SOUTH CHINA UNIVERSITY OF TECHNOLOGY

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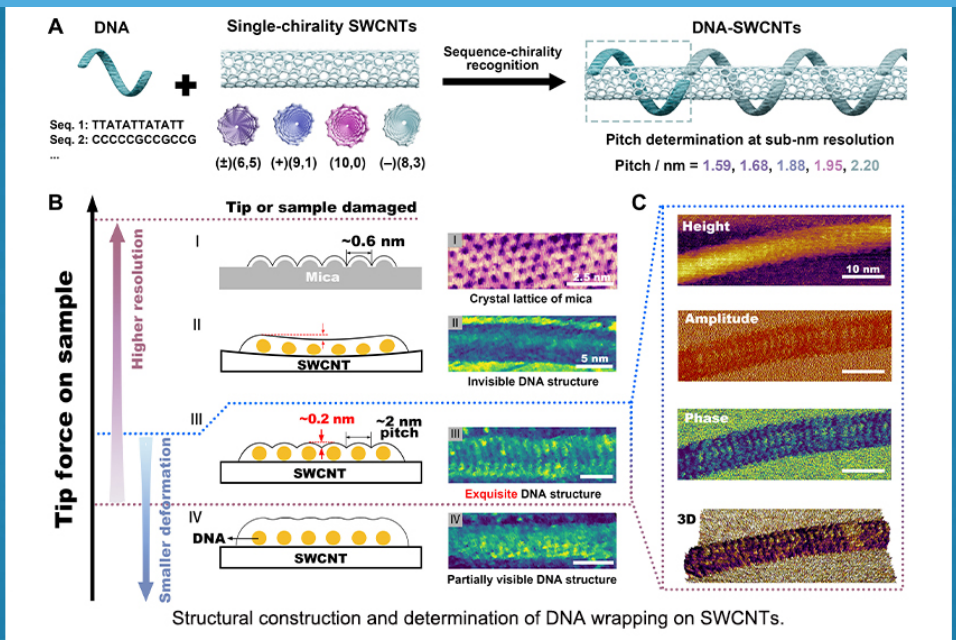
SCUT Newsletter 华工新闻快讯



Structural construction and determination of DNA wrapping on SWCNTs.

1. Prof. Zhiwei Lin's Research Team at SCUT Unveiled the DNA Wrapping Structures on SWCNTs at Sub-nm Resolution

华南理工大学林志伟团队揭示DNA缠绕单壁碳纳米管具象

The research team led by Prof. Zhiwei Lin at SCUT published a study titled "Understanding DNA-Encoded Carbon Nanotube Sorting and Sensing via Sub-nm Resolution Structural Determination" in *Science Advances*. They developed a high-resolution liquid-phase atomic force microscopy protocol that employed ultra-soft probes to precisely regulate probe-sample interaction forces through small-amplitude, high-frequency modulation. This innovative approach successfully

prevented structural deformation of DNA-SWCNTs while acquiring high-resolution DNA conformational data, marking the first experimental achievement in accurately determining the structure of DNA-SWCNTs. The study revealed that specific DNA sequences can form well-ordered left-handed helical structures around SWCNTs, providing insights into the molecular mechanism behind DNA-encoded functionalization of SWCNTs.

With exceptional electrical, optical, and mechanical properties, *SWCNTs* are widely used in electronics, optical devices, disease diagnostics, energy storage, and other fields.

华南理工大学林志伟团队以题为"Understanding DNA-Encoded Carbon Nanotube Sorting and Sensing via Sub-nm Resolution Structural Determination"发表于***Science Advances***。通过开发高分辨液相原子力显微镜技术，采用极软的探针，以小振幅、高频率对探针施加给样品的力进行了精准调节，成功避免DNA-SWCNTs形变，并获得高分辨率的DNA构象信息，首次在实验上实现了DNA-SWCNTs结构的精确解析，明确了特定DNA可以在SWCNT上形成有序的左旋缠绕构象，揭示了DNA为SWCNTs赋能的分子机制。

单壁碳纳米管凭借其卓越的电学、光学及力学性能，广泛应用于电子器件、光学仪器、疾病检测、能量储存等领域。

2. SCUT Students Repeated Stellar Performance at the 16th Chinese Mathematics Competition for College Students

华南理工学子在第16届全国大学生数学竞赛中再创佳绩

On April 12, the finals of the 16th Chinese Mathematics Competition for College Students (CMC) was held in Zhejiang Province. SCUT delegation secured two first prizes in the Mathematics category, as well as two second prizes and two third prizes in the Non-Mathematics category. Notably, An Chenyu, a Class of 2022 Mathematics and Applied Mathematics major at SCUT, claimed first prize in the upper division of the Mathematics category; and Zhan Le, a Class of 2023 Mathematics and Applied Mathematics major at SCUT, claimed first prize in the lower division of the Mathematics category.

The 16th CMC attracted 325,000 participants from over 1,200 universities across 32 regional divisions in China. Open to all undergraduates nationwide, the event aimed to strengthen STEM education, enhance the quality of talent cultivation in Chinese higher education, improve mathematics curriculum development, identify and nurture innovative mathematical talents.

4月12日，第十六届全国大学生数学竞赛决赛在浙江举行。华南理工大学参赛团队在数学类竞赛中获一等奖2项，在非数学类竞赛中获二等奖2项、三等奖2项。其中，2022级数学与应用数学专业安辰煜同学获高年级组数学类一等奖，2023级数学与应用数学专业詹乐同学获低年级组数学类一等奖。

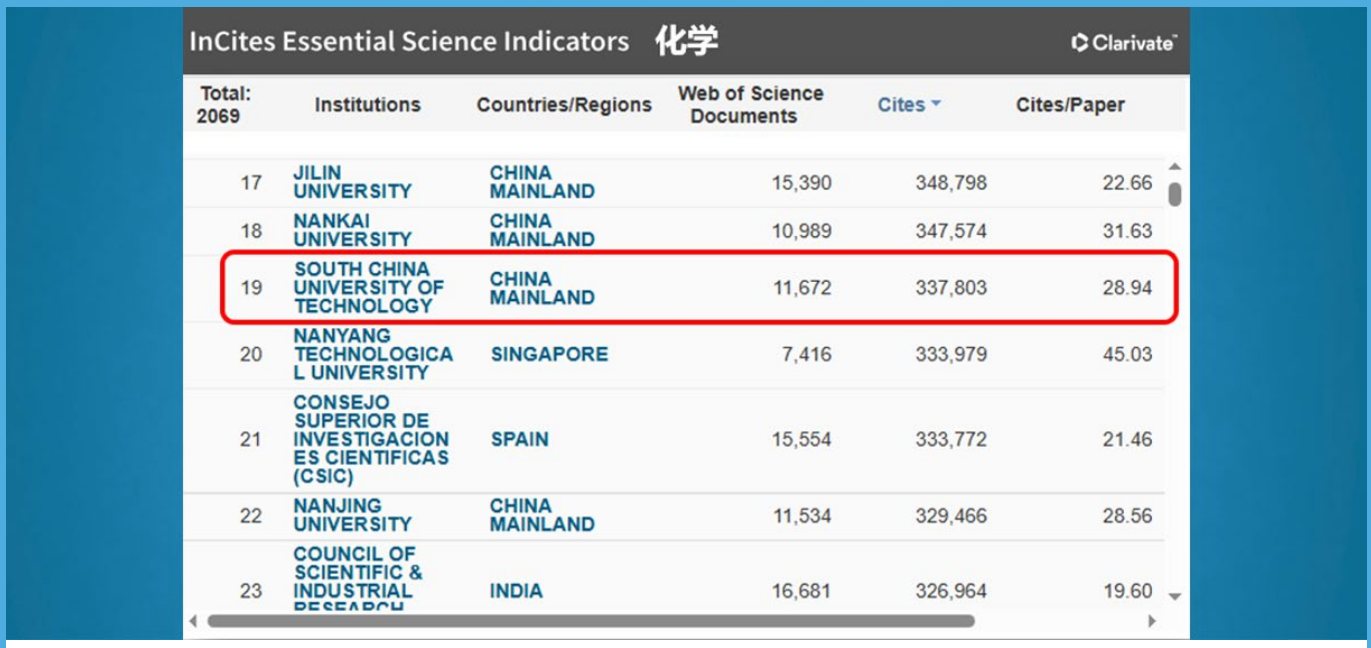
本届赛事面向全国本科生开展，共吸引了来自全国32个赛区1200余所高校的32.5万名学生参加，旨在加强基础学科教育，提升我国高等学校人才培养质量、数学课程建设，发掘数学创新人才。

3. SCUT Unveiled the World's First 20L Plasma-Assisted High-Energy Ball Mill

华南理工大学推出全球首台20L级等离子高能球磨设备

In April, SCUT unveiled the world's first 20L plasma-assisted high-energy ball milling system, marking a quantum leap in powder preparation technology. As the first large-volume plasma-assisted high-energy ball mill to date, this system overcomes critical technical challenges in plasma generation under variable mechanical energy constraints and uniform discharge across the container. Having achieved the first-ever large-scale plasma discharge in milling applications, this system helps accelerate R&D in critical materials for next-generation batteries, hydrogen storage composites, electronics & electrical components, aerospace & aviation, eco-friendly solid waste recycling, green construction materials, and beyond.

4月，华南理工大学推出全球首台20L级等离子高能球磨设备，标志着粉末制备技术领域取得重大突破。新设备是行业内首款大容积等离子高能球磨设备，攻克了可变机械能约束等离子体和罐体内均匀放电等技术难题，首次成功实现大体积等离子放电辅助球磨。该设备成功应用于新能源电池材料、储氢材料、电子电器材料、航空航天，环保固废、绿色建材等领域助力关键材料研发。



InCites Essential Science Indicators 化学 Clarivate

Total: 2069	Institutions	Countries/Regions	Web of Science Documents	Cites	Cites/Paper
17	JILIN UNIVERSITY	CHINA MAINLAND	15,390	348,798	22.66
18	NANKAI UNIVERSITY	CHINA MAINLAND	10,989	347,574	31.63
19	SOUTH CHINA UNIVERSITY OF TECHNOLOGY	CHINA MAINLAND	11,672	337,803	28.94
20	NANYANG TECHNOLOGICAL UNIVERSITY	SINGAPORE	7,416	333,979	45.03
21	CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (CSIC)	SPAIN	15,554	333,772	21.46
22	NANJING UNIVERSITY	CHINA MAINLAND	11,534	329,466	28.56
23	COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH	INDIA	16,681	326,964	19.60

4.SCUT's Chemistry Discipline Breaked into Top 0.01% Globally in ESI Rankings, Becoming the University's Second Discipline to Achieve This Milestone

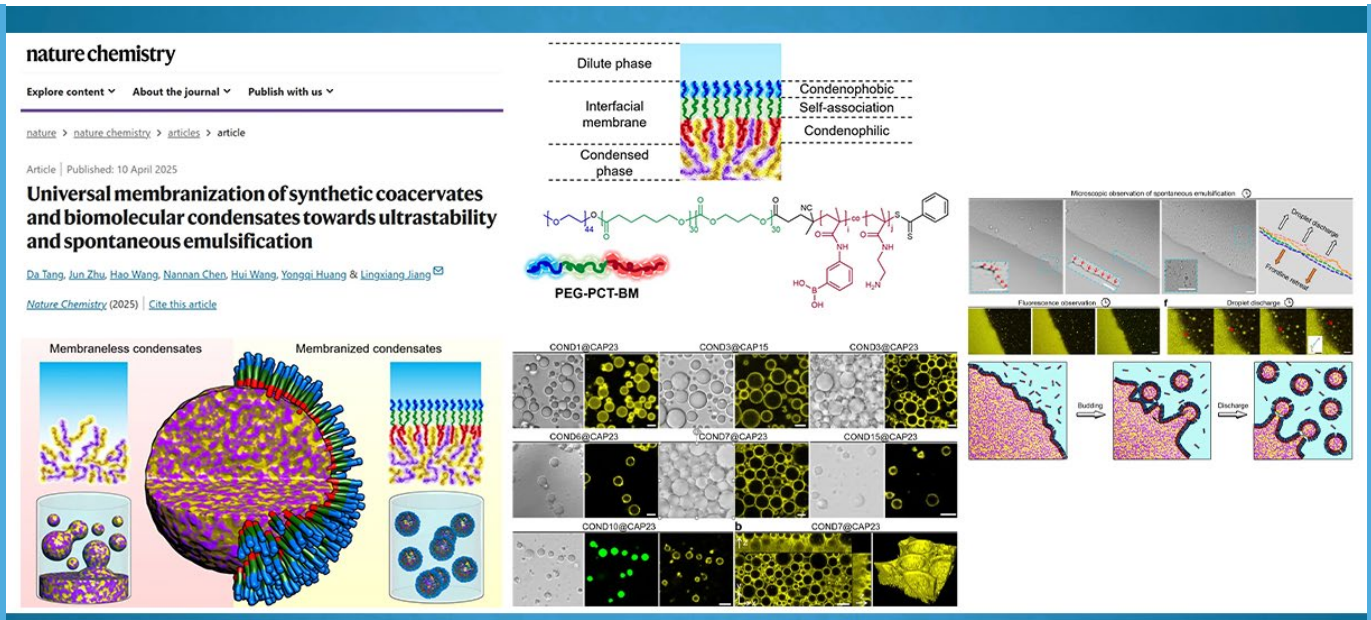
再获突破！华南理工大学化学进入ESI全球前万分之一

According to the latest Essential Science Indicators (ESI) data released by Clarivate in May, SCUT's Chemistry discipline has entered the ESI global top 0.01% for the first time, becoming the university's second discipline to achieve this elite status following Engineering. Now SCUT's overall ESI rank has surged to 141 worldwide among top 150 globally and 19 among mainland Chinese universities.

ESI is an analytical and evaluative tool for assessing research performance and tracking trends in scientific development. Disciplines ranking in the Top 1% are classified as "Excellent", Top 0.1% as "Exceptional", and Top 0.01% as "World-Leading". SCUT currently has 16 disciplines ranked in the ESI global top 1%, including 5 in the top 0.1% and 2 in the top 0.01%.

5月，科睿唯安公布了基本科学指标数据库（Essential Science Indicators，简称ESI）最新统计数据，华南理工大学化学学科首次进入ESI全球前万分之一行列，这是继工程学之后华南理工大学又一个进入ESI全球前万分之一的学科。华南理工大学ESI国际排名也攀升至全球前150强位居全球第141位，内地高校第19位。

ESI是衡量科学研究水平、跟踪科学发展趋势的分析评价工具，进入前百分之一的学科为优秀，前千分之一的学科为卓越，前万分之一的学科为领先。目前，华南理工大学共有16个学科进入ESI前百分之一，其中5个学科进入ESI前千分之一，2个学科进入ESI前万分之一。



5.SCUT Research Team Armored Condensate Droplets with "Molecular Bodysuit"

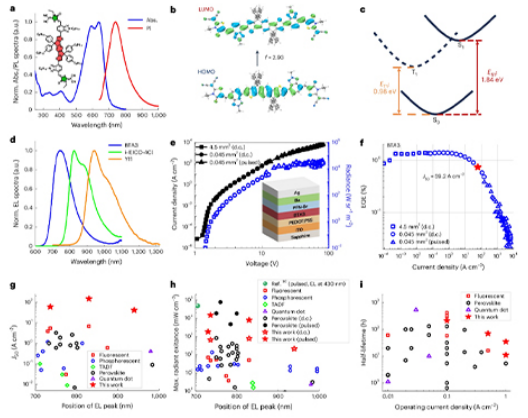
华南理工科研团队，给凝聚液滴披上"紧身盔甲"！

The research team led by Prof. Jiang Lingxiang at SCUT published a study titled "Universal Membranization of Synthetic Coacervates and Biomolecular Condensates Towards Ultrastability and Spontaneous Emulsification" in *Nature Chemistry*. The team developed Condensate-Amphiphilic Polymers (CAPs), which universally stabilize "coacervate-water" interfaces and achieve ultrastability and spontaneous emulsification of synthetic coacervates and biomolecular condensates. CAPs-membranized droplets function as a "molecular bodysuit" as they demonstrate exceptional stability not only in aqueous media but also under high-salinity, extreme pH, and organic solvent conditions.

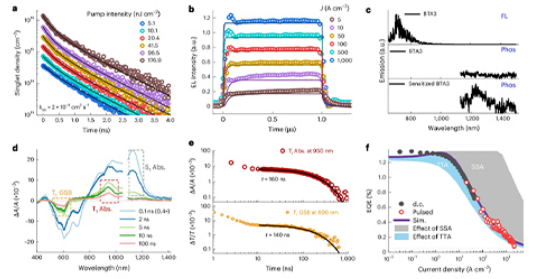
This material shows promising applications in developing intelligent drug delivery systems and novel functional materials. Furthermore, it demonstrates potential for simulating cellular compartmentalization and molecular transport processes, providing innovative tools for research in artificial cell engineering, organelle biomimetics, and bioengineering applications.

华南理工大学蒋凌翔团队以题为"Universal membranization of synthetic coacervates and biomolecular condensates towards ultrastability and spontaneous emulsification"发表于 *Nature Chemistry*。团队研究设计并合成了新型嵌段高分子" Condensate-Amphiphilicblock Polymers, CAPs "，该物质可通用地稳定各种"凝聚相-水相"界面，实现对合成或生物凝聚液滴的超强稳定和自发乳化能力。CAPs膜化的液滴不仅在水中稳定存在，更可在高盐、极端pH值甚至有机溶剂环境中保持形态，堪称"分子级紧身盔甲"。

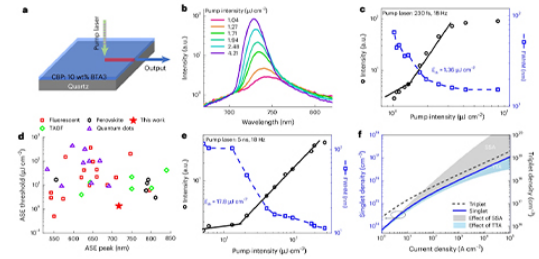
该物质可以应用于制备智能药物输送系统或新型材料，还可能进一步模拟细胞的各种分隔及分子运输过程，为人造细胞学、细胞器模拟、生物工程等研究领域提供新的工具。



Organic semiconductor for ultrahigh-brightness NIR emission.



Transient behaviour under optical and electrical excitations and simulated EQE roll-off.



ASE measurements of BTA3 and simulated singlet and triplet densities.

6.SCUT Prof. Wu Hongbin's Team Proposed a Novel Strategy to Suppress OLED Efficiency Roll-off

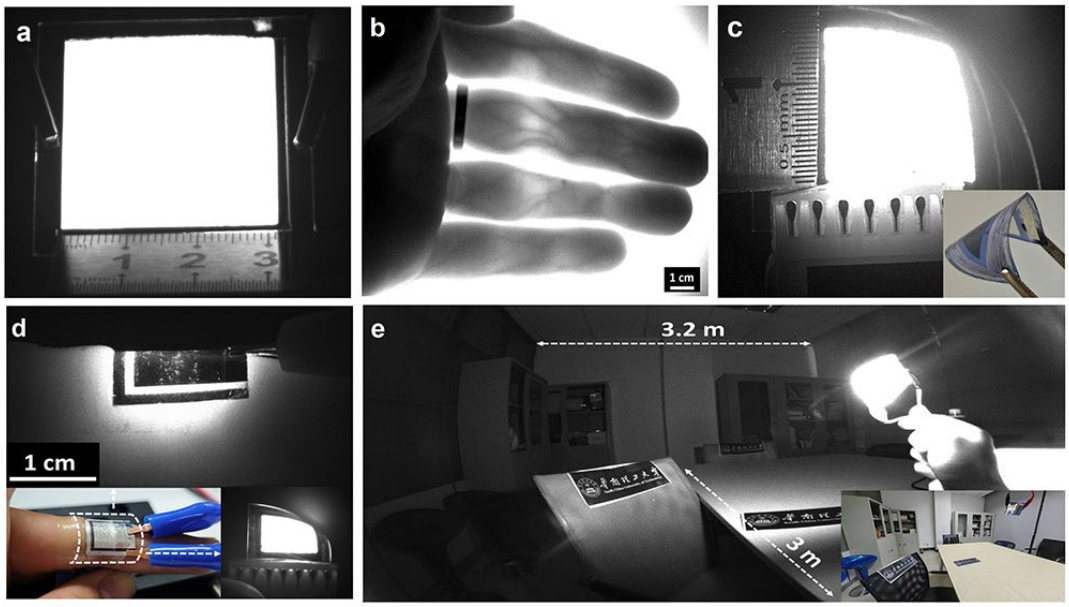
华南理工大学吴宏滨团队提出抑制有机发光二极管发光效率滚降新策略

On May 13, the research team led by Prof. Wu Hongbin at SCUT reported their research paper titled "Ultrahigh-radiance Near-infrared Organic Light-emitting Diodes" in *Nature Photonics*. They proposed a novel strategy to suppress efficiency roll-off in organic light-emitting diodes (OLEDs), through which the quenching of singlet excitons by long-lived triplet excitons was significantly alleviated, thus enhancing the critical current density to approximately 100 A/cm^2 under DC driving and 10 kA/cm^2 under pulsed driving, ultimately achieving ultrahigh-brightness near-infrared electroluminescence with a radiance 147 times greater than that of terrestrial solar irradiance.

Due to its low optical scattering and deep tissue penetration characteristics in living organisms, the near-infrared spectrum (700-1700 nm) holds broad application prospects in optical coherence tomography, biomedical diagnostic such as blood oxygen/glucose monitoring, and biometric identification including facial/iris/fingerprint recognition. Therefore, the results pave the way for further non-invasive, wearable and implantable electronic devices such as pulse oximeters, continuous glucose monitors, photobiomodulation therapy systems, and optical coherence tomography imaging platforms.

5月13日，华南理工大学吴宏滨团队以题为"Ultrahigh-radiance near-infrared organic light-emitting diodes"（超高辐射亮度的近红外有机发光二极管)发表于*Nature Photonics*（《自然·光子学》）。团队提出了抑制有机发光二极管发光效率滚降的新策略，通过降低长寿命三重态激子对单重态激子的猝灭，将器件在直流和脉冲驱动下的临界电流密度分别提高到100 A/cm2和10 kA/cm2量级，实现了亮度达到地表太阳辐照水平147倍的超高亮度近红外电致辐射。

近红外波段(700-1700 nm)因其在生物体内或者组织中呈现散射低、穿透深等特性，在光学相干断层扫描技术、血氧/血糖等生化信息采集、面部/虹膜/指纹等生物辨识等方向具有广泛的应用前景，成为血氧/血糖仪、光生物调节和光学相干成像等非侵入性、可穿戴、可植入电子设备的理想光源之一。



(a)Picture of a large-area flood light source with a size of 10 cm^2 (3.2 cm × 3.2 cm)

(b)Images of subcutaneous blood vessels of human fingers under the transmitted illumination of large-area NIR OLEDs

(c)A flexible 1.5×1.5 cm^2 area light source fabricated on bendable substrates

(d)Proof-of-concept demonstration of wearable OLED patches

(e)Demonstration for indoor active night-vision illumination applications

(a)预研阶段研制的10cm2的近红外OLEDs实物照片

(b)人手指血管透射成像

(c)基于柔性衬底制造的1.5×1.5 cm^2可弯曲面光源

(d)可穿戴OLEDs贴片概念演示

(e)用于室内主动夜视照明等应用的示例

7.The National Competition of Transport Science and Technology for Undergraduate Students Concluded with SCUT Smart Transportation Projects Winning Dual First Prizes

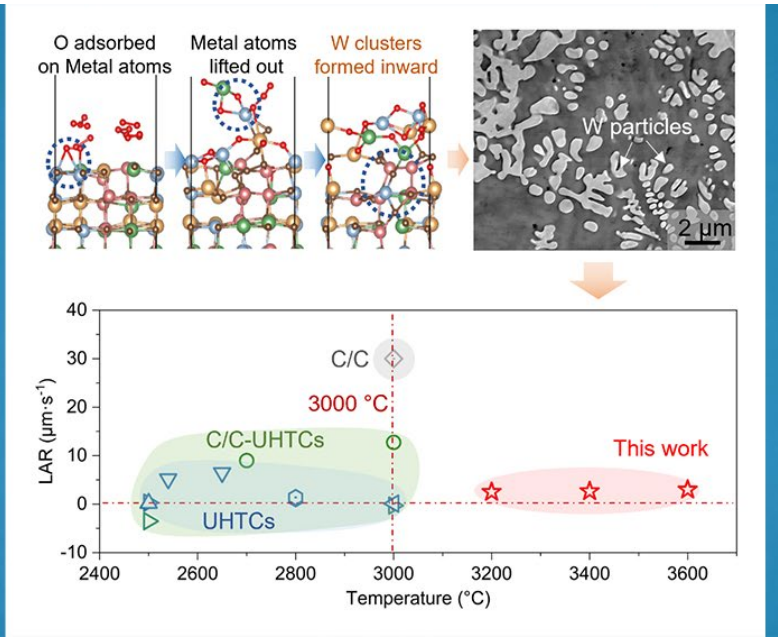
全国大学生交通运输科技大赛落幕　华南理工智慧交通项目获两项一等奖

The 20th National Competition of Transport Science and Technology for Undergraduate Students (NACTranS) was held from May 24 to 25. With a focus on next-generation productive forces and sustainable transportation development, the competition encompassed maritime technology, inland waterway transport, traffic engineering, road transportation, aviation systems, and more. SCUT secured two national first prizes and three second prizes among 1,232 entries from 144 universities across China. Notably, two groundbreaking projects from SCUT were awarded first prizes: "SmartFlow", an adaptive traffic signal control system that innovatively combines prior domain knowledge with meta-reinforcement learning; and "SafePlatoon", an autonomous bus platooning system with collaborative safety-optimized dispatch.

NACTranS, now in its 20th edition, stands as one of China's most influential collegiate technology competitions in transportation with the highest number of participating universities, the largest student participation base, and the most significant societal impact.

5月24日至25日，第二十届全国大学生交通运输科技大赛决赛落幕。本次大赛聚焦新质生产力与绿色交通发展，涵盖航海技术、水路运输、交通工程、道路运输、航空运输等领域。大赛共收到来自全国144所高校的1232件作品，华南理工大学获全国一等奖2项、二等奖3项。其中，“智序畅行”——融合先验知识与元强化学习的交通信号自适应控制方法和“慧安公交”——自动驾驶公交协同编队安全调度优化系统获一等奖。

据悉，全国大学生交通运输科技大赛迄今已举办二十届，是我国交通运输领域参赛高校最多、参与学生最多、社会影响力最大的大学生科技创新竞赛项目之一。



8.SCUT Chu Yanhui's Research Team Breaked Ultra-High Temperature Ceramics Barrier with 3,600°C-Oxidation-Resistant Material

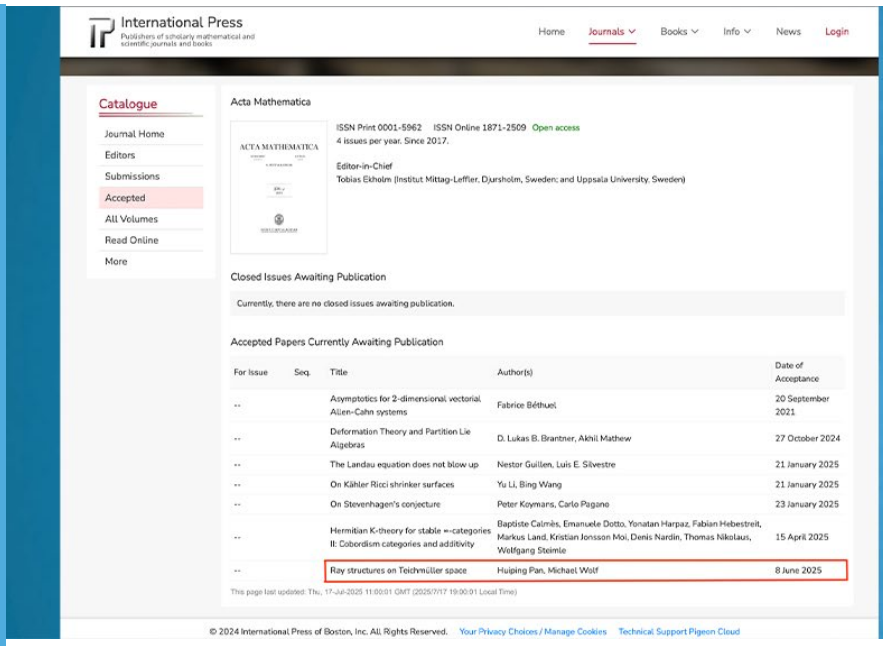
3600°C抗氧化！ 华南理工大学褚衍辉团队突破超高温陶瓷材料研发瓶颈

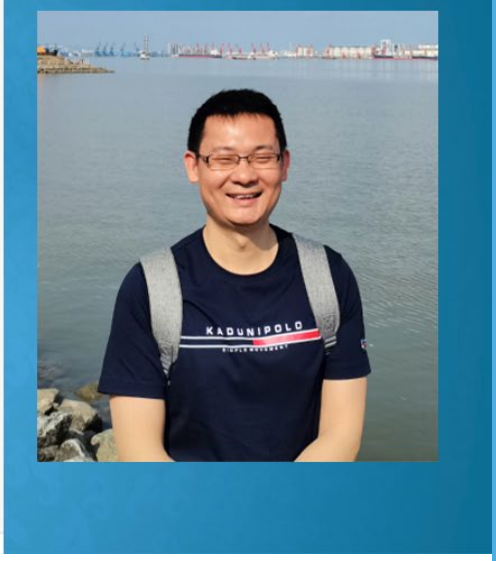
The research team led by SCUT Researcher Chu Yanhui published a study titled "Exceptional Oxidation Resistance of High-Entropy Carbides up to 3,600°C" in *Advanced Materials*. Through a high-entropy, multi-constituent compositional approach, the team successfully developed an oxidation-resistant high-entropy carbide material, (Hf, Ta, Zr, W)C, which is capable of withstanding ultra-high temperatures up to 3,600°C. This new type of ultra-high-temperature ceramic material holds significant potential for applications in aerospace & aviation, new energy, and other fields requiring extreme high-temperature resistance.

The exceptional ultra-high-temperature oxidation resistance of this material primarily stems from the formation of a tungsten alloy with an ultra-high melting point. Tungsten exhibits the highest surface oxygen adsorption energy among the constituent elements, making it the most oxidation-resistant. The other elements oxidize preferentially, thereby inhibiting the oxidation of the tungsten alloy. Based on this mechanism, the tungsten alloy disperses uniformly within the oxide layer, acting as a high-melting-point skeleton that enhances the viscosity of the oxide, effectively suppresses high-temperature volatilization of the oxide, and impedes oxygen penetration into the inner matrix.

华南理工大学褚衍辉团队以题为"Exceptional Oxidation Resistance of High-Entropy Carbides up to 3600℃"发表于*Advanced Materials*。团队通过高熵多组元成分设计，成功开发可耐3600℃高温的抗氧化高熵碳化物(Hf，Ta，Zr，W)C材料。该新型超高温陶瓷材料在航空航天、新能源等需耐受极端高温的领域具有广阔的应用前景。

该材料的超高温抗氧化性能主要得益于生成的具有超高熔点的钨合金。钨元素的表面氧原子吸附能最高，氧化难度最大，钨以外的其余元素则会优先氧化，阻碍钨合金的氧化。在此原理基础上，钨合金弥散分布于氧化物层，可作为高熔点骨架，提高氧化物黏度，有效降低氧化物的高温挥发，阻碍氧气向内部基体渗透。





9.SCUT Achieved First-Ever Publication in One of the World's Top Four Mathematics Journals

重大突破！华南理工成果首次被世界四大顶级数学期刊接受发表

In June 8, the paper titled "Ray Structures on Teichmller Space" by Associate Professor Pan Huiping from SCUT and Professor Michael Wolf, Chair of the School of Mathematics at Georgia Institute of Technology and Fellow of the American Mathematical Society, has been accepted for publication by *Acta Mathematica*, one of the four world-leading mathematics journals. This publication marks the first time that an SCUT researcher's work has been accepted by one of the four most selective and authoritative journals in mathematics.

Acta Mathematica is universally recognized as one of the four most prestigious mathematics journals in the world, standing alongside *Journal of the American Mathematical Society*, *Inventiones Mathematicae*, and *Annals of Mathematics*.

6月8日，华南理工大学潘会平副教授与美国佐治亚理工学院数学系主任、美国数学会会士 Michael Wolf 教授合作的论文"Ray structures on Teichmüller space"被国际顶尖数学期刊*Acta Mathematica*（《数学学报》）接受发表。这是华南理工大学教师首次在国际数学界公认的四大顶尖期刊上接受发表高水平研究成果。

据悉，Acta Mathematica是国际数学界公认的四大顶尖期刊之一，与Journal of the AmericanMathematical Society（《美国数学会杂志》）、Inventiones Mathematicae（《数学新进展》）和Annals of Mathematics（《数学年刊》）齐名。

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