundbreaking research in *Virtual and Physical Prototyping* (2024), providing novel insights and manufacturing strategies for unlocking the potential of advanced intermetallic alloys. Although traditional intermetallic compounds often suffer from poor machinability and high susceptibility to cracking during additive manufacturing, this study successfully demonstrates the fabrication of crack-free and high-performance Chemically Complex Intermetallic Alloys (CCIMAs) through electron beam powder bed fusion (EBPBF).

The EBPBF-processed CCIMAs (NiCoFeAlTiB) exhibit a highly intricate microstructure, characterized by multiphase compositions. Specifically, a disordered FCC phase serves as the material's matrix, interwoven with ordered intermetallic phases in an L12 lattice structure. By fine-tuning the interplay between the ordered lattice and high-entropy disordered phases through an optimized EBPBF process, the researchers achieved exceptional mechanical performance in the material, including a commendable tensile strength of approximately 1 GPa and a balanced ductility of around 11%. The study also unveiled that the presence of HCP and L21 precipitation phases plays an integral role in slowing and ultimately halting crack propagation.

This research underscores the feasibility of leveraging EBPBF to fabricate CCIMAs with customizable microstructures, offering essential new strategies and insights for the advancement of intermetallic materials and their applications.

材料学院範才濤在 *Virtual and Physical Prototyping* (2024) 上發表挖掘先進金屬間合金的潛力的見解和製造策略最新研究成果。傳統的金屬間化合物缺乏可加工性，在增材製造過程中容易產生裂紋，而本項工作證明了通過電子束粉末床融化（EBPBF）可成功製造出無裂紋且高性能的化學複雜型金屬間合金 (CCIMAs)。由 EBPBF 製造的 CCIMAs (NiCoFeAlTiB) 微觀結構非常複雜，呈現出多相組成，其中無序的 FCC 相構成基體，與 L12 有序的金屬間相交錯。有序晶格和高熵無序相的獨特組合通過優化的 EBPBF 工藝進行了調整，賦予了該材料優異的機械性能，包括較高的拉伸強度（約 1 GPa）和足夠的延展性（約 11%）。研究發現，HCP 和 L21 析出相也能有效減緩和阻止裂紋擴展。這項工作展示了利用 EBPBF 製造具有定制微結構的 CCIMAs，這將為挖掘先進金屬間合金的潛力提供新的見解和製造策略。

Article Link: https://doi.org/10.1080/17452759.2024.2356733

Dr. JIA Yuefei and Dr. XU Long published their research in *Journal of Materials Science & Technology*

材料学院賈嶽飛賈嶽飛博士和徐龍博士在 *Journal of Materials Science & Technology* 發表最新研究成果

Under the postdoctoral supervision of Professor Jia Yuefei, Dr. Xu Long (currently a lecturer at Jiangsu University of Science and Technology) has recently published groundbreaking research in *Journal of Materials Science & Technology* (2024), detailing the fabrication and processing of kilogram-scale HfNbTaTiZr refractory high-entropy alloys (HEAs) and paving the way for their high-temperature applications.

This study highlights the potential of suspension melting, combined with high-temperature multidirectional forging, as a viable route for the scalable production of kilogram-scale HfNbTaTiZr alloys. The exceptional high-temperature mechanical performance of the material is attributed to the lattice defects effectively introduced into alloy grains through precise high-temperature forging processes. These defects enhance the alloy's thermal stability and strength at elevated temperatures.

The research marks a significant step forward in developing scalable methods for fabricating kilogram-scale HfNbTaTiZr refractory HEAs and establishes a solid foundation for their practical applications in high-temperature environments.

材料学院賈嶽飛博士和徐龍博士（現為江蘇科技大學講師）在 *Journal of Materials Science & Technology*(2024) 上發表製造和加工公斤級 HfNbTaTiZr 難熔高熵合金及其在高溫下應用奠定基礎最新研究成果。

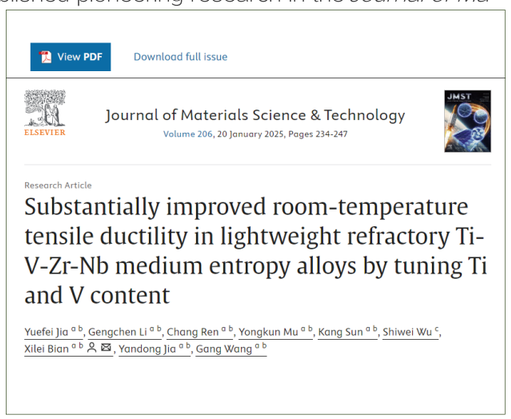
研究結果表明，懸浮熔煉和高溫多向鍛造有望規模化製造公斤級 HfNbTaTiZr 難熔高熵合金，其在高溫下優異的力學表現歸功於高溫鍛造在合金晶內引入的晶格缺陷。本研究為製造和加工公斤級 HfNbTaTiZr 難熔高熵合金及其在高溫下應用奠定基礎。

Article Link: https://doi.org/10.1016/j.jmst.2024.04.078

Dr. JIA Yufei published his research in *Journal of Materials Science & Technology*

材料学院賈嶽飛博士在 *Journal of Materials Science & Technology* 發表最新研究成果

Dr.Jia Yuefei from Shanghai University has published pioneering research in the *Journal of Materials Science & Technology* (2024), revealing innovative approaches and future directions for lightweight refractory medium-entropy alloys.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ELSEVIER

Journal of Materials Science & Technology

Volume 206, 20 January 2025, Pages 234-247

Research Article

Substantially improved room-temperature tensile ductility in lightweight refractory Ti-V-Zr-Nb medium entropy alloys by tuning Ti and V content

Yuefei Jia [a b], Gengchen Li [a b], Chang Ren [a b], Yongkun Mu [a b], Kang Sun [a b], Shiwei Wu [c], Xilei Bian [a b] ✉, Yandong Jia [a b], Gang Wang [a b]

The study addresses a persistent challenge in materials science while simultaneously unlocking new possibilities for engineering applications. Through precise and systematic modulation of titanium and vanadium content, Jia's team discovered a fundamental ductility mechanism unique to these alloys. This breakthrough enables a critical transition from brittle intergranular fracture to more desirable ductile fracture behavior. More impressively, the team demonstrated that the deformation mechanism could evolve from limited single-slip systems to multiple cooperative slip modes without compromising the alloy's inherent strength properties.

The research highlights the remarkable case of (Ti1.5V)3ZrNb, which achieved an extraordinary 360% improvement in elongation compared to conventional equimolar TiVZrNb medium-entropy alloys, while still maintaining an impressive yield strength of approximately 800 MPa. This exceptional combination of strength and ductility stems from two key effects of elemental composition adjustment: the purification of grain boundaries through reduction of detrimental phases, and the strategic regulation of dislocation configurations during deformation.

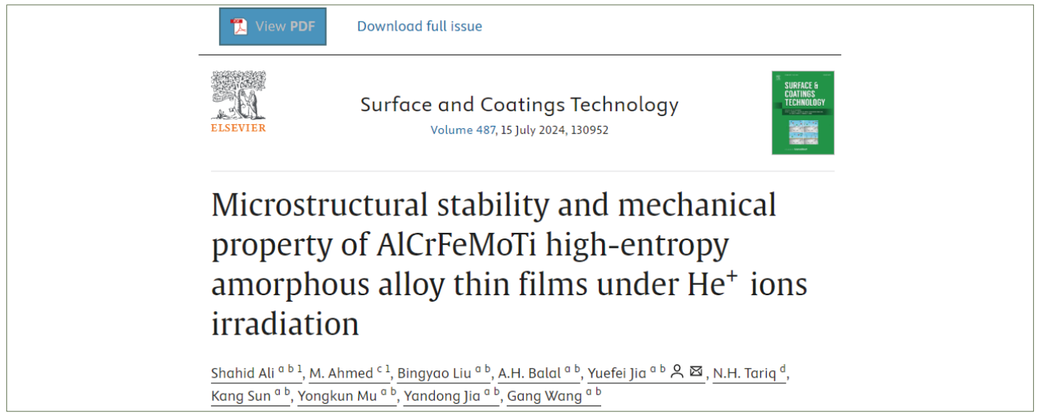
These findings represent a significant advancement in alloy design strategy, offering transformative insights for developing next-generation lightweight refractory medium-entropy alloys with optimized performance characteristics for demanding applications.

材料学院賈嶽飛博士在 *Journal of Materials Science & Technology* 上發表輕質難熔中熵合金的應用新思路和方向的最新研究成果。這項研究不僅解決了科學家們長期以來的困擾，還為工程應用開闢了新的可能性。具體來說，通過系統調節 Ti 和 V 的含量，研究人員揭示了一種內在的延展性機制。這種機制使得斷裂形式從晶間脆性斷裂向韌性斷裂轉變。此外，調控後的變形機制也從單一滑移模式演變為多重協同滑移模式，而合金的強度並未明顯降低。以 (Ti1.5V)3ZrNb 為例，相比等摩爾比的 TiVZrNb 中熵合金，其延伸率提高了 360%，同時保持了約 800 MPa 的高屈服強度。這一成果顯示，合金構成元素的調控不僅通過減少有害相而淨化晶界，還調控了變形位錯構型。這些見解為輕質難熔中熵合金的應用提供了新的思路和方向。

Article Link: https://doi.org/10.1016/j.jmst.2024.04.020

Dr. JIA Yufei and international student Shahid Ali published their latest research in *Surface and Coatings Technology*

材料学院賈嶽飛博士和國際學生 Shahid Ali 在 *Surface and Coatings Technology* 發表最新研究成果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ELSEVIER

Surface and Coatings Technology

Volume 487, 15 July 2024, 130952

Microstructural stability and mechanical property of AlCrFeMoTi high-entropy amorphous alloy thin films under He^+ ions irradiation

Shahid Ali [a b 1], M. Ahmed [c 1], Bingyao Liu [a b], A.H. Balal [a b], Yuefei Jia [a b] ✉, N.H. Tariq [d], Kang Sun [a b], Yongkun Mu [a b], Yandong Jia [a b], Gang Wang [a b]

Under the postdoctoral supervision of Dr. Jia Yuefei from Shanghai University, international student Shahid Ali has made significant strides in material science by publishing an insightful study in *Surface and Coatings Technology* (2024), focusing on the selection of structural materials for advanced nuclear reactors. In the realm of fourth-generation nuclear energy systems, AlCrFeMoTi high-entropy amorphous films have emerged as a highly promising candidate material due to their outstanding radiation resistance, opening up new opportunities for nuclear industry applications.

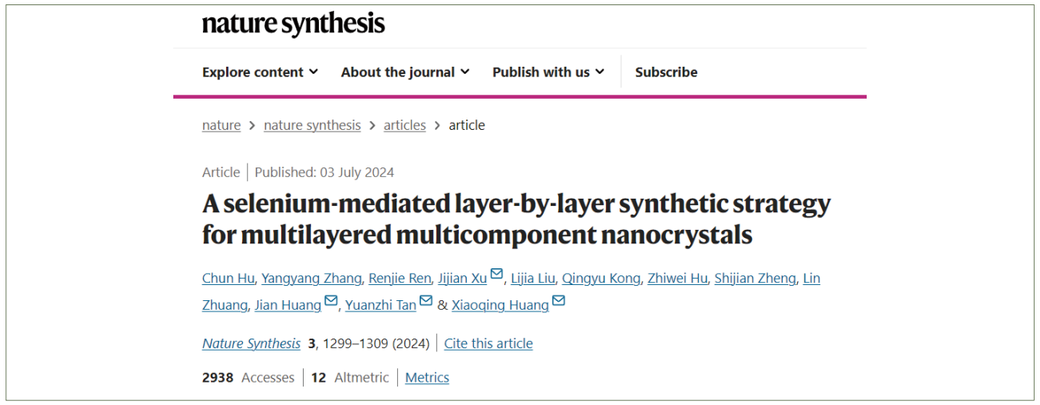
The research successfully synthesized equiatomic AlCrFeMoTi high-entropy amorphous films using advanced magnetron sputtering technology. Subsequent low-dose helium ion irradiation experiments showed that increasing radiation doses triggered an ordering transition in the internal structure of the films, resulting in a noticeable improvement in hardness and a smoother surface. These findings are pivotal, as they underline both the radiation stability of high-entropy amorphous materials and their remarkable potential for optimizing mechanical properties under extreme conditions. This work enhances the understanding of radiation-induced structural evolution in advanced materials and provides vital guidance for selecting future structural materials for nuclear reactors.

材料学院賈嶽飛博後指導，國際留學生 Shahid Ali 完成在 *Surface and Coatings Technology*(2024) 上發表核反應爐結構材料選擇的最新研究成果。在探索第四代核能系統的關鍵材料中，AlCrFeMoTi 高熵非晶薄膜展現出卓越的輻射抗性，為核工業應用提供了新的可能性。本研究通過磁控濺射技術成功合成了等原子比的 AlCrFeMoTi 高熵非晶薄膜，並對其進行了低劑量氦離子輻照實驗。實驗結果表明，隨著輻照劑量的增加，薄膜內部結構發生了有序化轉變，硬度顯著提升，而表面卻變得更加平滑。這一發現不僅揭示了高熵非晶材料在輻射環境下的穩定性和機械性能的優化潛力，也為未來核反應爐結構材料的選擇提供了重要的科學依據。

Article Link: https://doi.org/10.1016/j.surfcoat.2024.130952

Prof. HUANG Jian from the Materials Genome Institute led an international team of researchers to publish a pioneering study in *Nature Synthesis*

材料基因組工程研究院黃健研究員在《*Nature* Synthesis》發表題最新研究成果



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Article | Published: 03 July 2024

A selenium-mediated layer-by-layer synthetic strategy for multilayered multicomponent nanocrystals

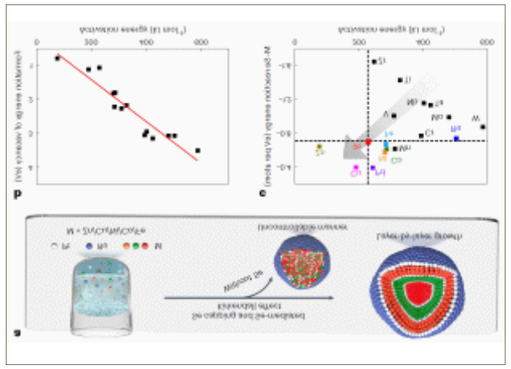
Chun Hu, Yangyang Zhang, Renjie Ren, Jijian Xu ✉, Lijia Liu, Qingyu Kong, Zhiwei Hu, Shijian Zheng, Lin Zhuang, Jian Huang ✉, Yuanzhi Tan ✉ & Xiaoqing Huang ✉

Nature Synthesis **3**, 1299–1309 (2024) | Cite this article

2938 Accesses | **12** Altmetric | Metrics

The paper is entitled ‘A selenium-mediated layer-by-layer synthetic strategy for multilayered multicomponent nanocrystals’, which is a collaboration between Prof. Huang Jian and Prof. Huang Xiao-Qing of Xiamen University. The team discovered that during the nucleation and growth process of nanocrystals, selenous acid molecules play a crucial role in inhibiting self-assembly, agglomeration, and phase separation. This is achieved through the selenium capping effect and differences in the bonding strength between selenium and various metals. This approach allows for the precise control of nanocrystal structure, yielding multicomponent materials with small particle sizes and ordered, layer-by-layer growth characteristics. Importantly, this selenium-mediated strategy could also extend to the synthesis of other multicomponent multilayered noble-metal-based nanocrystals, including palladium (Pd), ruthenium (Ru), and rhodium (Rh), making it a highly versatile and promising method for advanced nanomaterial development.

该成果由黃健研究员和廈門大學黃小青教授團隊等國內外多所高校與科研機構團隊合作完成，文章題為“A selenium-mediated layer-by-layer synthetic strategy for multilayered multicomponent nanocrystals。研究發現，在納米粒子成核生長過程中，由於硒封蓋效應以及金屬－硒鍵合強度的差異，硒酸分子能夠有效地抑制其自組裝、團聚以及相分離，進而獲得具有小尺寸、逐層生長有序結構特徵的納米粒子。此外，該策略也極有希望應用於其他貴金屬基（如鈀、釕、銠等）多组分多层納米粒子的製備合成。



Article Link: https://www.nature.com/articles/s44160-024-00598-2

YU Tao published his research in *IEEE Journal on Selected Areas in Communications*

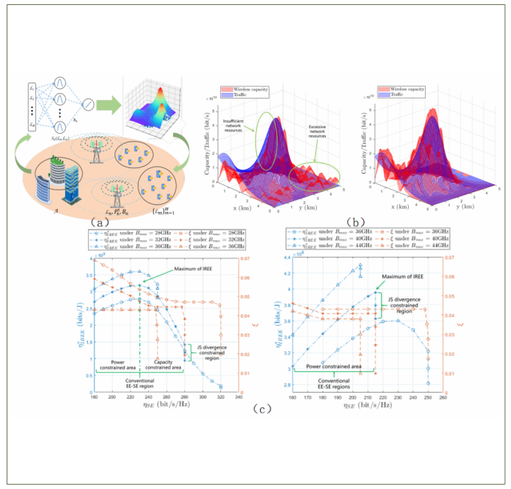
通信與信息工程學院博士研究生余濤在《*IEEE Journal on Selected Areas in Communications*》發表研究成果

PhD student Yu Tao from the School of Communication and Information Engineering, Shanghai University, under the supervision of Professor Zhang Shunqing, recently published a research paper titled “IREE Oriented Green 6G Networks: A Radial Basis Function Based Approach” as the lead author in *IEEE Journal on Selected Areas in Communications*.

To tackle the rising energy consumption of networks and the spatiotemporal diversity in traffic demand, while establishing new design guidelines for high-energy-efficiency 6G networks, the research team developed an optimization framework based on Radial Basis Function (RBF) to maximize Integrated Relative Energy Efficiency (IREE).

Unlike traditional energy-efficient approaches, the study employs a SE-based (Spectral Efficiency) RBF network to optimize network utility under a given IREE and iteratively enhances IREE using the proposed Dinkelbach’s algorithm. Numerical results reveal that compared to conventional EE-oriented designs, the proposed method achieves a remarkable IREE improvement of 123.0% - 185.9%, significantly outperforming existing energy-efficient algorithms.

Furthermore, by examining the IREE-SE trade-off across different traffic demands, the study suggests that wireless network operators should focus on balancing traffic demand and network capacity distribution to maximize IREE performance, particularly in urban areas with high spatial traffic fluctuations.



通信與信息工程學院博士研究生余濤在導師張舜卿教授的指導下，以第一作者在《*IEEE Journal on Selected Areas in Communications*》發表題為“IREE Oriented Green 6G Networks: A Radial Basis Function Based Approach”的研究論文。

为了應對日益增長的網路能耗以及差異化的流量時空分佈，同時為高能效 6G 網路提供新的設計指南，研究團隊提出了一種基於徑向基函數（Radial Basis Function，RBF）的新型無線網路部署優化框架以最優化集成相對能效（Integrated Relative Energy Efficiency，IREE）指標。與傳統的節能優化方案不同，團隊研究使用基於頻譜效率（Spectral Efficiency，SE）的 RBF 網路以最大化給定 IREE 的下的網路效用，並使用提出的丁克爾巴赫演算法逐步提升 IREE。通過數值實驗，研究團隊發現，與傳統的面向 EE 的高能效設計相比，該方案的 IREE 顯著提高了 123.0%~185.9%，優於現有高能效演算法。此外，通過研究不同流量需求下的集成相對能效－譜效權衡，團隊研究建議無線網路運營商應花費更多精力來平衡流量需求和網路容量的分佈，以提高 IREE 性能，尤其是當流量分佈的空間變化較為顯著時（如城市區域）。

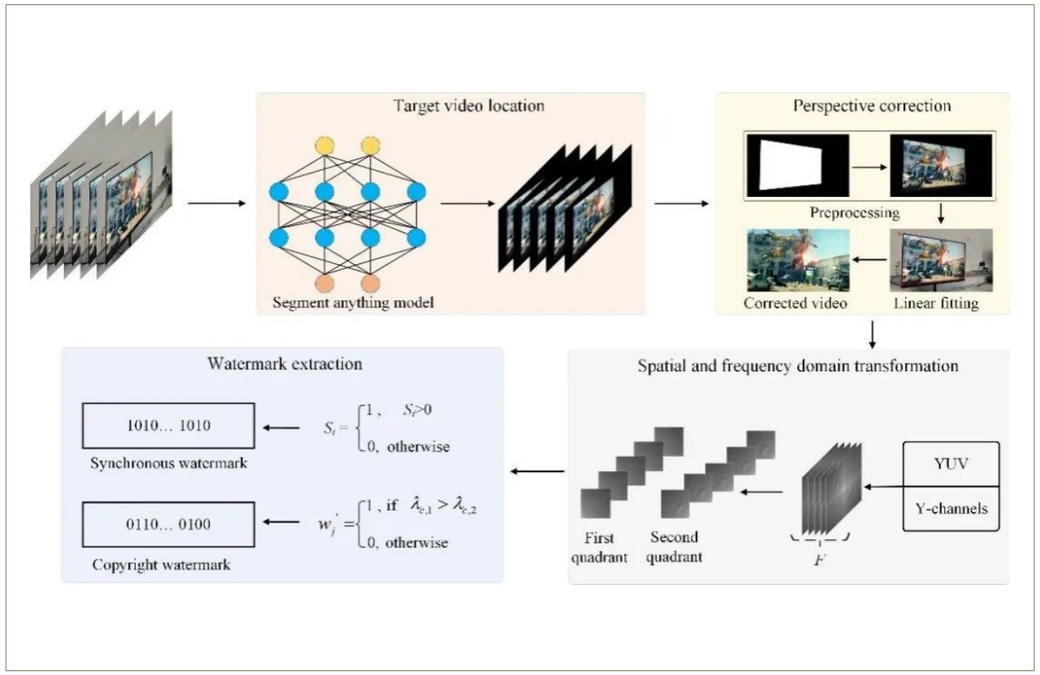
Article Link: https://ieeexplore.ieee.org/document/10605762

LIN Lina published her research in *IEEE Transactions on Circuits and Systems for Video Technology*

通信與信息工程學院碩士研究生林麗娜在《*IEEE Transactions on Circuits and Systems for Video Technology*》發表研究成果

Master's student Lin Lina from the School of Communication and Information Engineering, Shanghai University, under the supervision of Associate Professor Wu Hanzhou, has recently published a study titled "Automatic, Robust and Blind Video Watermarking Resisting Camera Recording" in the high-impact journal *IEEE Transactions on Circuits and Systems for Video Technology*. Associate Professor Wu Hanzhou and Dr. Wu Deyang serve as the corresponding authors. By leveraging a segmentation model and the frequency domain characteristics of video, this method enhances watermark robustness and imperceptibility while enabling fully automated watermark extraction in recorded video scenarios.

通信與信息工程學院碩士研究生林麗娜在導師吳漢舟副教授的指導下，以第一作者在《*IEEE Transactions on Circuits and Systems for Video Technology*》(IF：8.3) 上發表題為"Automatic, Robust and Blind Video Watermarking Resisting Camera Recording"的研究論文，吳漢舟副教授、吳德陽博士為通訊作者。本文基於分割模型和視頻的頻域資訊，提出了一種全自動抵抗攝像機錄製的魯棒盲視頻水印方案，在保證水印魯棒性和不可感知性的前提下，使得在錄製場景下水印提取工作更加自動化。



Article Link: https://ieeexplore.ieee.org/document/10644044

Prof. WEN Jianxiang led his team to publish their latest research in *ACS Photonics*

文建湘教授課題組在《*ACS Photonics*》發表最新研究成果

Professor Wang Tingyun's research team from the Key Laboratory of Special Optical Fibers and Optical Access Networks, Chinese Ministry of Education, Shanghai University, specifically Professor Wen Jianxiang's group, has recently published a study titled "Over 252 mW Circularly Polarized Vortex Fiber Laser with Intracavity Tunable Helicity and Chirality via a High-Gain and High-Birefringent Active Fiber" in the high-impact journal *ACS Photonics*.The first author of this study is Wu Yan, a PhD student at the School of Communication and Information Engineering, Shanghai University.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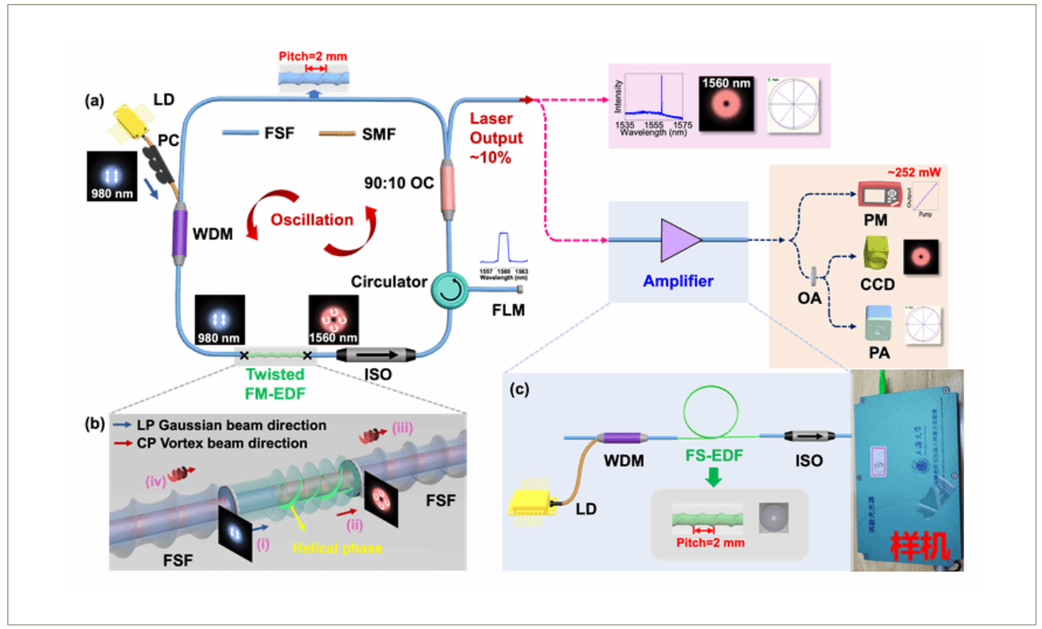
ARTICLE | August 10, 2024
Over 252 mW Circularly Polarized Vortex Fiber Laser with Intracavity Tunable Helicity and Chirality via a High-Gain and High-Birefringent Active Fiber
Yan Wu, Jianxiang Wen*, Yinghui Lu, Fengzai Tang, Geoff West, Yanhua Luo, Fufei Pang, Gang-Ding Peng, and Tingyun Wang

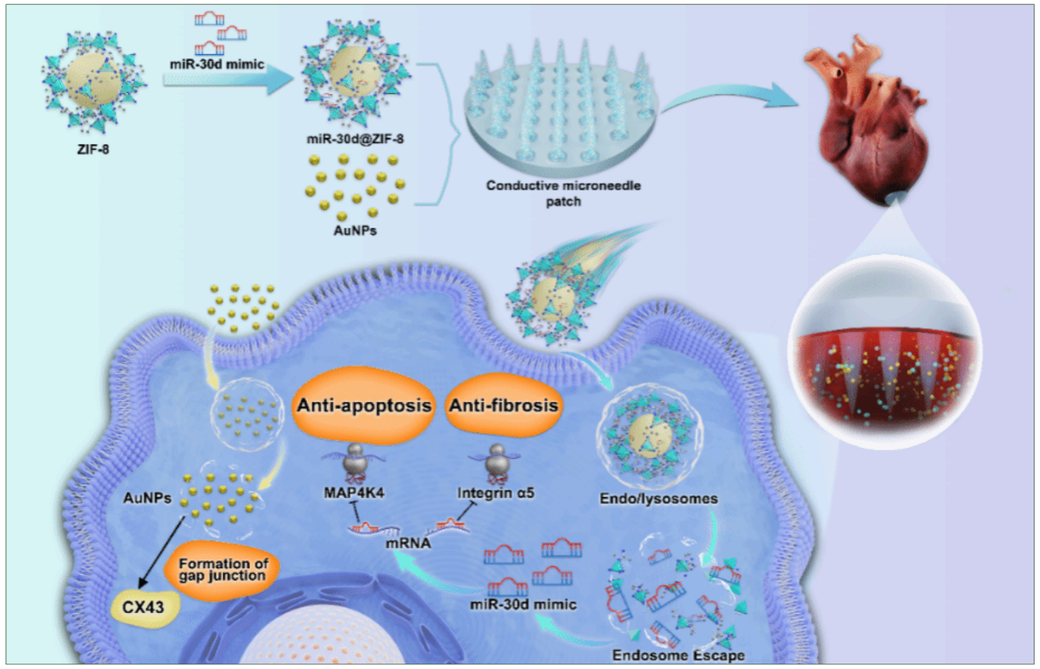
特種光纖與光接入網省部共建重點實驗室王廷雲教授研究團隊的文建湘教授課題組在國際光學領域著名期刊《*ACS Photonics*》發表題為"Over 252 mW Circularly Polarized Vortex Fiber Laser with Intracavity Tunable Helicity and Chirality via a High-Gain and High-Birefringent Active Fiber"的最新研究成果。第一作者為上海大學通信學院博士研究生吳妍。



Article Link: https://pubs.acs.org/doi/abs/10.1021/acsphotonics.4c01022

Dr. CHEN Xuerui and Prof. BEI Yihua published their latest research in *ACS Nano*

陳雪瑞和貝毅樺教授在 *ACS Nano* 发表最新研究成果



CHEN Xuerui and BEI Yihua from the School of Life Sciences and Institute of Cardiovascular Sciences at Shanghai University have recently published their latest research titled "Nanoparticle–Patch System for Localized, Effective, and Sustained miRNA Administration into Infarcted Myocardium to Alleviate Myocardial Ischemia–Reperfusion Injury" in *ACS Nano*, a leading journal in nanoscience and nanotechnology.

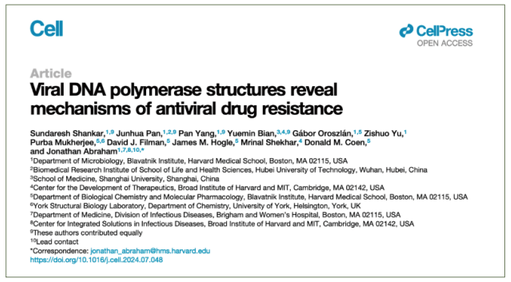
Their study presents an innovative miRNA nanodelivery system based on a conductive microneedle patch. This system enables localized, efficient, and sustained delivery of miR-30d directly to the infarcted myocardial tissue, significantly alleviating myocardial ischemia–reperfusion injury.

生命科學學院、上海大學心血管研究所陳雪瑞 / 貝毅樺在 *ACS Nano* 雜誌線上發表了題為"Nanoparticle–Patch System for Localized, Effective, and Sustained miRNA Administration into Infarcted Myocardium to Alleviate Myocardial Ischemia–Reperfusion Injury"的最新研究成果。該研究構建了一種由導電微針貼片負載的 miRNA 納米遞送系統，通過 miR-30d 在梗死心肌處的局部、高效和持續給藥，改善心肌缺血再灌注損傷。

Article Link: https://pubs.acs.org/doi/10.1021/acsnano.3c08811

Prof. BIAN Yuemin as a co-first author published a research paper in *Cell*

醫學院卞月珉教授作为共同第一作者在《*Cell*》发表最新研究論文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Article

Viral DNA polymerase structures reveal mechanisms of antiviral drug resistance

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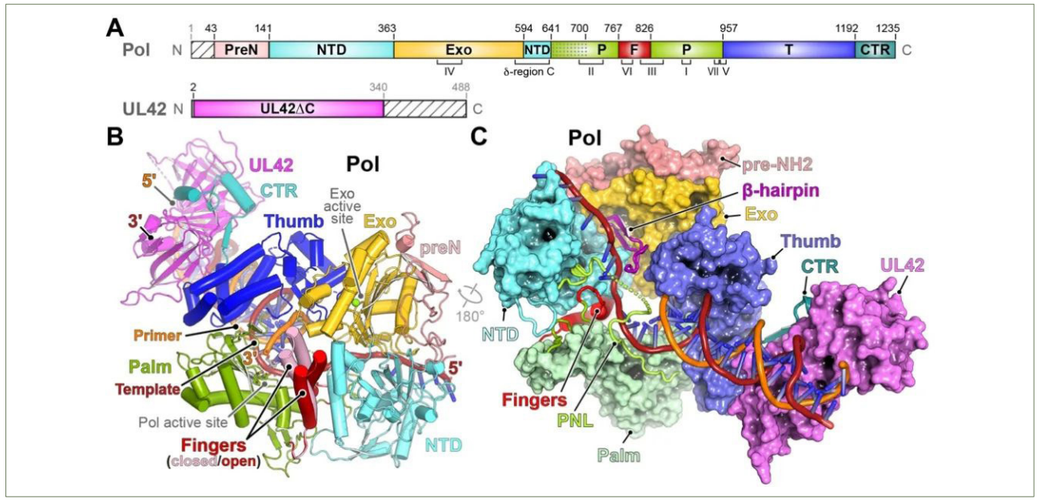
Professor Bian Yuemin from the School of Medicine, Shanghai University, in collaboration with Professor Jonathan Abraham from Harvard Medical School, has published a research paper as a co-first author in the prestigious journal *Cell*. The study, titled "Viral DNA polymerase structures reveal mechanisms of antiviral drug resistance," provides key structural insights into the mechanisms underlying antiviral drug resistance.

This research presents the first complete structural visualization of the DNA-bound herpes simplex virus (HSV) polymerase holoenzyme in multiple conformations, as well as its interactions with clinically used antiviral drugs. The HSV polymerase functions as a heterodimer, comprising Pol, the catalytic subunit, and UL42, a processivity factor that facilitates long-chain DNA synthesis. Structurally, Pol features the characteristic thumb, palm, and finger domains, along with a 3'–5' exonuclease (Exo) domain and an N-terminal domain (NTD). Meanwhile, UL42 strongly associates with DNA as a monomer.

醫學院卞月珉教授與美國哈佛大學醫學院 Jonathan Abraham 教授團隊合作，作為共同第一作者，在國際頂級期刊《*Cell*》上發表題為 Viral DNA polymerase structures reveal mechanisms of antiviral drug resistance 的研究論文。

該研究首次揭示了多種構象下與 DNA 結合的單純皰疹病毒聚合酶全酶（DNA-bound herpes simplex virus polymerase holoenzyme），以及其與臨床使用的抗病毒藥物的相互作用。HSV 聚合酶是由 Pol 和一個促進長鏈 DNA 合成的過程性亞基（UL42）組成的異二聚體。HSV Pol 具有典型的拇指、手掌和手指域，3'-5' 外切酶域（Exo），以及 NH2 末端域（NTD），UL42 作為單體緊密結合 DNA。



Article Link: https://doi.org/10.1016/j.cell.2024.07.048

A. Prof. LU Zeqi published the latest research in *Nature Communications*

力學與工程科學學院陸澤琦副研究員在《*Nature Communications*》發表最新研究成果

Associate Researcher LU Zeqi from the School of Mechanics and Engineering Science, Shanghai University, in collaboration with partner institutions, has recently published a study titled ‘Ocean wave energy harvesting with high energy density and self-powered monitoring system’ in *Nature Communications*, a leading journal in interdisciplinary science.

A Marine Internet of Things (IoT) requires reliable, real-time ocean monitoring, yet the widespread deployment of ocean sensors makes power supply and data transmission via cables impractical. As a solution, ocean monitoring systems must incorporate sustainable power sources and wireless transmission capabilities.

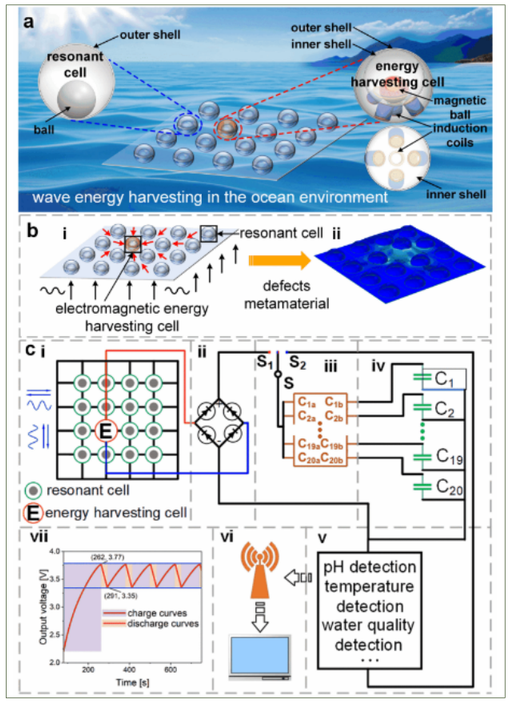
By optimizing integrated dynamic matching across materials, structures, and signal transmission, the research team designed a high-strength, adaptable, and floatable metamaterial-based energy harvester. This self-powered system overcomes the limitations of cables and batteries in ultra-low-frequency wave environments (1–2 Hz), enabling continuous monitoring of ocean parameters with wireless data transmission to the cloud for real-time processing.

Unlike solar and wind energy in marine environments, this energy harvester—leveraging metamaterial defect states—achieves an energy density of 81 W/m^3, significantly improving energy conversion efficiency. For the first time, this system enables a stable 24/7 power supply for ocean monitoring across various weather conditions.

Article Link: https://doi.org/10.1038/s41467-024-50926-5

上海大學力學與工程科學學院陸澤琦副研究員與合作單位團隊在國際著名期刊《*Nature Communications*》(IF=16.6) 上發表題為“Ocean wave energy harvesting with high energy density and self-powered monitoring system”的研究成果。

構建海洋物聯網需要一個必不可少的海洋環境監測系統。然而，現有的廣泛分佈的海洋監測感測器使得通過電纜提供電力和傳輸監測資訊變得不切實際。因此，海洋環境監測系統特別需要持續的電源和無線傳輸能力來監測資訊。團隊通過材料、結構和信號傳輸的集成動態匹配優化，設計了一種高強度、環境多相容、可漂浮的超材料能量收集裝置。自供電監測系統突破了電纜和電池在超低頻波環境（1至2 Hz）中的局限性，能夠即時監測各種海洋參數，並將資料無線傳輸到雲端進行後處理。與海洋環境中的太陽能和風能相比，基於超材料缺陷態特性的能量收集裝置實現了高能量密度（81 W/m3）。首次實現了監控系統在各種天氣條件下（24 小時）的穩定供電。



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