上海大学 SHANGHAI UNIVERSITY

SHUGLØBAL SHANGHAI UNIVERSITY 上海大学国际部

NEWSLETTER

2023 OCTOBER

RESEARCH

Shanghai University (hereinafter referred to as SHU) is one of the top 40 Chinese universities, top 100 Asian universities, the premier university of Shanghai, and a member of China Project 211 Universities. It is a comprehensive university offering 101 undergraduate programs, 180 graduate programs, and 95 doctoral programs in various disciplines including science, humanities & social sciences, engineering, economics & management, art, etc.

SHU was founded in 1922, and has been developed into a university with profound academic traditions and outstanding research facilities, embracing students from various countries with its global outlook. Just like the city of Shanghai, SHU has undergone dramatic changes in the past few decades，turning into a multicultural community with tremendous opportunities and resources.

SHU is inspired to build a highly effective platform for "Developing Talent", "Conducting Science & Technology Research", and "Serving Society". Faculty and students can grow together in a supportive and pleasant learning environment. Through the continuous improvement of the "All-round and whole-person" education model, SHU aims at providing society graduates cultivated with global vision, citizenship consciousness, humanity mindset, innovative spirit and practical ability to meet future challenges. The university currently has 18986 graduate students, 19877 undergraduate students, and 2229 international students. Students graduated from SHU are widely welcomed by employers from various firms and companies.

There are currently 3482 faculty members working for the university, including 814 professors and 1119 associate professors,7 Highly Cited Researchers. Based on the contribution of our top-level faculty and diligent students, SHU has achieved collaboration with 251 universities in 55 nations and regions, managing 5 Confucius Institutes with partners in South America, Europe, Asia, etc.

ShanghaiUniversity:https://en.shu.edu.cn/
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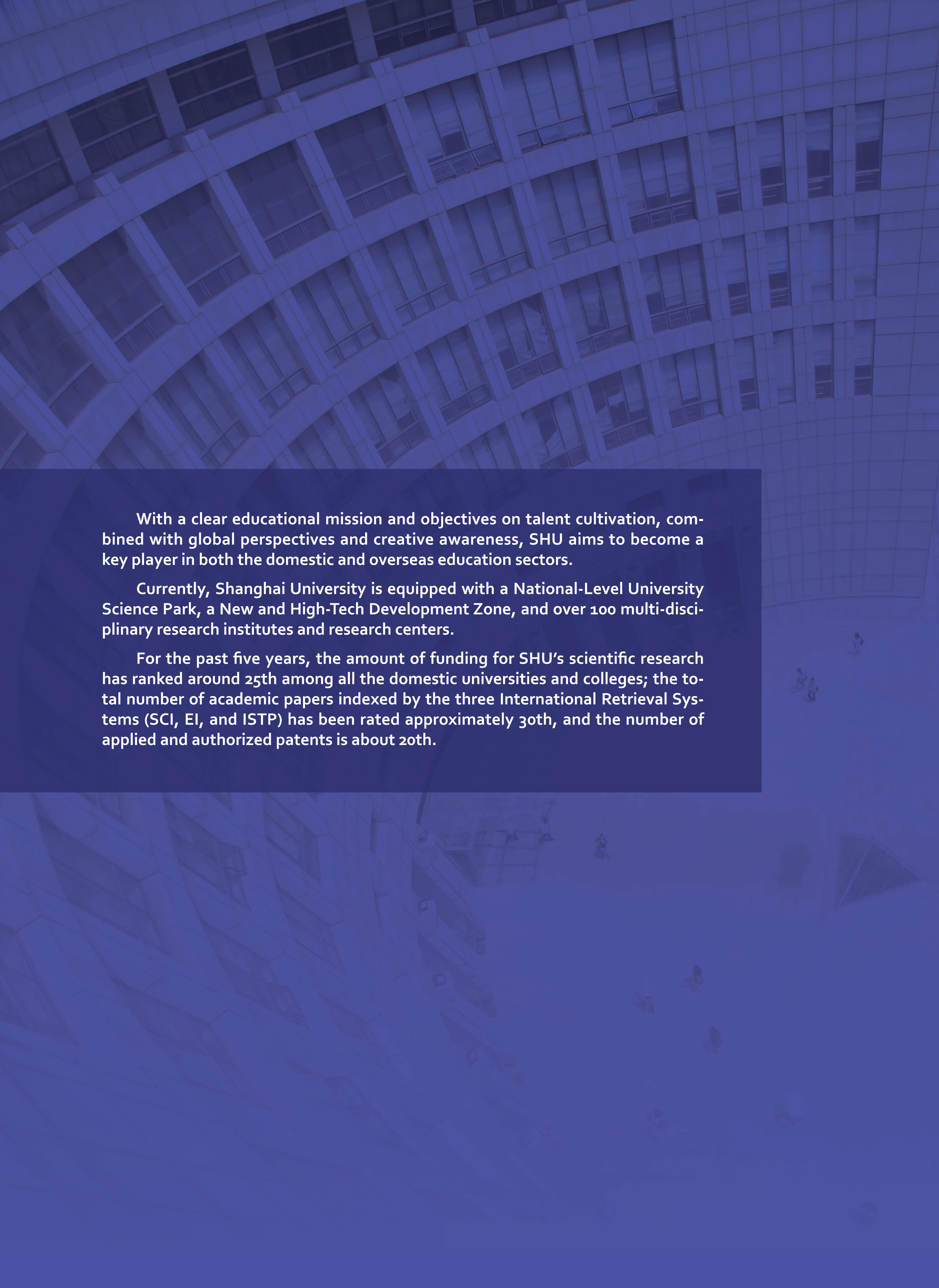

With a clear educational mission and objectives on talent cultivation, combined with global perspectives and creative awareness, SHU aims to become a key player in both the domestic and overseas education sectors.

Currently, Shanghai University is equipped with a National-Level University Science Park, a New and High-Tech Development Zone, and over 100 multi-disciplinary research institutes and research centers.

For the past five years, the amount of funding for SHU's scientific research has ranked around 25th among all the domestic universities and colleges; the total number of academic papers indexed by the three International Retrieval Systems (SCI, EI, and ISTP) has been rated approximately 30th, and the number of applied and authorized patents is about 20th.

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Dr. Jiang Li from the COS Achieves Significant Breakthrough in Nature Machine Intelligence

Dr. Jiang Li from the College of Sciences and his Collaborators Published their Significant Achievement at Nature Machine Intelligence

理學院李江研究員及合作團隊在《Nature Machine Intelligence》發表高水準成果

Dr. Jiang Li from the Institute of Materiobiology at the College of Sciences, along with the team led by Academician Chunhai Fan from the School of Chemistry and Chemical Engineering at Shanghai Jiao Tong University, developed a DNA framework state machine that operates in the cellular environment. This intelligent machine can instantly discern the temporal sequence of environmental signals and switch between various structural and functional states. In living cells, it has achieved graded delivery, genome positioning, and gene editing functions of the CRISPR system under the regulation of temporal signals. This achievement has been recently published in the journal Nature Machine Intelligence.

理學院材料生物學研究所李江研究員與上海交通大學化學化工學院樊春海院士團隊近期發展了一種可工作於活細胞環境的框架核酸狀態智慧機，可即時分辨環境信號的時間順序並在多種結構與功能狀態間切換，在活細胞中實現了時序信號調控的 CRISPR 系統的分級輸運、基因組定位與基因編輯功能。該成果近日發表于《自然·機器智慧》（Nature Machine Intelligence）雜誌。

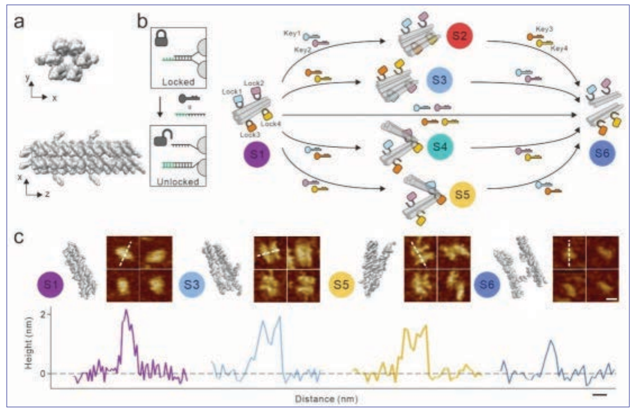


Figure 1. DNA framework nucleic acid state machine responsive to temporal signals.
圖 1. 可回應時序性信號的框架核酸狀態機

Molecular machines refer to molecules that, at the molecular level, can exhibit mechanical movements in response to external stimuli (Nobel Prize in Chemistry 2016). Achieving sophisticated artificial molecular intelligence within living cells, despite its significant scientific and immense potential applications in fields such as biocomputing, micro/nanorobotics, and nanoscale intelligent therapeutics, still poses substantial challenges. Thanks to the advancement of DNA nanotechnology, precise dynamic nanostructures programmed with DNA offer a powerful toolbox for realizing this goal. While some studies have reported DNA molecular machines capable of intelligent logic operations in the cellular environment, current designs of molecular machines still lack environmental responsiveness with temporal resolution akin to viruses. This limitation restricts their regulation and applications within biological systems.

分子機器是指在分子級別能根據外界刺激作出類似機械運動回應的分子（2016 年諾貝爾化學獎）。而在活細胞中實現複雜的人工分子智慧，儘管對於生物計算、微納機器人、納米智慧診療等領域都具有重要的科學意義和巨大的應用潛力，仍然存在著巨大的挑戰。 得益于 DNA 納米技術的發展，DNA 程式設計的精確動態納米結構為實現這一目標提供了強大的工具箱。儘管已有若干工作報導了可在活細胞環境中實現智慧

邏輯運算的 DNA 分子機器，當前的分子機器設計仍然缺乏類似病毒的時序分辨能力的環境回應性，這限制了它們在生命系統中的調控與應用。

In response to this challenging issue, the research team has developed a DNA framework State Machine (DFSM) capable of switching between multiple states based on a chain replacement reaction-mediated framework for nucleic acid-responsive conformational changes (Figure 1). A Finite State Machine (abbreviated as FSM) is an abstract machine that can transition between a finite number of states based on external input signals. Its next state not only depends on the external input signals but also on its current state. Therefore, the same combination of signals with different input sequences may result in different state transitions. This imparts temporal resolution to the FSM's response to input signals. The constructed state machine in this study is based on a flexible six-helix frame nucleic acid structure with multiple "lock" structures at different positions. These "locks" can be specifically opened through the input of DNA strands or other molecular "keys," triggering chain replacement reactions and resulting in conformational changes. Moreover, different sequences of key inputs can induce the state machine to adopt different configurations, thereby achieving temporal resolution in response to input signals. Based on this design, the research team demonstrated the ability of the state machine to respond to sequential signals in living cells, enabling the graded delivery of CRISPR-Cas9 and achieving genome positioning and gene-editing activity under the control of temporal signals (Figure 2).

針對這一挑戰性問題，研究團隊基於鏈置換反應介導的框架核酸回應性變構發展了一種可以在多個狀態間進行切換的有限狀態機（DFSM）（圖 1）。有限狀態機（簡稱狀態機）是一個可以根據外部輸入信號在自身有限個狀態間進行切換的抽象機器器。它的下一個狀態不僅取決於外部輸入信號，還取決於自身當前的狀態。因此，同樣的信號組合但不同的輸入順序可能產生不同的狀態切換。這賦予了狀態機對輸入信號的時序分辨能力。本研究所構建的狀態機基於一個可以開合的六螺旋框架核酸結構，結構上不同位元點有多個“鎖”結構，可通過輸入 DNA 鏈或其他分子“鑰匙”引發鏈置換反應而特異性地打開，從而產生構型轉換。並且，不同的鑰匙輸入順序可以引發框架核酸狀態機產生不同的構型，從而實現對於輸入信號時序性的分辨能力。基於該設計，研究團隊在活細胞中展示了該狀態機回應時序性信號進行 CRISPR-Cas9 分級遞送的能力，實現了受時序信號調控的基因組定位與基因剪切活性（圖 2）。

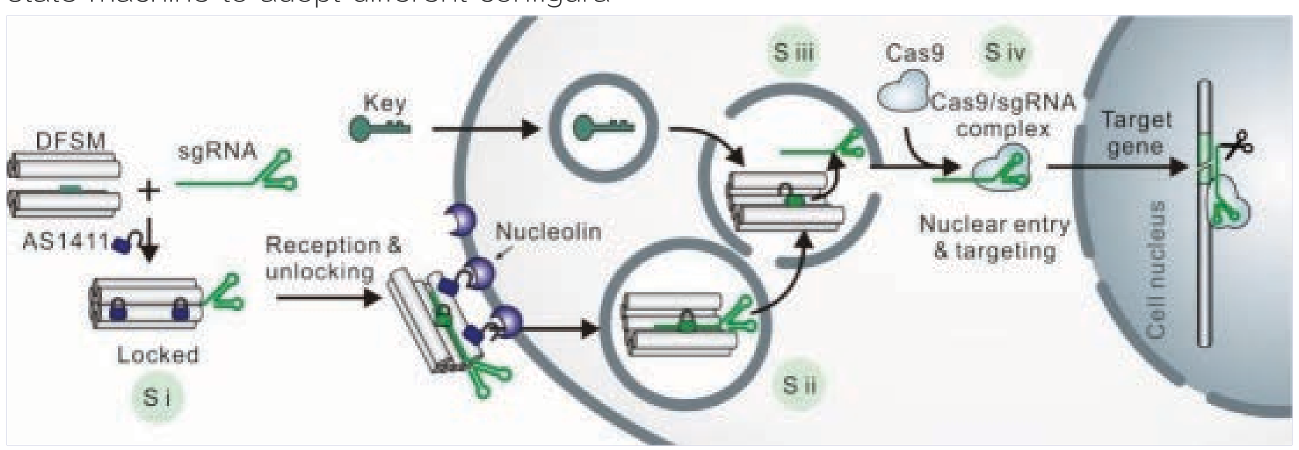
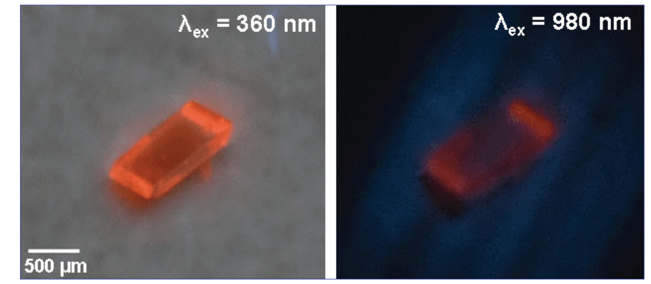
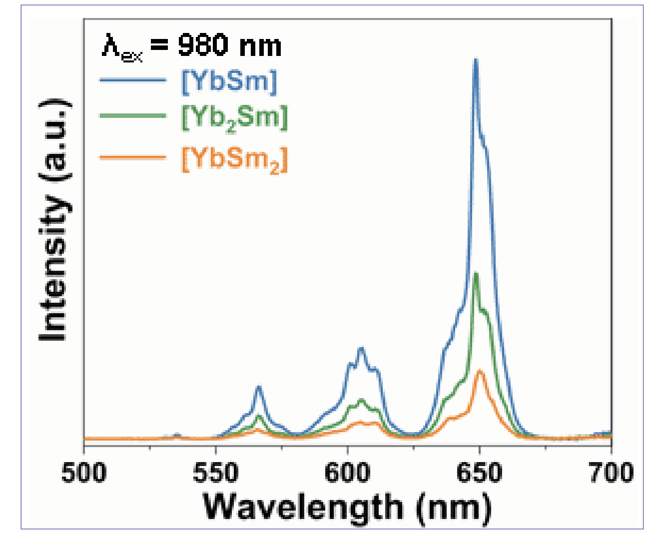


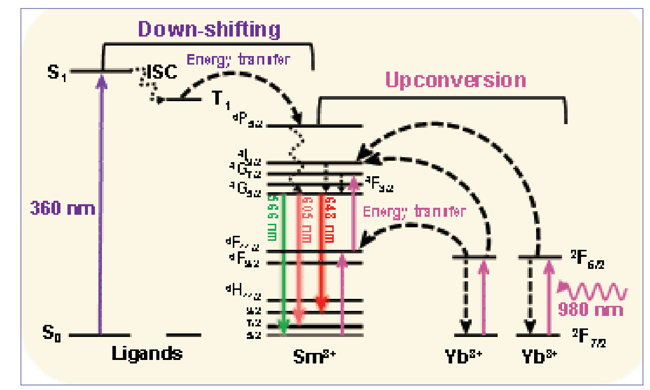
Fig. 2. The DNA framework state machine, responsive to temporal signals within living cells, achieves graded delivery and targeted gene editing in the CRISPR system.
圖 2. 活細胞中框架核酸狀態機回應時序性信號實現 CRISPR 體系的分級遞送與目標基因編輯

Research conducted at the Institute of Materiobiology at Shanghai University, where Dr. Jiang Li is affiliated, focuses on innovative design and applications of nucleic acid biomaterials. The institute engages in research on the design and functionalization of material biological units, providing new materials for critical areas such as biosemiconductor and chip manufacturing, as well as disease diagnosis. This collaborative effort involved a joint team comprising institutions such as Shanghai Jiao Tong University, the National Key Scientific Infrastructure for Translational Medicine, Shanghai University, the Shanghai Advanced Research Institute of the Chinese Academy of Sciences, and the Shanghai Institute of Applied Physics. The project received funding from sources including the National Natural Science Foundation of China and the Ministry of Science and Technology.

李江研究員所在的上海大學材料生物學研究所圍繞創新核酸生物材料設計及重要領域應用，開展材料生物基元設計與功能化研究，為生物半導體及晶片製造、疾病診療等重要領域提供新材料。這項工作由上海交通大學、轉化醫學國家重大科技基礎設施、上海大學、中國科學院上海高等研究院、上海應用物理研究所等單位組成的聯合團隊共同完成，並得到了國家自然科學基金委、科技部等項目的資助。







文章链接：https://www.nature.com/articles/s42256-023-00707-4
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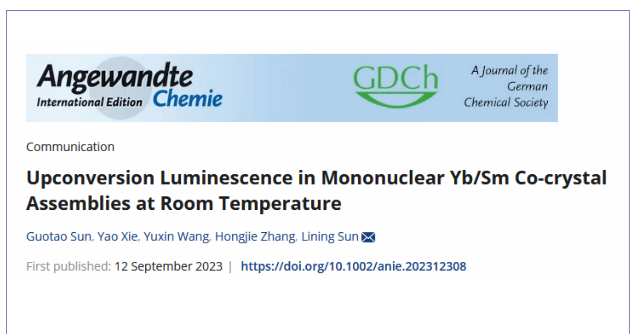
Professor Lining Sun's Team from the College of Sciences Publishes Latest Research Findings in Angewandte Chemie International Edition

理學院孫麗甯教授團隊在《Angewandte Chemie International Edition》上發表最新研究成果

The esteemed team led by Professor Sun from the College of Sciences has made a remarkable breakthrough in the realm of molecular-level rare earth upconversion luminescence. Their seminal work, titled "Upconversion Luminescence in Mononuclear Yb/Sm Co-crystal Assemblies at Room Temperature", has been showcased in the prestigious 'Angewandte Chemie International Edition', a journal recognized as top-tier by both JCR and CAS. Guotao Sun, a doctoral student from the class of 2020 at Shanghai University, is the paper's lead author. Shanghai University is credited as both the primary affiliation for the lead author and the sole institution for the corresponding author.

理學院孫麗甯教授團隊在分子水準的稀土上轉換發光領域又取得重要進展，相關研究結果以"Upconversion Luminescence in Mononuclear Yb/Sm Co-crystal Assemblies at Room Temperature"為題發表在化學頂級學術期刊《德國應用化學》（Angewandte Chemie International Edition， JCR 和中科院一區Top）上。該論文第一作者為 2020 級博士生孫國濤，上海大學為第一作者單位和唯一通訊作者單位。



Communication

Upconversion Luminescence in Mononuclear Yb/Sm Co-crystal Assemblies at Room Temperature

Guotao Sun, Yao Xie, Yuxin Wang, Hongjie Zhang, Lining Sun

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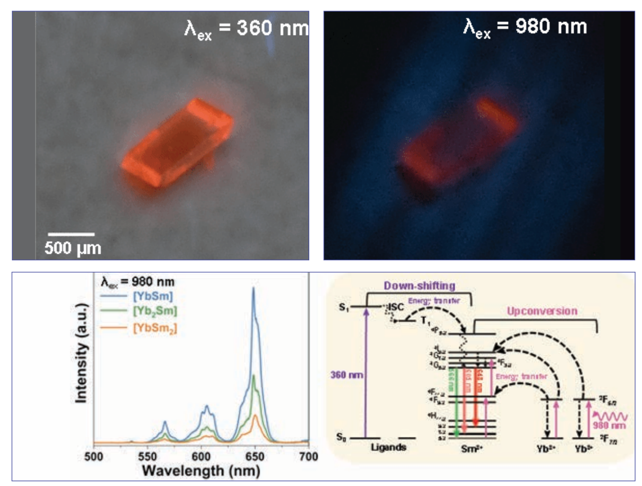
Due to the rich energy levels and the characteristics of 4f electron transitions in rare earth ions, certain rare earth materials exhibit unique upconversion luminescence properties. They can convert low-energy near-infrared excitation light into high-energy visible or ultraviolet light emissions. In recent years, rare earth upconversion luminescence has been extensively applied in various cutting-edge fields. At present, research on rare earth upconversion luminescence primarily focuses on inorganic matrices, such as bulk materials, phosphors, and nanoparticles. For along period, upconversion luminescence was believed to be unattainable in molecular complexes. The primary reason is that groups like -CH, -OH, and -NH in molecular complexes can quench the weak upconversion luminescence through non-radiative transitions.

由於稀土離子具有豐富的能級及 4f 電子躍遷的特性，使得某些稀土材料具有獨特的上轉換發光性能，能夠將低能量的近紅外激發光轉換為高能量的可見光或紫外光發射，近年來稀土上轉換發光已被廣泛應用於多個前沿領域。目前，稀土上轉換發光現象的研究主要集中於無機基質中，例如塊狀材料、螢光粉和納米顆粒等。在很長一段時間裡，上轉換發光被認為不可能在分子配合物中實現，主要原因是分子配合物中的-CH, -OH 和 -NH 基團能夠通過非輻射躍遷的方式猝滅本身就很弱的上轉換發光。

Professor Sun's team designed a Yb/Sm co-crystal assembly composed of mononuclear Yb and Sm molecular complexes. Under the excitation of 980 nm near-infrared light, energy is transferred to Sm3+ ions through cooperative sensitization upconversion and energy transfer upconversion, achieving upconversion luminescence of Sm3+ ions. Simultaneously, under the excitation of 360 nm ultraviolet light, the Yb/Sm co-crystal assembly can also emit down-shifting luminescence from Sm3+ ions. In addition to the luminescence spectroscopy results, the accompanying photo illustrates that, under excitation with light at wavelengths of 360nm and 980 nm respectively, one can visibly observe the single crystal of Yb/Sm assembly emitting a brilliant orange-red luminescence. Furthermore, the team delved deeper into the effects of different molar ratios of molecular complexes on the luminescence of Sm3+ ions. They found that the luminescence intensity was the strongest when the molar ratio of Yb3+ to Sm3+ was 1:1. The team also explored the variations in fluorescence lifetimes during both down-conversion and up-conversion luminescent processes. The team conducted a comprehensive characterization and discussion of the structure and energy transfer mechanisms of the Yb/Sm co-crystal assembly. Their innovative achievement in realizing upconversion luminescence of Sm3+ ions in molecular complexes paves a new avenue for designing novel molecular upconversion luminescent systems.



孫麗甯教授團隊設計了一種 Yb/Sm 共晶聚集體，該聚集體由單核 Yb 分子配合物和單核 Sm 分子配合物組成，在 980nm 近紅外光的激發下，能量通過協同敏化上轉換和能量轉移上轉換的方式傳遞給 Sm3+ 離子，實現了 Sm3+ 離子的上轉換發光；同時在 360nm 的紫外光激發下，該 Yb/Sm 共晶聚集體也能夠發射出 Sm3+ 離子的下轉移發光。除了螢光光譜的結果，下圖照片也顯示出，分別在 360nm 與 980nm 波長光激發下，肉眼能夠清楚地觀察到該 Yb/Sm 聚集體的單晶都能夠呈現出亮麗的橙紅色發光。此外，該團隊進一步研究了不同比例的分子配合物組合對 Sm3+ 離子發光的影響，當 Yb3+:Sm3+ 的摩爾比為 1:1 時其發光強度最強，同時也探究了下轉移和上轉換發光過程的螢光壽命變化等。該團隊對 Yb/Sm 共晶聚集體的結構和能量傳遞機理進行了系統的表徵和討論，創新性的實現了分子配合物中 Sm3+ 離子的上轉換發光，這為設計新型分子上轉換發光體系打開了嶄新的思路。

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Professor Xuyong Yang of the School of Mechatronic Engineering and Automation Co-authors Study Published in Nature

機自學院楊緒勇教授課題組以共同通訊作者在 Nature 上發表合作論文

On August 9, the esteemed journal Nature spotlighted a groundbreaking study in its Accelerated Article Preview titled 'Tautomeric Mixture Coordination Enables Efficient Lead-Free Perovskite LEDs' (DOI: 10.1038/s41586-023-06514-6). This research is the brainchild of Professor Xuyong Yang and his team at Shanghai University's Key Laboratory of Advanced Display and System Applications (Ministry of Education), affiliated with the School of Mechatronic Engineering and Automation. 10.1038/s41586-023-06514-6)。

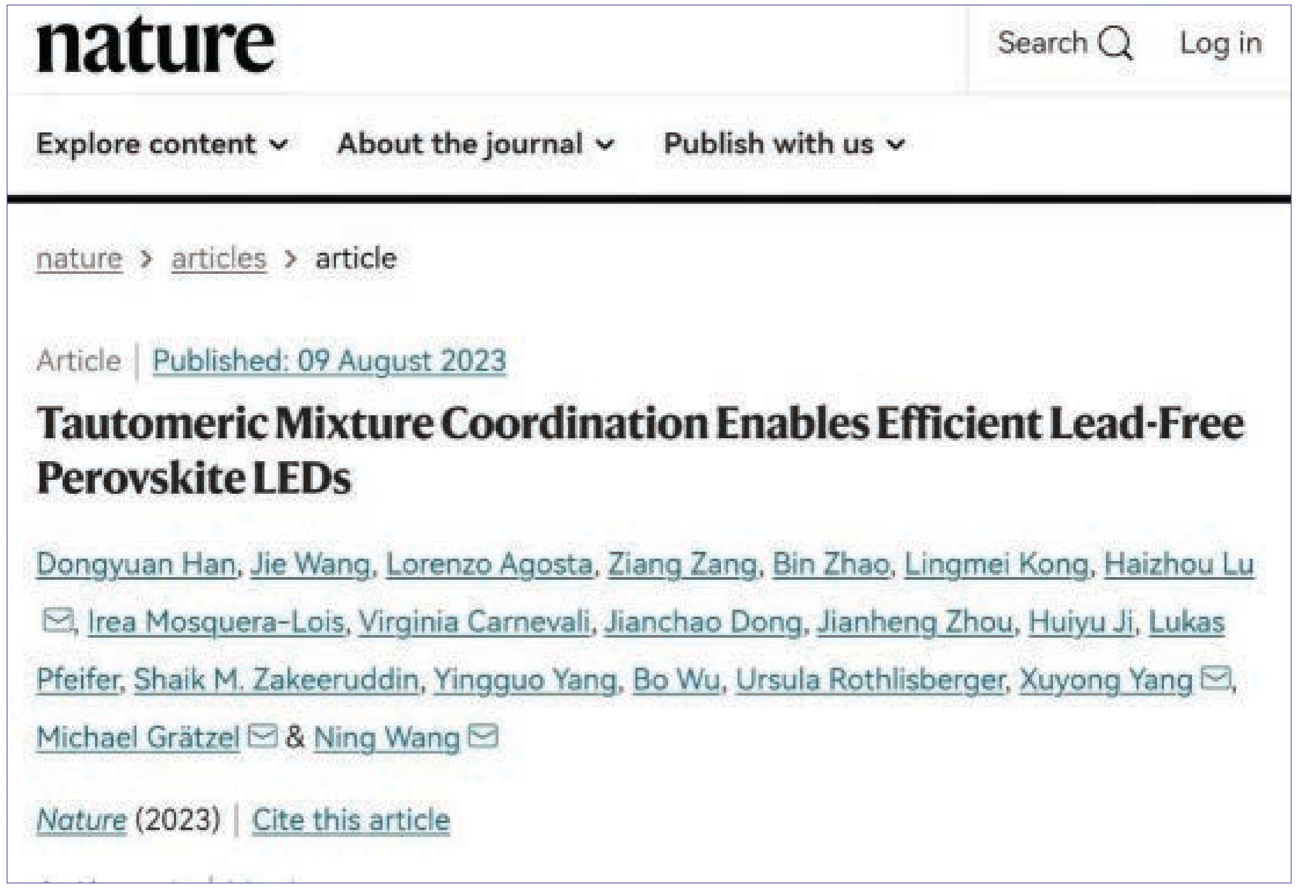
8月9日，國際著名期刊《Nature》以 Accelerated Article Preview（加速預覽）的形式線上刊發了上海大學機電工程與自動化學院新型顯示技術及應用集成教育部重點實驗室楊緒勇教授課題組最新合作研究成果"Tautomeric Mixture Coordination Enables Efficient Lead-Free Perovskite LEDs" (DOI: 10.1038/s41586-023-06514-6)。

The road to commercializing lead-based halide perovskite optoelectronic devices is overshadowed by challenges surrounding the Pb element's bio and environmental compatibility. These water-soluble perovskites can break down into bivalent Pb compounds and pure Pb. The detrimental, irreversible impact of the heavy metal Pb on both our environment and health cannot be overlooked, especially in user-centric applications like lighting and displays, necessitating stringent restrictions on lead usage. Hence, the quest for stable, high-performing, lead-free perovskites has surged to the forefront of contemporary perovskite research.

鉛基鹵化物鈣鈦礦光電器件的商業化前景面臨著 Pb 元素的生物及環境相容性問題。水溶性的鉛基鹵化物鈣鈦礦可降解成二價 Pb 化合物和單質 Pb。重金屬 Pb 無論是對環境還是對人體都可造成不可逆的傷害，尤其是在人易接觸的照明和顯示領域，鉛的使用應該是被嚴格限制的。因此，探索和開發穩定、高效的無鉛鈣鈦礦已成為當前鈣鈦礦領域的前沿研究熱點。

In a collaborative stride, Professor Xuyong Yang, along with Professor Ning Wang of Jilin University, Professor Michael Grätzel from EPFL Lausanne, and Professor Haizhou Lu of Southeast University, has introduced a versatile strategy tailored for robust lead-free tin-based perovskites. By coordinating perovskites with tautomeric mixtures, they achieved electron confinement in divalent tin within quasi-two-dimensional perovskites. This also leads to the spontaneous formation of steady, quasi-vertical H-bonded tautomeric superstructures, sidestepping pitfalls associated with Anderson localization. Employing this method, the team managed to significantly refine the structural integrity of the lead-free tin perovskite crystals. This enhancement led to a remarkable reduction, by two orders of magnitude in the non-radiative recombination capture coefficient. Furthermore, the exciton binding energy observed a twofold increase, thereby substantially elevating its optoelectronic capabilities. This innovative approach marked a milestone by achieving an external quantum efficiency of over 20% in tin-based perovskite light-emitting diodes for the first time. Spearheading this work as a co-corresponding author is Professor Xuyong Yang, with Shanghai University standing as a pivotal contributor.

楊緒勇教授與吉林大學王甯教授、洛桑聯邦理工學院 Michael Grätzel 教授及東南大學 Haizhou Lu 教授等共同報導了一種適宜於穩定無鉛錫基鈣鈦礦的普適性策略：通過互變異構體混合物與鈣鈦礦的配位，誘導准二維無鉛錫基鈣鈦礦中二價錫的電子局域化，並自發的在錫基鈣鈦礦表面形成准垂直、穩定的 H 鍵互變異構二聚體和三聚體超結構，避免了安德森局域化導致的不利影響。這一策略有效提高了無鉛錫鈣鈦礦晶體結構的有序性，並將其非輻射複合係數降低了兩個數量級，同時激子的束縛能提高了兩倍，使其光電特性均得到了大幅提高，首次突破了錫基鈣鈦礦發光二極體 20% 的發光外量子效率。楊緒勇教授為該工作共同通訊作者，上海大學為主要完成單位之一。



Article link: https://www.nature.com/articles/s41586-023-06514-6
文章链接：https://www.nature.com/articles/s41586-023-06514-6

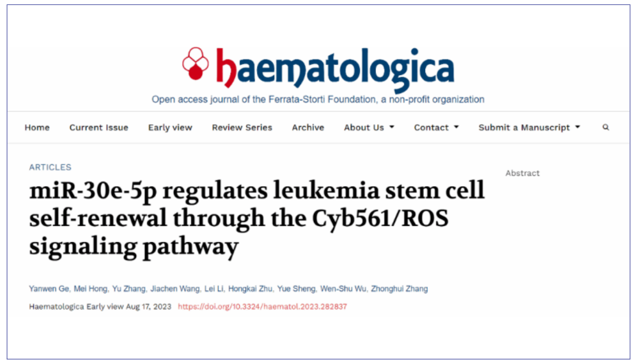
Prof. Zhonghui Zhang's Team at Shanghai University's School of Life Sciences Advances Hematology Research with Latest Paper in Haematologica

生命科學學院張忠輝教授課題組在 Haematologica 雜誌發表研究論文

Professor Zhonghui Zhang's research group from the School of Life Sciences has made the latest progress in the study of the regulatory mechanisms of leukemia stem cell self-renewal. It has been discovered that the high-efficiency expression of miR-30e-5p can effectively inhibit the growth of leukemia stem cells in mice, prolonging the survival time of myeloid leukemia model mice, and clarifying its specific molecular mechanisms of action. The related research findings were published in the international journal of hematopathology and physiology, Haematologica, under the title "miR-30e-5p regulates leukemia stem cell self-renewal through the Cyb561/ROS signaling pathway".

生命科學學院張忠輝教授課題組在白血病幹細胞自我更新機理的調控研究中取得最新進展：發現高效表達 miR-30e-5p 可在小鼠體內有效抑制白血病幹細胞的生長，延長髓系白血病模型小鼠的生存時間，並明確其具體分子作用機制。相關研究成果在國際血液病理及生理學期刊《Haematologica》上發表，題為"miR-30e-5p regulates leukemia stem cell self-renewal through the Cyb561/ROS signaling pathway"。

The latest impact factor of the journal is 10.1. This groundbreaking study represents a joint venture led by Shanghai University in partnership with esteemed institutions worldwide, such as Tongji Medical College at Huazhong University of Science and Technology, Xiangya Hospital of Central South University, and the University of Illinois at Chicago. At the helm as co-corresponding author is Professor Zhang Zhonghui of Shanghai University, with master's candidate Ge Yanwen from the School of Life Sciences credited as the lead author. Shanghai University proudly stands as the primary contributor to this research milestone.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ARTICLES

miR-30e-5p regulates leukemia stem cell self-renewal through the Cyb561/ROS signaling pathway

Abstract

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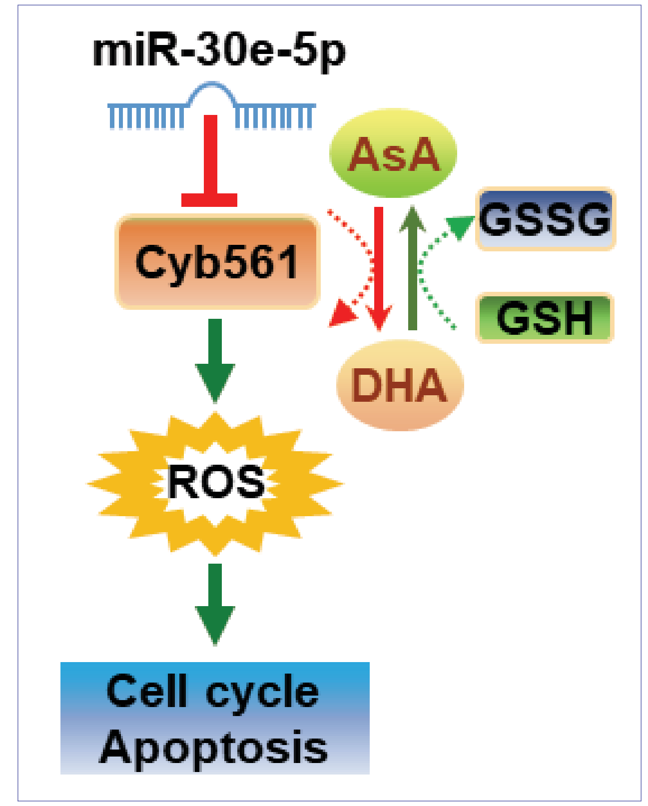
該雜誌的最新影響因數為 10.1。該研究成果是由上海大學與華中科技大學同濟醫學院、中南大學湘雅二院及美國伊利諾大學芝加哥分校等國內外多家科研機構合作，上海大學張忠輝教授為共同通訊作者，生命學院碩士研究生葛言文為論文第一作者，上海大學為第一完成單位。

Acute myeloid leukemia (AML) is a type of malignant tumor disease of the hematopoietic system, mainly caused by leukemia stem cells arising from mutations or chromosomal rearrangements in hematopoietic progenitor cells. Although there has been some improvement in the treatment of AML in recent years, the 5-year disease-free survival rate for adult AML is only about 24%. Therefore, studying the molecular mechanisms of leukemia stem cell self-renewal is particularly important and urgent for the clinical treatment of AML. Numerous studies have indicated that the self-renewal capabilities of leukemia stem cells can significantly influence the onset and progression of Acute Myeloid Leukemia (AML). Moreover, since the regulatory mechanisms of self-renewal are remarkably similar between normal hematopoietic stem cells and leukemia stem cells, it becomes challenging to eradicate leukemia stem cells using conventional chemotherapy. Building upon preliminary research, the paper reveals that miR-30e-5p can substantially inhibit the occurrence and development of leukemia stem cells without affecting the physiological functions of normal hematopoietic stem cells, thereby prolonging the survival of mice modeled with myelogenous leukemia. Employing bioinformatics and other technological methods, the study discovered that within leukemia stem cells, miR-30e-5p regulates the downstream target molecule Cyb561, which affects the levels of ascorbic acid and glutathione in the cells, thus controlling intracellular ROS levels. This, in turn, exerts a crucial regulatory effect on the cell cycle and apoptosis of leukemia stem cells.

急性髓系白血病（Acute myeloid leukemia, AML）是一類造血系統的惡性腫瘤疾病，主要是由於造血乾祖細胞中的某些基因發生突變或基因組重排而產生的白血病幹細胞所致。雖然近年來對 AML 治療水準已有一定程度的提高，但成人 AML 的 5 年無病生存率僅約為 24%。因此，研究白血病幹細胞自我更新的分子機理對 AML 的臨床治療顯得尤為重要和迫切。多項研究表明，白血病幹細胞的自我更新能力可顯著影響 AML 的發生發展。同時，由於正常造血幹細胞和白血病幹細胞在自我更新能力上的調控具有諸多相似性，因此白血病幹細胞通常難以用常規手段化療手段進行根除。該論文在前期研究基礎上，發現 miR-30e-5p 在不影響正常造血幹細胞生理功能的條件下，可顯著抑制白血病幹細胞的發生發展，延長白血病模型小鼠的生存時間。通過生物資訊學等多種技術手段，研究發現：在白血病幹細胞中 miR-30e-5p 是通過調控下游靶分子 Cyb561，影響白血病幹細胞內抗壞血酸及谷胱甘肽的水準進而調控胞內 ROS，最終對白血病幹細胞的細胞週期和細胞凋亡產生重要調節作用。



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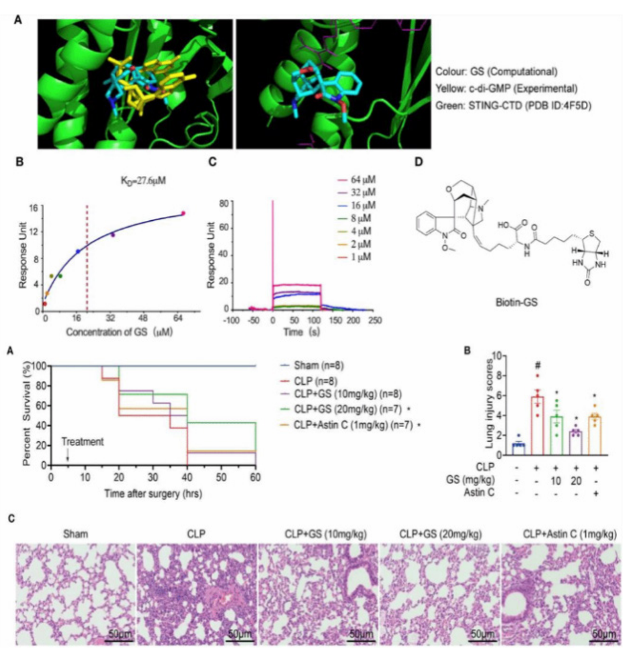
Associate Professor Li Su's Group at the Institute for Translational Medicine Unveils Novel Sepsis Treatments with Green Alkaloid in Frontiers in Immunology

轉化醫學研究院蘇笠副教授團隊在國際知名期刊《Frontiers in Immunology》上發表鉤吻綠城治療膿毒症的最新研究成果

The latest findings from the team led by Associate Professor Li Su of the Institute of Translational Medicine have been published in the prestigious international journal Frontiers in Immunology. Ph.D. candidate Yuhong Chen, and master's students Huihui Bian and Juan Lv are co-first authors, with Director Yingke Li of Naval Medical University and Director Zhao Liang of Luodian Clinical Drug Research Center, Shanghai University serving as co-corresponding authors. This article, titled "Gelsevirine is a novel STING-specific inhibitor and mitigates STING-related inflammation in sepsis", details how the natural product Gelsevirine mediates K48 ubiquitination degradation of STING via TRIM21, thereby inhibiting the excessive activation of the STING-NFκB pathway and treating the hyper-organ damage caused by sepsis.



轉化醫學研究院蘇笠副教授團隊最新成果在國際知名期刊《Frontiers in Immunology》上發表，博士研究生陳育紅、碩士研究生卞慧慧和呂娟為共同第一作者，海軍軍醫大學李盈科主任和上海大學附屬羅店醫院趙亮主任為共同通訊作者。這篇題為“Gelsevirine is a novel STING-specific inhibitor and mitigates STING-related inflammation in sepsis”（STING 特異性抑制劑鉤吻綠城可減輕膿毒症模型中 STING 相關炎性損傷）的研究報告詳細闡述了天然產物鉤吻綠城通過 TRIM21 介導 STING 發生 K48 泛素化降解，從而抑制 STING-NFκB 通路過度活化，治療膿毒症引起的過器官損傷。

Sepsis is a life-threatening condition resulting from an uncontrolled host response to infection, claims the lives of approximately 5.3 million people worldwide each year, making it a leading cause of mortality in Intensive Care Units (ICUs). STING is a pattern recognition receptor that can induce antibacterial immunity and interferon (IFN)-dependent antiviral responses. Numerous studies have proven that excessive activation of the STING signaling pathway is closely associated with sepsis onset and progression. In recent years, research on STING-related pathways and the development of targeted drugs have become hot topics. This study evaluates the in vivo effects of Gelsevirine and explores its molecular mechanisms targeting the STING pathway, elucidating the protective role of Gelsevirine against sepsis and its potential mechanisms in detail. The results underscore that Gelsevirine interacts with TRIM21, promoting K48-mediated ubiquitination degradation of the STING protein, thus inhibiting the activation of the STING-NFκB signaling pathway. Additionally, Gelsevirine has exhibited a favorable safety profiles during treatment, rendering it a promising candidate drug for treating inflammatory damage in sepsis with potential clinical applications. Moreover, the elucidation of the mechanism by which Gelsevirine promotes the ubiquitination degradation of STING to inhibit the STING-NFκB signaling pathway provides a new perspective in the development of sepsis treatment drugs.

膿毒症是宿主對感染的反應失調而導致的危及生命的器官功能障礙，據統計全球每年約 530 萬人死於膿毒症，是重症監護病房 (ICU) 高死亡率的主要原因之一。STING 是一種模式識別受體，可誘導抗細菌免疫和干擾素 (IFN) 依賴的抗病毒免疫，多項研究證明 STING 信號通路過度啟動可引起膿毒症發生與發展。 近年來，STING 相關通路的研究以及靶向藥物的開發已經成為熱點。本研究通過對鉤吻綠城的體內進行評價並對其靶向 STING 通路的分子機制進行探索，詳細闡明鉤吻綠城對膿毒症的保護作用及其潛在機制。 結果顯示鉤吻綠城與 TRIM21 存在相互作用，可促進 STING 蛋白發生 K48 介導的泛素化降解，從而抑制 STING-NF-kB 信號 通路的啟動；同時，鉤吻綠城在治療過程中，表現出較好的安全性。 因此，鉤吻綠城有望成為治療膿毒症炎性損傷的候選藥物，具有潛在的臨床應用價值；同時，鉤吻綠城促進 STING 泛素化降解抑制 STING-NF-kB 信號通路的機制的闡明也為開發治療膿毒症的藥物提供了新思路。

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Collaborative Breakthrough in Physics by Prof. Jiong Yang’s Team and Zhejiang University Featured in Nature Physics

材料基因院楊炯教授團隊與浙江大學合作的研究成果在《自然 · 物理學》（Nature Physics）上發表

A team led by Professor Jiong Yang from Materials Genome Institute (MGI) at Shanghai University, in collaboration with Professor Tiejun Zhu’s team from Zhejiang University and other renowned domestic and international institutions, has utilized first-principles calculations, high and low-temperature transport testing, and inelastic neutron scattering to verify the profound modulation effects of charged dopants on the phononic structures of heavy-band thermoelectric materials for the first time. This discovery is of vital importance in exploring effective aliovalent doping strategies to achieve electrical and phononic decoupling and cooperative optimization in thermoelectric materials. Both Professor Jiong Yang and Professor Tiejun Zhu from Zhejiang University, along with researcher Chenguang Fu, are joint corresponding authors of the research. Their findings were published online on August 17, 2023, Beijing time, in the renowned international journal Nature Physics under the title “Strong phonon softening and avoided crossing in aliovalence-doped heavy-band thermoelectrics.”

上海大學材料基因組工程研究院楊炯教授團隊和浙江大學朱鐵軍教授團隊等國內外多所高校與科研機構結合第一性原理計算、高低溫輸運測試、非彈性中子散射等首次證實了帶電摻劑對重帶熱電材料聲子結構有著強烈的調製作用，這一研究結果對於探尋有效異價摻雜策略以實現熱電材料的電聲解耦與協同優化具有重要意義。楊炯教授與浙江大學朱鐵軍教授，付晨光研究員為共同通訊作者，該研究成果於北京時間 2023 年 8 月 17 日 以 "Strong phonon softening and avoided crossing in aliovalence-doped heavy-band thermoelectrics" 為題發表在國際著名期刊《自然 · 物理學》（Nature Physics）上線上發表。

Central to the study is Professor Jiong Yang’s team’s utilization of first-principles calculations to analyze the phononic structures and thermal transport properties of doped systems. They combined theoretical and experimental methods for in-depth research. Focusing on the NbFeSb-based heavy-band thermoelectric material, which currently boasts the best p-type performance among half-Heusler alloys, they analyzed the full temperature range of lattice thermal conductivity in experimental samples with 10% aliovalent doping and isoelectronic alloying. They compared this with first-principles calculations of Nb0.875X0.125FeSb (X=Ti; Zr; Hf). Their findings reveal that the 65% lattice thermal conductivity suppression achieved at room temperature with 10% aliovalent doping mainly stems from the reduction in phonon group velocity due to the doping (Fig.1). Through inelastic neutron scattering, they directly observed the phonon state density of various doped/alloyed samples, identifying significant optical phonon softening caused by aliovalent doping. This softening in energy range aligns with theoretical calculations (Fig.2). Apart from inducing optical phonon softening, the heavy atomic mass element, Hf, in a lower phonon energy range also introduced an “avoided crossing” effect between acoustic and optical phonons (Fig.3). This altered the phonon dispersion relationship, causing a significant drop in phonon group velocity and further suppressing the material’s lattice thermal conductivity.

該成果以楊炯教授團隊對摻雜體系的聲子結構，熱輸運性能等第一性原理計算為重要分析手段通過理論與實驗相結合進行深入研究。以目前半赫斯勒合金中 p 型性能最優的 NbFeSb 基重帶熱電材料作為研究物件，將 10% 濃度的異價摻雜和共電子合金化的實驗樣品的全溫度範圍晶格熱導率，與第一性原理計算的 Nb0.875X0.125FeSb (X=Ti; Zr; Hf) 結果進行交互對比分析，發現 10% 的異價摻雜在室溫下實現的 65% 晶格熱導率抑制主要源自異價摻雜帶來的聲子群速度的下降（圖 1）。通過非彈性中子散射技術對不同摻雜 / 合金化樣品的聲子態密度進行直接觀測，發現異價摻雜引入顯著的光學聲子軟化，且軟化能量範圍與理論計算吻合（圖 2）。除了帶來光學聲子軟化之外，具有較重原子質量的 Hf 元素在較低聲子能量範圍還引起了聲學聲子和光學聲子的“avoided crossing”效應（圖 3），導致聲子色散關係發生變化，聲子群速度顯著下降，進一步抑制了材料的晶格熱導率。

Capitalizing on vast computational resources and cutting-edge characterization techniques, such as inelastic neutron testing, this research delved deeper into the assumptions of unchanged phonon structures in traditional point defect scattering models and their actual mechanisms. For the first time, both experimental and theoretical calculations elucidated that, based on the conventional model’s understanding that only mass fluctuation and stress field fluctuation affect phonon relaxation time, not only does composition change lead to phonon structure modifications, but charged dopants also play a pivotal role in modulating thermoelectric material phonon structures. Emphasizing that aliovalent doping, besides being a strategy for optimizing the electrical performance

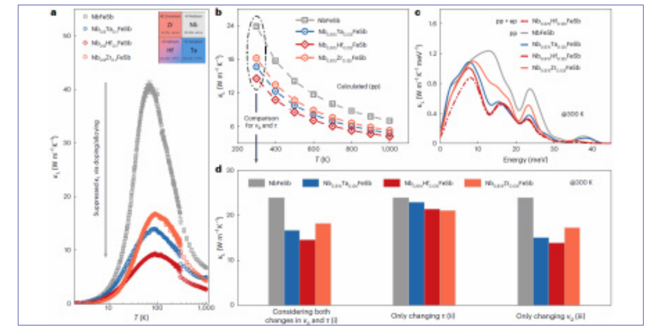

Figure 1: Lattice Thermal Conductivity Comparison for Aliovalent Doping/ isoelectron Alloying in NbFeSb Samples
圖 1 異價摻雜 / 共電子合金化 NbFeSb 樣品的晶格熱導率對照

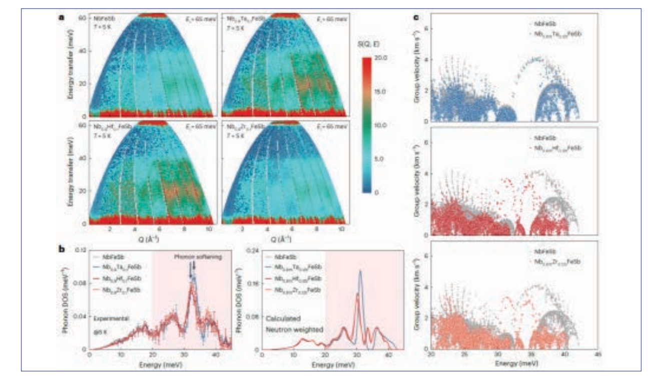

Figure 2: Optical Phonon Softening and Phonon Group Velocity Reduction Induced by Aliovalent Doping
圖 2 異價摻雜誘導光學聲子軟化與聲子群速度下降

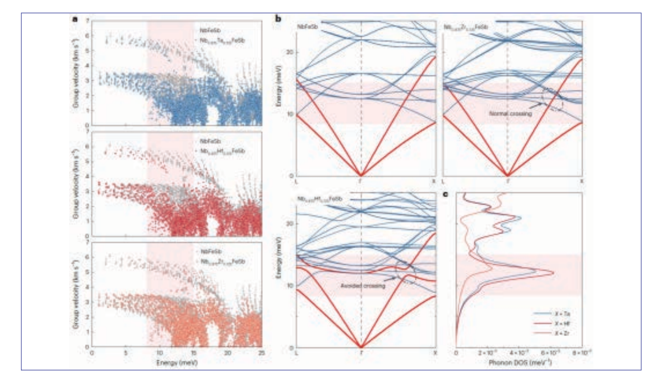

Figure 3: Avoided Crossing Effect and Phonon Group Velocity Suppression Due to Heavy Element Doping
圖 3 重元素摻雜引起聲學聲子 – 光學聲子“avoided crossing” 效應以及聲子群速度抑制

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of materials, can also have a significant impact on the thermal transport of semiconductor materials, these findings are crucial for exploring effective aliovalent doping strategies to realize the electrical and phononic decoupling and cooperative optimization of thermoelectric semiconductor materials. In addition to this research, Professor Jiong Yang' s team has published renowned journals on first-principles work concerning the thermal transport properties of doped systems, including Mg2.75X0.25Sb2 [X= Ca; Yb], Bi2Te3-based compounds, and TiCo0.75Fe0.25Sb. In this Nature Physics study, the collaboration between Zhejiang University, Shanghai University, and Shanghai Jiao Tong University validated the profound impact of element doping, especially aliovalent doping, on material phonons and thermal transport, from both theoretical and neutron experimental perspectives.

依託于豐富的算力資源和非彈性中子測試等先進表徵技術，該研究對傳統點缺陷散射模型下聲子結構不變的假設和其真實作用機制進行了更深層次研究與討論。首次從實驗和理論計算兩個層面闡明在傳統模型對質量波動和應力場波動僅影響聲子弛豫時間的認識基礎上，不僅成分改變引起聲子結構變化，帶電摻劑還對熱電材料聲子結構起到顯著調製作用，強調異價摻雜作為材料電學性能的優化策略之外也可能對半導體材料的熱輸運有不可忽視的影響，對於探尋有效異價摻雜策略以實現熱電半導體材料的電聲解耦與協同優化具有重要意義。除了本研究工作外，楊炯教授團隊對於摻雜體系熱輸運性質的第一性原理工作，例如 Mg2.75X0.25Sb2 [X= Ca; Yb] (J. Comput. Chem. 2019, 40，1693)， Bi2Te3 基化合物 (Adv. Funct. Mater. 2019, 291900677)，TiCo0.75Fe0.25Sb (Mater. Today Phys. 2023, 31, 100993) 等皆發表在著名期刊上。而在本次 Nature Physics 的工作中，浙江大學、上海大學、上海交通大學等高校之間的合作，則第一次從理論與中子實驗兩方面的角度驗證了元素摻雜，特別是異價摻雜對於材料聲子以及熱輸運直接而深刻的影響。

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Breakthrough in Semi-Transparent Photovoltaic Devices by Prof. Wang Shenghao and Assoc. Prof. Xu Tao' s Team, Featured in Advanced Energy Materials

材料基因院王生浩教授、中歐學院徐韜副教授等在《Advanced Energy Materials》發表半透明光伏器件最新進展

Professor Wang Shenghao, from Materials Genome Institute (MGI) and Associate Professor Xu Tao from Sino-European School of Technology in Shanghai University have achieved a significant breakthrough in the field of semitransparent organic solar cells by high-throughput screening methodology for optical couple layer. Their cutting-edge research, titled "High-Throughput Computing Guided Low/High Index Optical Coupling Layer for Record-Performance Semitransparent Organic Solar Cells," has been published in the prestigious journal "Advanced Energy Materials". Shanghai University is acknowledged as the primary affiliation for this publication, with Associate Professor Xu Tao distinguished as the lead author. Both Professor Wang Shenghao and Professor Zhu Furong from Hong Kong Baptist University share the honor of co-corresponding authors while Dr. Xu Tao as the first author. Dr. Wang Zihan, who is a senior laboratory technician from the Fabrication and Characterization Center of MGI contributed high-resolution cross-sectional transmission electron microscope images for the device.

材料基因院王生浩教授與中歐工程技術學院徐韜副教授團隊在高效半透明有機太陽能電池領域取得新進展，在能源材料領域國際知名期刊《Advanced Energy Materials》（影響因數：27.8）發表題為"High-Throughput Computing Guided Low/High Index Optical Coupling Layer for Record-Performance Semitransparent Organic Solar Cells"的研究論文。上海大學為本文第一署名單位，徐韜副教授為論文第一作者，王生浩教授、香港浸會大學朱福榮教授為共同通訊作者。材料基因院製備與表徵中心的王子涵高級實驗師為器件測試了高分辨截面圖。

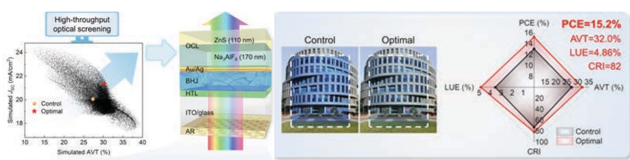
Organic solar cells, renowned for their cost-effectiveness, lightweight, and flexibility, emerge as a forefront contender in the next-generation green energy technology. Notably, organic photovoltaic materials can be precisely tailored chemically to control their light absorption, demonstrating a unique semi-transparent property for visible light while generating electricity by largely absorbing non-visible light. This dual characteristic of transmitting light and generating power expands the application scenarios of photovoltaic technology to building integrated photovoltaic (BIPV) and photovoltaic greenhouses. Currently, the development of semitransparent organic solar cells (ST-OSCs) still faces a core challenge: how to maintain a decent average visible light transmittance (AVT) while achieving a high power conversion efficiency (PCE). Consequently, there arises an imminent need to pioneer efficient optical-controlling strategy to amplify light absorption in the non-visible spectrum, with particular emphasis on harnessing the near-infrared light—constituting over 50% of solar energy and yet underutilized.

有機太陽能電池具有成本低、品質輕、可彎曲等優勢，是備受矚目的新一代綠色能源技術。更值得關注的是，有機光伏材料可通過化學剪裁實現對其吸收光譜的精確調控，從而表現出可見光半透明的獨特性質，這一既透光又發電的特性

將光伏技術的應用場景拓展到光伏建築一體化與光伏農業大棚等新興領域，為光伏產業注入了全新的概念。目前，半透明有機太陽能電池（ST-OSCs）的發展仍面臨著一個核心挑戰：如何在保持良好的平均可見光透過率（AVT）的同時實現較高的能量轉換效率（PCE）。因此，亟需發展高效的光學調控手段以提升器件在非可見光區的光吸收，尤其對於目前仍未被高效利用的占太陽光能量 >50% 的近紅外光。

The work, led by Prof. Wang and Assoc. Prof. Xu' team, innovatively addresses the trade-off challenge in ST-OSCs by balancing high optical transparency and high photovoltaic performance. The approach integrates an optical coupling structure, identified through high-throughput computational screening and performance prediction, to jointly enhance the ST-OSCs' transmittance in the visible spectrum and their photoconversion ability in the near-infrared region. A rapid thin-film optical computation model, treating layer thickness and material choice as variables, systematically explores nearly a million material-and-thickness combinations to maximize the core metrics of PCE and AVT. This comprehensive exploration results in highly transparent and efficient organic solar cells with high photoconversion efficiency, namely, through such optical control optimization, ST-OSCs based on the ternary active layers of PM6:BTP-eC9:L8-BO organic materials achieved a PCE of 15.2%, an AVT of 32%, and a color rendering index (CRI) of 82, setting a new efficiency record in the field of semi-transparent photovoltaics . These outcomes underscore the critical significance and universality of optical control based on high-throughput calculations, proving invaluable for the scientific and engineering for efficient design of high-performance semi-transparent photovoltaic devices and showcasing its broad application potential.

本工作針對 ST-OSCs 中高光學透過和高光電轉換相互競爭這一核心問題，提出一種半透明光伏器件近紅外光學調控的新策略：在器件中引入基於高通量計算篩選和性能預測的光耦合結構，協同提升 ST-OSCs 在可見光區的透過率和在近紅外區的光電轉換效率。開發一個具有極快運行速度的薄膜光學計算模型，將光耦合層的各層膜厚與材料選擇均視為自由變數，通過高通量計算詳細考察所有可能的材料與膜厚組合（近百萬個）對器件性能的影響規律，最大程度地提升半透明器件的 PCE 與 AVT 這兩個相互制約的核心指標，實現可見光高透明高效有機太陽能電池。通過光學調控優化，基於三元活性層體系 PM6:BTP-eC9:L8-BO 的 ST-OSCs 獲得了 15.2% 的 PCE，32% 的 AVT 以及 82 的顯色指數（CRI），刷新了半透明光伏領域的效率記錄。本工作的研究成果表明基於高通量計算的光學調控對於科學、高效設計高性能半透明光伏器件的重要性和普適性，展現了該方法廣泛的應用潛能。



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MGI's Prof. Qiang Sun's Research Group Using Graph Neural Networks to Unveil Patterns of Surface Molecular Self-assembly

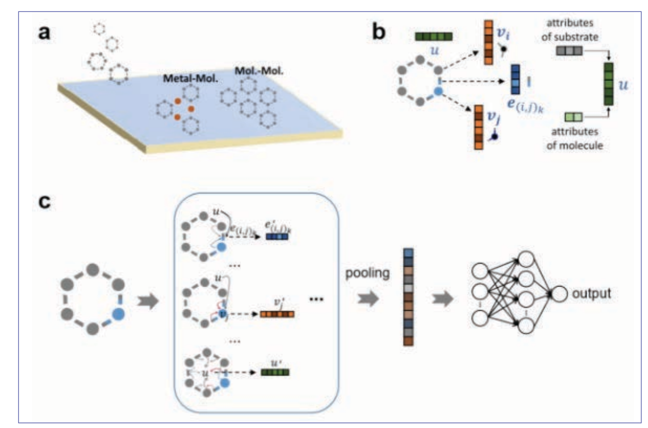
材料基因院孫強教授課題組發表利用圖神經網路預測表面分子自組裝的最新進展

Professor Sun's research group has published a research paper demonstrating the use of machine learning techniques to predict the self-assembled structures of organic molecules on metal surfaces. The study is published in ACS Nano, a leading nanoscience and nanomaterials journal, titled "Predicting molecular self-assembly on metal surfaces using graph neural networks based on experimental datasets". This research conducted by the MGI Surface Science group exemplifies an advanced and methodical inquiry within the domain of surface science. It leverages the foundational principles set forth by the Materials Genome Initiative to expedite and refine the process of identifying and architecting precursor molecules essential for the synthesis of novel nanostructures and nanomaterials.

孫強教授課題組發表最新論文，展示了使用機器學習技術預測有機分子在金屬表面的自組裝結構，研究成果發表於《ACS Nano》（最新影響因數：17.1），論文題目為"Predicting molecular self-assembly on metal surfaces using graph neural networks based on experimental datasets"。這項研究是 MGI 表面科學課題組基於材料基因理念在表面科學領域進行的創新研究，有助於加速納米結構和具有所需性質的新型納米材料的前體分子的篩選和設計。

Molecular self-assembly on surfaces is a commonly employed approach to construct supramolecular nanostructures with unique properties. Thanks to its broad significance, molecular self-assembly has received extensive attention over the past decades. Combining experimental techniques with quantum mechanics or molecular dynamics simulations has been the mainstay for exploring molecular self-assembly structures; however, this typically requires intensive time and effort. Generally speaking, the self-assembly patterns are determined by the intrinsic properties of the molecules and their environment. Due to the complexity of molecular functional groups and their interactions with surfaces, predicting the self-assembly structures of molecules on metal surfaces remains a significant challenge.

分子在表面的自組裝是構建具有特殊性能的超分子納米結構的一種常用方法，由於其廣泛的重要性，分子自組裝在過去幾十年中受到了廣泛的關注。迄今為止，將實驗與量子力學或分子動力學方法相結合是探索分子自組裝結構的主要方法，然而這通常需要花費大量的時間和精力。一般來說，自組裝模式由分子和環境的固有性質決定。由於分子官能團的複雜性及其與表面的相互作用，預測分子在金屬表面的自組裝結構仍然是一個巨大的挑戰。



(a) Schematic illustration of molecular self-assembly on a metal surface.

（a）分子在金屬表面形成自組裝結構的示意圖

(b) Construction of the molecular graph. (c) Architecture of the graph neural network.

（b）分子圖的構建（c）圖神經網路模型的架構

在本工作中，作者使用掃描隧道顯微鏡（STM）表徵了一系列多環芳烴（PAH）分子在不同金屬表面上的自組裝結構，以構建用於模型訓練的實驗資料集，之後將經過修改的圖神經網路模型MEGNet 用作機器學習（ML）框架來訓練模型。 與傳統的 ML 模型相比，圖神經網路直接從分子的結構表徵中獲得特徵，從而保證了表徵分子所需的所有相關資訊。 作者的研究結果表明，在預測與分子自組裝相關的目標性質方面，該圖神經網路演算法比傳統的 ML 演算法具有更好的性能。此外，將訓練好的 ML 模型應用到一種新的 PAH 分子中所獲得的預測結果與實驗表徵結果吻合得很好，這突出了 ML 模型的通用性。

In this work, the authors utilized the experimental tool of scanning tunneling microscopy (STM) to characterize the self-assembled structures of polycyclic aromatic hydrocarbon (PAH) molecules on various metal surfaces, creating an experimental dataset for model training. Subsequently, a modified graph neural network model, MEGNet, was employed as the machine learning (ML) framework for training. Compared to traditional ML models, graph neural networks directly extract features from the structural representations of molecules, thereby ensuring that all relevant information required to characterize the molecules is captured. The results show that the graph neural network algorithm outperforms traditional ML algorithms in predicting target properties related to molecular self-assembly. Furthermore, the application of the trained ML model to a novel PAH molecule resulted in predictions that closely matched experimental characterizations, highlighting the generalization of the ML model.

Research group website: https://www.qiangsungroup.cn/
課題組網站：https://www.qiangsungroup.cn/
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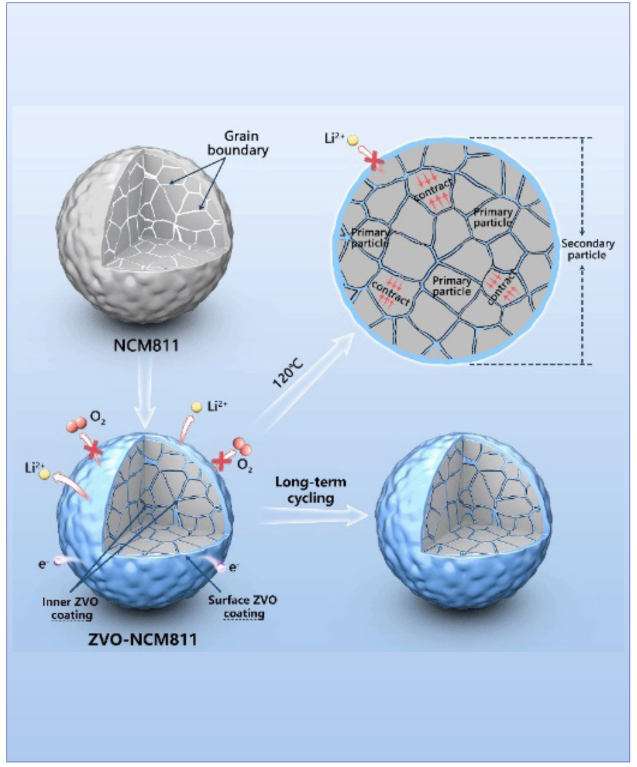
Doctoral Candidates at the School of Materials Science Showcase Breakthrough Research in Journal Small

材料學院博士生在《Small》上發表最新研究成果

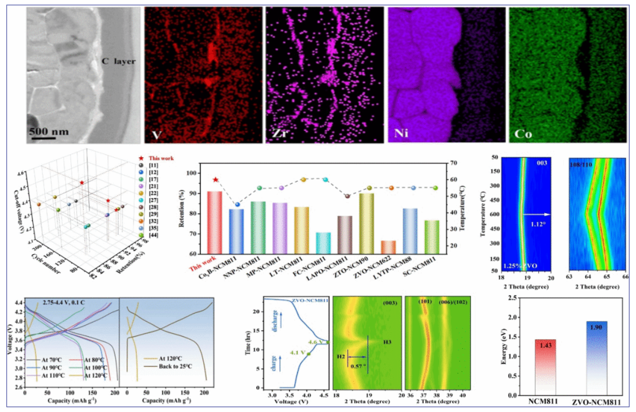
Wei Nie, a doctoral candidate at the School of Materials Science and Engineering at Shanghai University, has innovatively designed a protective layer based on surface-interface confinement functionalization. By constructing a ZrV2O7 coating layer with negative thermal expansion properties on the surface of primary and secondary particles of polycrystalline Ni-rich layered oxide cathode materials, this approach effectively suppresses capacity fade and ameliorates thermal runaway issues. This groundbreaking research is encapsulated in the paper entitled "Building Negative-thermal-expansion Protective Layers on the Grain Boundary of Ni-rich Cathodes Enables Safe and Durable High Voltage Lithium Ion Batteries," published on August 28, 2023, in the internationally recognized journal of materials science, Small, which boasts an impressive impact factor of 13.3 in 2023. The first author of this paper is Ph.D. student Wei Nie, with Shanghai University being the affiliated institution for the first author. Professors Hongwei Cheng, Yufeng Zhao, and Xionggang Lu serve as co-corresponding authors. Since joining the university, Ph.D. student Wei Nie has published two academic papers as the first author in Journal of Power Sources (2022, 522, 230994; IF=9.2) and Small Methods (2023, 2201572; IF=12.4).

上海大學材料學院博士生聶薇基於表界面限域功能化設計保護層，在多晶富鎳層狀氧化物正極材料的一次和二次顆粒表面構建具有負熱膨脹特性的 ZrV2O7 包覆層，有效抑制容量衰竭和改善熱失控問題。該最新研究成果以“Building Negative-thermal-expansion Protective Layers on the Grain Boundary of Ni-rich Cathodes Enables Safe and Durable High Voltage Lithium Ion Batteries”為題，於 2023 年 8 月 28 日在國際材料科學知名期刊《Small》上發表，該期刊 2023 年影響因數為 13.3。該論文第一作者為博士生聶薇，上海大學為第一作者單位，程紅偉教授、趙玉峰教授和魯雄剛教授為共同通訊作者。博士生聶薇同學進校以來，以第一作者身份已在《Journal of Power Sources》(2022, 522, 230994; IF=9.2) 和《Small Methods》(2023, 2201572; IF=12.4) 期刊上發表了兩篇學術論文。



Mechanism of ZrV2O7 protective layer on secondary and primary particles of Ni-rich cathode materials

富鎳正極材料的二次顆粒和一次顆粒上 ZrV2O7 保護層的作用機制



Comparison of the construction and lithium storage performance of ZrV2O7 protective layer, suppression of thermal runaway, and structural evolution law

ZrV2O7 保护层的构建和储锂性能对比、热失控的抑制以及结构演变规律

This research work, for the first time, reports the construction of a highly conductive ZrV2O7 protective layer with negative thermal expansion properties on secondary and primary particles of Ni-rich layered cathode materials.The strategy significantly mitigates the accumulation of by-products, the generation of intergranular/intragranular cracks, and suppresses microstructures (fewer microcracks), phase transitions (H1-H2-H3), and side reactions (LiF and LixPOyFz). DFT calculations show that the conductivity and lattice oxygen stability (1.90 eV vs. 1.43 eV) of the ZVO-NCM811 cathode material are improved. Even at high cut-off voltage (4.6 V vs. Li/Li+) or high temperature (95.3% capacity retention after 100 cycles at 60 ° C), the produced ZVO-NMC811 exhibits stable cycling performance (86.5% capacity retention after 100 cycles) andrate capacity (67.1 mAh g-1 at 30 C). And at hazardous temperatures, the lithium ion channels at 120 ° C rapidly close, limiting further battery exotherm and thus reducing the risk of thermal runaway.

该研究工作，首次报道在富镍层状正极材料的二次颗粒和一次颗粒上构建了具有负热膨胀特性的高导电性 ZrV2O7 保护层。该策略可显著减轻副产物的积累、晶间 / 晶内裂纹的产生，抑制微观结构（较少的微裂纹）、相变（H1-H2-H3）和副反应（LiF 和 LixPOyFz）。DFT 计算表明，ZVO-NCM811 正极材料的电导率和晶格氧稳定性（1.90 eV 对 1.43 eV）得到了改善。即使在高截止电压（4.6 V vs. Li/Li+）或高温（60℃下 100 次循环后 95.3% 的容量保持率）下，所生产的 ZVO-NMC811 也表现出稳定的循环性能（100 次循环之后 86.5%）和倍率容量（30 C 下 67.1 mAh g-1）。在危险的温度下，锂离子通道在 120 ℃时迅速关闭，限制电池的进一步放热，从而降低热失控风险。

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Master Student from the School of Computer Science Present Latest Research at Premier CCF A-category Conference

電腦學院研究生在中國電腦學會 CCF A 類會議發表最新研究成果

The International Joint Conference on Artificial Intelligence (IJCAI 2023), a CCF A-category conference organized by the China Computer Federation, was held in Macao, China, from August 19 to 25th. The research work "Hierarchical Semantic Contrast for Weakly Supervised Semantic Segmentation" by Associate Professor Xiaoqiang Li's team from the School of Computer Engineering and Science at Shanghai University was accepted by the conference and presented as an oral report. IJCAI stands for the International Joint Conference on Artificial Intelligence, one of the most influential and prestigious events in the international AI community, held annually around the globe, with an acceptance rate of about 15% for this year's conference. Yuanchen Wu, a master's student from the 2022 class of the School of Computer Engineering and Science, is the first author of the paper, with Associate Professor Xiaoqiang Li serving as the sole corresponding author.

人工智慧領域國際學術會議 IJCAI 2023（中國電腦學會 CCF A 類會議）於 8 月 19 日至 8 月 25 日在中國澳門召開，上海大學電腦工程與科學學院李曉強副教授課題組的研究成果 "Hierarchical Semantic Contrast for Weakly Supervised Semantic Segmentation" 被該會議接收錄用，並在大會進行口頭報告。IJCAI 全稱國際人工智慧聯合會議（International Joint Conference on Artificial Intelligence），該會議是是國際人工智慧界最有影響力和權威性的盛會之一，在世界範圍內每年召開一次，本屆會議錄用率約為 15%。 電腦工程與科學學院 2022 級碩士研究生吳遠塵為論文第一作者，李曉強副教授為唯一通訊作者。

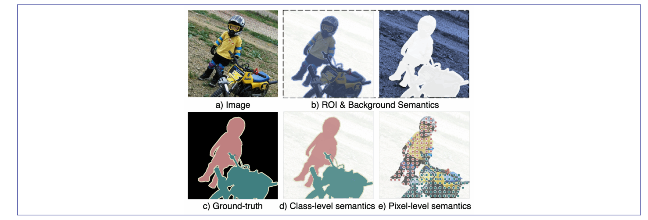

Fig. 1 Different semantic levels of segmentation goals
图 1 分割目标的不同语义层次

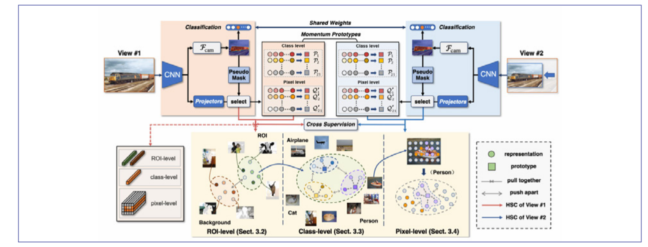

Fig. 2 Framework for CAM generation based on hierarchical semantic comparison
图 2 基于层次语义对比的 CAM 生成框架

Method	BB.	Sup.	val	test
PSA [CVPR' 18] [Ahn and Kwak, 2018]	R38	$\mathcal{I}$	61.7	63.2
IRNet [CVPR' 19] [Ahn et al., 2019]	R50	$\mathcal{I}$	63.5	64.8
SEAM [CVPR' 20] [Wang et al., 2020]	R38	$\mathcal{I}$	64.5	65.7
CONTA [NIPS' 20] [Zhang et al., 2020]	R101	$\mathcal{I}$	66.1	66.7
Ru et al. [IJCAI' 21] [Ru et al., 2021]	R101	$\mathcal{I}$	67.2	67.3
EDAM [CVPR' 21] [Wu et al., 2021]	R101	$\mathcal{I}+\mathcal{S}$	70.9	70.6
AdvCAM [CVPR' 21] [Lee et al., 2021a]	R101	$\mathcal{I}$	68.1	68.0
URN [AAAI' 22] [Li et al., 2022]	R101	$\mathcal{I}$	69.5	69.7
AMR [AAAI' 22][Qin et al., 2022]	R101	$\mathcal{I}$	68.8	69.1
ReCAM [CVPR' 22] [Chen et al., 2022]	R101	$\mathcal{I}$	68.5	68.4
MCTformer [CVPR' 22] [Xu et al., 2022]	R38	$\mathcal{I}$	71.9	71.6
RCA [CVPR' 22] [Zhou et al., 2022]	R101	$\mathcal{I}+\mathcal{S}$	72.2	72.8
PPC [CVPR' 22] [Du et al., 2022]	R101	$\mathcal{I}+\mathcal{S}$	72.6	73.6
EPS [Lee et al., 2021c]	R101	$\mathcal{I}+\mathcal{S}$	70.9	70.8
Ours (w/ EPS)	R101	$\mathcal{I}+\mathcal{S}$	**73.6**	**74.5**†

Fig. 3 Comparison of the performance of different methods on PASCAL VOC 2012 validation set and test set
图 3 不同方法在 PASCAL VOC 2012 验证集及测试集性能比较

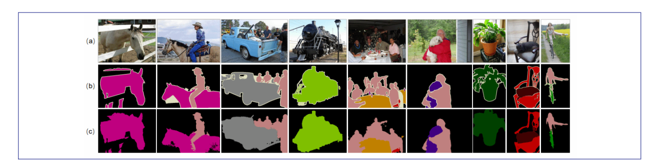

Fig. 4 Final segmentation results
图 4 最终分割结果

Shanghai University’s “SA-80 Longque” UAV Achieves Maiden Flight Success

上海大學“SA-80 龍雀號”無人飛行器首飛成功

At 11:50 AM on August 25, at the Anji Test Base in Huzhou, Zhejiang, upon an online command from Professor Zhang Tianzhong, Dean of the School of Mechanics and Engineering Science at Shanghai University, the “SA-80 Longque” UAV, featuring a blended wing-body design, soared into the skies powered by its ducted fan engine.

8 月 25 日 11 時 50 分，在浙江湖州安吉試驗基地，隨著上海大學力學與工程科學學院院長張田忠教授一聲線上指令，上海大學翼身融合佈局“SA-80 龍雀號”無人飛行器在涵道風扇發動機推進下騰空而起。

The “Longque” UAV was conceived by Shanghai University’s Center for Modern Aerodynamics of Flight Vehicles, pioneering its aerodynamic layout, aesthetics, and structural design, securing full intellectual property ownership. In “SA-80 Longque,” ‘S’ denotes Shanghai University (SHU), ‘A’ stands for the Aerodynamics Research Center of Modern Aircraft (ARCMA), and ‘80’ signifies the engine class. An arduous journey of three years in research and development culminated in today’s successful inaugural flight. The debut flight meticulously executed 28 specific tests within four principal categories, adhering strictly to the mission blueprint and flawlessly conducting vital flight operations such as takeoff, ascent, cruise, banking, and touchdown, fulfilling all research objectives with distinction.

“龍雀號”無人機由上海大學現代飛行器空氣動力學研究中心完成氣動力學佈局、氣動外形和結構等多個方面的設計研發工作，具有完全自主產權。“SA-80 龍雀號”中 S 代表上海大學（SHU），A 代表現代飛行器空氣動力學研究中心（ARCMA），80 是發動機尺寸。研發製作過程總歷時三年整，最終迎來今日成功首飛。此次首飛完成了四個大項 28 個子項的測試試驗，並嚴格按照預設任務要求，精准執行起飛、爬升、巡航、迴旋和著陸等重要飛行任務，出色完成了首飛各項科研任務！

The “SA-80 Longque” UAV is crafted with a revolutionary blended wing-body design, noted for its reduced drag, minimal noise, and superior maneuverability and control stability. Professor Xiaoquan Yang, project lead of the “SA-80 Longque” UAV at Shanghai University, indicates ongoing endeavors to enhance its reliability, safety, adaptability, and stability, with the goal of expanding its application spectrum and functionalities.

“SA-80 龍雀號”無人飛行器採用新一代翼身融合設計，具有低阻力、低雜訊、機動性和操穩性能好等突出優點。“SA-80 龍雀號”無人飛行器研發團隊負責人上海大學楊小權教授表示，目前“SA-80 龍雀號”無人飛行器正在持續探索其可靠性、安全性、適應性、穩定性，應用範圍和功能不斷擴展。

Founded in 2019, the Aerodynamics Research Center of Modern Aircraft (ARCMA) at Shanghai University is committed to advancing the aviation field. Dedicated to “application-orientation”, “pioneering frontiers” and “strategic domain placement”, it tackles pivotal aerodynamic challenges associated with aerodynamic coupling in aerospace vehicles. In recent times, Professor Xiaoquan Yang, at the helm of the research center, has spearheaded original, cutting-edge scientific projects in line with the nation’s principal economic strategies and societal demands, securing high-quality, innovative breakthroughs.

成立于 2019 年的上海大學現代飛行器空氣動力學研究中心（ARCMA），服務航空領域。以“應用導向”、“定為前沿”、“領域佈局”為目標，研究空天飛行器的關鍵空氣動力學問題和與空氣動力學耦合的重大難題。近年來，研究中心負責人楊小權教授帶領研究中心成員，結合經濟主戰場、結合國家社會需求，積極開展原創性、科技攻關項目的研究，取得高品質創新成果。

起飛 Takeoff

爬行 Ascent

著陸 Touchdown

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