陕西师范大学
SHAANXI NORMAL UNIVERSITY

化学化工学院
School of Chemistry & Chemical Engineering

02 / 2023

# 光子鼻与分子材料团队
# Photonic Nose and Molecular Materials Group

# 简 报
# Newsletter

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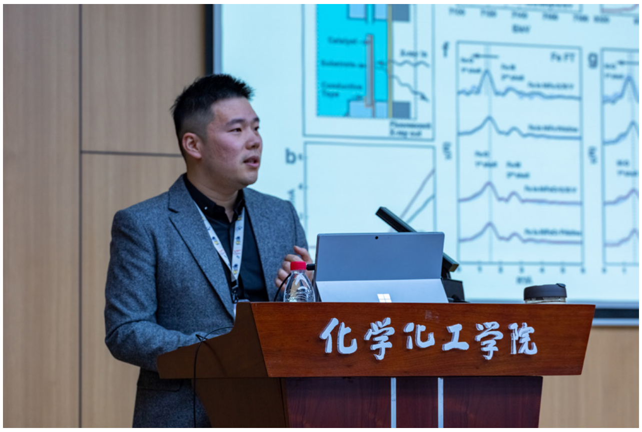
# 薄鑫、刘小燕老师作学术交流报告

## Bo Xin and Liu Xiaoyan gave academic reports



2023 年 2 月 10 日下午，光子鼻与分子材料团队在致知楼 1668 报告厅举行学术交流会，薄鑫老师和刘小燕老师作了学术交流报告。

团队全体教师和研究生参加了此次交流会，会议由刘静教授主持。

薄鑫老师以“高效电解水制氢催化剂的设计与应用”为题，介绍了高价态铬掺杂催化体系对电化学析氧催化活性的提升、采用一步电沉积法制备的钼磷共掺杂钴基活性材料对电化学析氢催化性能的促进，及其在实际工业生产中的广阔前景。薄鑫老师还分享了自己的求学和科研生涯经历，鼓励同学们在科研中要多尝试，“前期不要顾及有没有成果，卯着劲多做，做多了就懂了”。

刘小燕老师以“软物质纳米颗粒与仿生物膜的相互作用”为题，介绍了在研究课题中使用简单的磷脂分子模拟细胞膜，将实验结果与理论计算结合研究了纳米粒子与细胞膜之间的相互作用，及其在药物运输、癌症治疗和细胞包封等方面的重要意义。

汇报后，薄鑫老师和刘小燕老师与在场师生就所关心的问题进行了交流。

On February 10, 2023, the Photonic Nose and Molecular Materials group held an academic exchange meeting in the 1668 lecture hall of Zhizhi Building, and Dr. Bo Xin and Dr. Liu Xiaoyan gave academic reports.

Teachers and graduate students of the group participated in the meeting, which was anchored by Prof. Liu Jing.

Bo Xin introduced the improvement of the catalytic activity of electrochemical oxygen evolution by high-valence chromium-doped catalytic system with the title of "Design and Application of Efficient Electrolyzed Water to Hydrogen Production Catalyst", the promotion of the catalytic performance of molybdenum-phosphorus co-doped cobalt-based active materials prepared by one-step electrodeposition method, and its broad prospects in actual industrial production. Teacher Bo Xin also shared his experience in his study and scientific research career, encouraging students to try more in scientific research, "Don't care about whether there are results in the early stage, do more work, and understand when you do more".

Liu Xiaoyan introduced the use of simple phospholipid molecules to simulate cell membranes in the research topic entitled "Interaction between Soft Matter Nanoparticles and Biofilms", and combined experimental results with theoretical calculations to study the interaction between nanoparticles and cell membranes, and its significance in drug delivery, cancer treatment and cell encapsulation.

After the presentation, Bo Xin and Liu Xiaoyan exchanged views with the teachers and students present.

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## 简讯动态 News in Brief

# 房喻院士参加催化与表界面化学青年学者交流会并作报告

## Fang Yu speaks at Young Scholars Forum of Catalysis and Surface/Interface Chemistry

2023 年 2 月 26 日，房喻院士赴大连市参加在中国科学院大学能源学院（大连）举办的 B02 催化与表界面化学青年学者学术交流会，并作题为《薄膜荧光传感研究——回顾与展望》大会报告。彭浩南教授、何刚教授参加了此次会议。

On February 26, 2023, Prof. Fang Yu went to Dalian to participate in the B02 Catalysis and Surface Interface Chemistry Young Scholars Academic Exchange Conference held at the School of Energy Science of the University of Chinese Academy of Sciences (Dalian), and gave a conference report titled "Research on Film Fluorescence Sensing - Review and Prospects". Prof. Peng Haonan and Prof. He Gang attended the meeting.

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# Bi-*ortho*-Carborane Unit-Riveted Perylene Monoimides: Structure-Tuned Optical Switches for Electron Transfer and Robust Thin Film-Based Fluorescence Sensors

Nannan Ding[1†], Yu-Chan Liao[2†], Gang Wang[1], Kai-Hsin Chang[2], Zhaolong Wang[1], Ke Liu[1], Jiani Ma[1*], Pi-Tai Chou[2*] & Yu Fang[1*]

# 邻碳硼烷–苝单酰亚胺多分体的电子转移构效关系调控及其薄膜态荧光传感

薄膜基荧光传感器（FFSs）作为一种可调、多功能的微型探测器替代品，在社会安全和环境应用中具有更重要的意义。然而，FFSs的设计仍然存在挑战，这在很大程度上取决于荧光传感单元的结构和性质以及传感单元薄膜态的adlayer结构。因此，具有优异的光物理性质、多孔性和抗堆积结构的荧光传感单元的创新设计在灵敏度和可逆性方面对获得高性能FFSs起着关键作用。

在本工作中，我们策略性地设计并合成了一种V型邻碳硼烷–苝单酰亚胺（PMI）衍生物PDCB，该V型结构中，苯基邻碳硼烷显著阻碍了PMI的旋转。稳态光谱研究表明，PDCB在稀溶液中不仅表现出类似PMI单体态的发射，长波甚至近红外区还有溶剂极性依赖的发射。而具有线型结构的参比化合物PMI–CBH，仅表现出单体态的、且无溶剂依赖的发射。时间分辨光谱表明，PDCB的局域激发态（LE）在PMI和苯–碳硼烷之间通过化学键发生了光诱导电子转移（PET）反应，形成了电荷转移（CT）态。另外两个PMI的衍生物PCB和PDCBP也表现出类似的现象。在甲苯溶液中，PET速率为PCB (48 ps$^{-1}$) > PDCB (163 ps$^{-1}$) > PDCBP (815 ps$^{-1}$)，即随着空间位阻的增加，PET速率降低，说明在PET反应发生前存在构象弛豫。PDCB及其衍生物的LE和CT发射具有相同的总衰减率，表明LE和CT态之间存在热力学平衡。

利用化合物弯曲结构和高孔隙率（~38 %）及其微环境敏感特性，制备

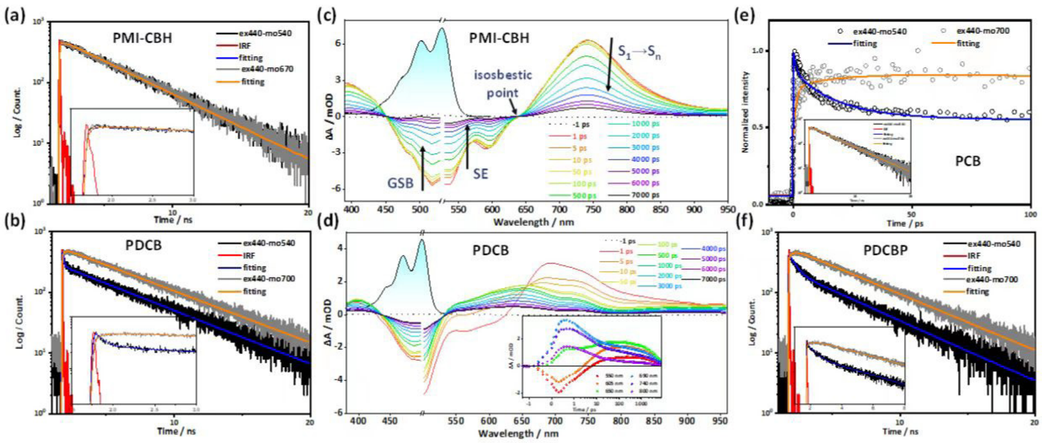

图1 化合物的时间分辨光谱。

Figure 1 Time-resolved fluorescence and transient absorption spectra of the compounds.

了基于化合物 PDCB 的管式传感器，其响应时间小于 1 s，恢复时间 < 10 s，在室温环境气氛中对丙酮气体的检测限 < 2.2 ppt。经过 100 次循环后，传感性能无明显下降，实现了实用的高性能丙酮薄膜荧光传感器。

该工作首次报道了非线型 PMI–苯基碳硼烷衍生物经由结构弛豫诱导形成电荷转移态，与以往通过改变电子给 / 受体的电子授受能力来调控分子内电子转移速率不同，通过改变苯基碳硼烷的空间位阻，首次实现了 PMI 与苯基碳硼烷之间电子转移速率的精细调控。

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As a tunable, versatile alternative for miniaturised detector, film-based fluorescent sensors (FFSs) are much more significant in social security and environmental applications. However, design of FFSs remains a great challenge, which is largely determined by the structural property of the sensing fluorophore and the adlayer structure of fluorophore-based film. Therefore, innovative design of sensing fluorophores possessing superior photophysical properties, porous and packing-resistance structures plays pivotal roles for high performance FFSs in terms of sensitivity and reversibility.

To this end, PDCB, a structurally riveted perylene monoimide (PMI) derivative incorporating large spatial phenyl-carborane was strategically designed and synthesized, which was found to be with unexpected photophysical properties. PDCB with a bending configuration between PMI and phenyl-carborane exhibits not only PMI-like emission but also a large Stokes shifted emission in the red and near IR. In sharp contrast, the reference compound PMI-CBH, which is in a linear configuration, exhibits only PMI-like and solvent independent emission profile. Time-resolved fluorescence and transient absorption studies reveal that upon local excitation (LE) PDCB undergoes a photoinduced electron transfer (PET) between PMI and phenyl-carborane via a through bond manner, resulting in a charge-transfer (CT) state. Further support is given by synthesis of other two PDCB derivatives, PCB and PDCBP, where the former truncates a carborane moiety and latter adds an ortho-phenyl ring from the parent PDCB. As a result, PET was also observed for PCB and PDCBP, the rate of which is in the order of PCB (48 $ps^{-1}$) > PDCB (163 $ps^{-1}$) > PDCBP (815 $ps^{-1}$) in toluene, being decreased as increasing the steric hindrance, inferring the perquisite of structure reorganization prior to the through bond PET reaction. Both LE and CT emissions exhibit identical population decay rate for PDCB and its derivatives, manifesting the thermal equilibrium between LE and CT states.

Taking the bending structure, advantage of profound porosity (~38%) and sensitive microenvironment effects, we fabricated a PDCB-based film and proved it to be an excellent acetone-selective sensor, having a fast response time of less than 1 s, followed by a recovery time of < 10 s and a detection limit of < 2.2 ppt in the ambient atmosphere at room temperature. No observable degradation of the sensing performance after 100 on-off cycles, attaining a practical and high-performance acetone film sensor.

This work is the first to report that non-linear PMI-phenyl-carborane derivatives form a charge transfer state through structural relaxation, which is different from the previous regulation of intramolecular electron transfer rate by changing the electron donor/acceptor ability. By changing the steric hindrance of phenyl-carborane, we achieved the fine regulation of electron transfer rate between PMI and phenyl-carborane for the first time.

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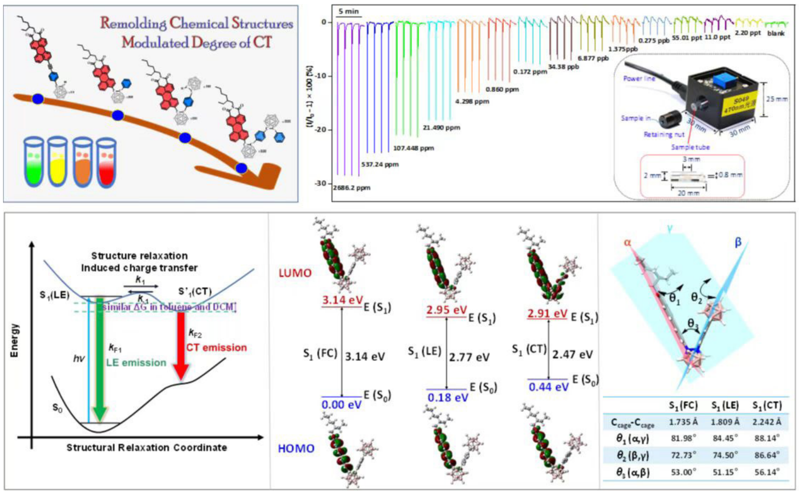
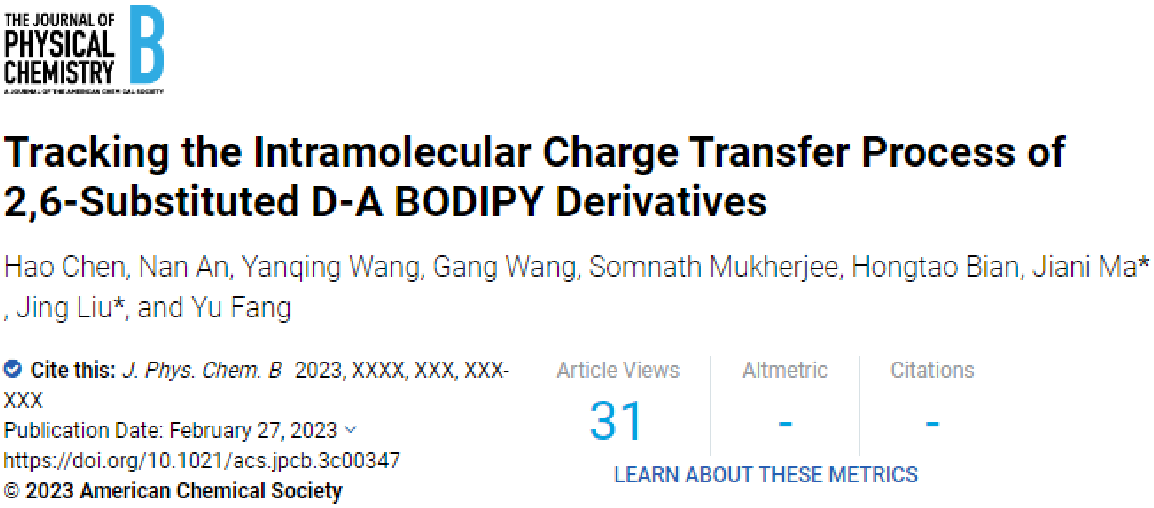


| | $S_1$(FC) | $S_1$(LE) | $S_1$(CT) |
|---|---|---|---|
| $C_{cage}$-$C_{cage}$ | 1.735 Å | 1.809 Å | 2.242 Å |
| $θ_1$ (α,γ) | 81.98° | 84.45° | 88.14° |
| $θ_2$ (β,γ) | 72.73° | 74.50° | 86.64° |
| $θ_3$ (α,β) | 53.00° | 51.15° | 56.14° |

图 2 结构弛豫诱导化合物激发态电子转移的示意图和理论计算，及化合物 PDCB 薄膜态对丙酮气体的传感

Figure 2 Schematic diagram and computational approach of structure relaxation-induced electron transfer of compound(s), and sensing performance of the conceptual PDCB-based sensor.



THE JOURNAL OF PHYSICAL CHEMISTRY B

# Tracking the Intramolecular Charge Transfer Process of 2,6-Substituted D-A BODIPY Derivatives

Hao Chen, Nan An, Yanqing Wang, Gang Wang, Somnath Mukherjee, Hongtao Bian, Jiani Ma*, Jing Liu*, and Yu Fang

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# 2,6– 位电子给体修饰 BODIPY 衍生物的分子内电荷转移过程研究

氟硼二吡咯烷（BODIPY）因其摩尔消光系数大、荧光量子产率高、荧光发射峰较窄以及光物理和化学性质可调等优点引起了科研工作者的广泛关注。近年来，BODIPY 衍生物已被应用于化学传感器、荧光成像、光电器件和光动力治疗等领域。然而，BODIPY 的刚性骨架结构抑制了其激发态的非辐射跃迁，导致该类分子荧光辐射的 Stokes 位移较小，继而引起严重的自吸收现象且发射谱带多位于能量较大区域（$\lambda_{em} < 600$ nm），限制了 BODIPY 衍生物的实际应用。

为了改善 BODIPY 衍生物的光物理性质，科研工作者在 BODIPY 骨架的不同位点引入了不同的取代基。研究表明：同时包含电子给体（D）和电子受体（A）结构的荧光化合物受光激发后，可通过分子内电荷转移（Intramolecular Charge Transfer, ICT）过程调控激发态能隙，进而改善其光物理性质。其中，在 2,6– 位引入电子给体被证明是调控 BODIPY 衍生物光物理性质的一个有效策略，显然，要理性设计性能优异的 D–A 型 BODIPY 衍生物，追踪其激发态 ICT 过程至关重要。然而，截止目前为止，有关 2,6– 位取代的 D–A 型 BODIPY 衍生物的发光动力学研究尚未被报道，飞秒瞬态吸收光谱（fs–TA）是研究这一超快光物理过程的有力技术。

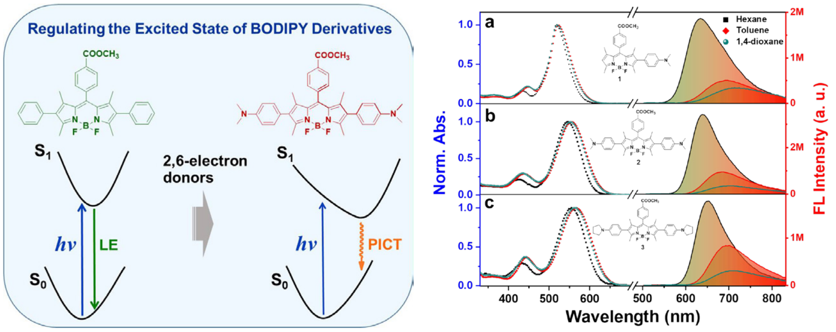

图 1. 左：BODIPY 衍生物激发态的调控过程；右：化合物 1(a), 2(b), 3(c) 在不同溶剂中的吸收光谱（归一化）和荧光发射光谱。

Figure 1. Left: schematic illustration of regulating the excited state of BODIPY derivatives; Right: normalized absorption (dot line) and fluorescence emission (solid line) spectra of 1 (a), 2 (b), and 3 (c) in hexane (black line), toluene (red line), and 1,4-dioxane (green line).

本工作中，我们设计合成了三种 2,6– 位修饰电子给体的 BODIPY 衍生物，1–3，由于 ICT 过程，化合物 3 表现出了较大的 Stokes 位移和较高的荧光量子产率。利用 fs–TA 光谱，我们成功追踪了 D–A 型 BODIPY 衍生物受光辐射后的激发态动力学过程，结果表明：化合物 2 和 3 在非极性和小极性溶剂中即可形成 CT 激发态，但在极性较大的溶剂里主要以电荷分离态为主，导致该类分子在大极性溶剂里荧光量子差率很低。利用 fs–TA 光谱，我们首次在非极性及小极性溶剂里探测到了 2,6– 位取代 D–A 型 BODIPY 分子的 CT 激发态，表明相较于其他位点修饰，2,6– 位取代是改善 BODIPY 分子光物理性质的有效策略，该策略为设计制备具有优异光物理性质的 BODIPY 发光材料提供了思路

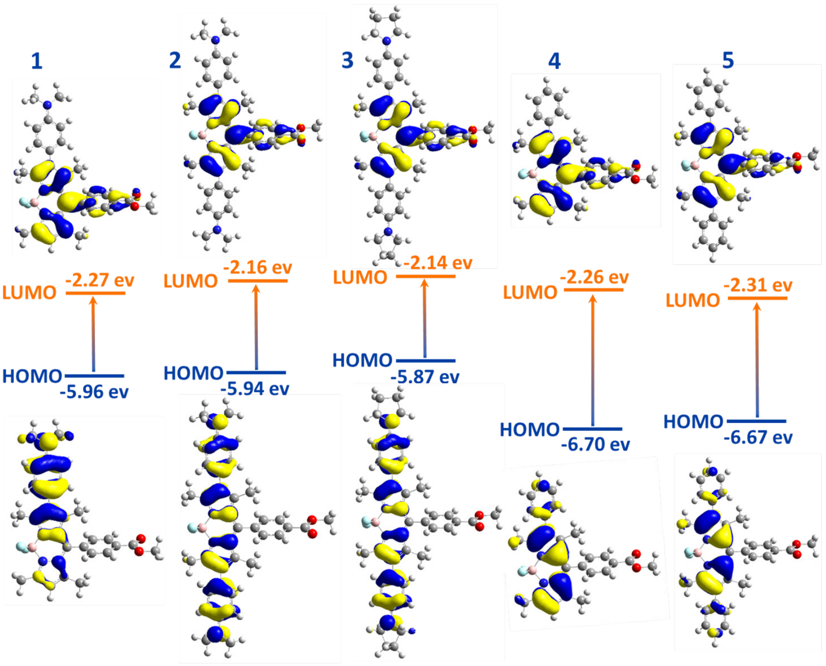

图 2 化合物 1–5 在正己烷中的激发态 HOMO–LUMO 轨道能级。
Figure Distribution of HOMOs and LUMOs of compounds 1-5 at the S1-min in n-hexane.

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In recent years, boron dipyrromethene (BODIPY) has been extensively studied due to its excellent properties, such as large extinction coefficient, high emission quantum yield, relatively sharp emission peaks, and tunable photophysical and chemical properties. BODIPY fluorophores have been widely used in chemosensors, fluorescence imaging, photoelectric devices, and photodynamic therapy. However, the rigid skeleton of the BODIPY derivatives prevents non-radiative deactivation of the excited state, leading to their straightforward excited state relaxation. The small Stokes shift results in strong self-absorption and the emission in the green region ($\lambda_{em}$ < 600 nm), limiting the applications of BODIPY derivatives.

Great efforts have been devoted to broadening the Stokes shift of BODIPY by introducing different substituents at different core positions. It has been proven that the photophysical properties of push-pull chromophores can be tuned through the intramolecular charge transfer. Modifying the 2, 6 positions with electron donors is proposed as a striking strategy for improving the photophysical properties of the BODIPY derivatives. To design a fluorescent framework with excellent properties, it is crucial to understand the dynamics of the excited state of ICT. However, as of now, there is no relevant study on tracking the ICT process of 2,6-substituted BODIPY compounds and no direct spectral information has been reported regarding the generation and decay of the ICT state. Femtosecond transient absorption (Fs-TA) is a powerful technique to elucidate these ultrafast dynamics.

In this study, three BODIPY derivatives with electron donating substituents on the 2,6-positions of the core were designed and synthesized. Importantly, a large Stokes shift was observed with a moderate QY for 3 in hexane through ICT process. The CT state formation was probed by broadband femtosecond transient absorption spectroscopy. Unlike other studies utilizing indirect steady state fluorescent testing to describe the CT state in 2,6-substituted BODIPYs, the present study applied direct information regarding the CT state's generation and evolution for the first time. Noticeably, compounds 1-3 exhibited CT emission even in the non-polar or less polarity solvent. This work highlights that decorating the 2,6-positions of the BODIPY core with electron donating groups is the key to adjusting its photophysical properties, compared to other substitution positions. This convenient approach is expected to facilitate the development of the efficient photo-functional materials based on the functionalized BODIPY.

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## New reticular chemistry of pillared rare-earth kgd supermolecular building layer frameworks with ethane-trapping property†

Hong-Xin Li, Han Fang, Yu-Feng Zhang, Zong-Hui Zhang and Dong-Xu Xue *

# 具有乙烷捕获特性的稀土 kgd 超分子构筑层骨架的新网格化学

从乙烷中高效纯化乙烯具有重要意义，但也具有挑战性。柱层型 MOF 材料可以通过保持超分子构筑层（SBL）不变而改变连接的柱子，从而实现对结构孔尺寸和孔表面环境的调控。为此，该类材料在气体分离、储存和催化等方面具有广泛应用前景。基于单一边传递的二维层共有五种，分别为 sql，kgm，hcb，hex 和 kgd，基于前四种 SBL 的柱层型 MOF 材料报道相对较多，而基于 kgd SBL 的柱层型 MOF 则鲜有报道，这可能与 kgd 型 SBL 包含两种结点有关。此外，文献调研表明，目前报道的柱层型 MOF 主要基于过渡金属，基于稀土的柱层型 MOF 则研究极少。

鉴于以上想法，本文以 $Tb(NO_3)_3$–$6H_2O$ 为金属源，分别以单一三齿羧酸 $H_3NTB$（4,4',4''– 三羧基三苯胺）、$H_3NTB$ 与一系列不同长度的线性二羧酸的混合配体为桥连配体，采用溶剂热法，成功地制备了五例基于不常见基于 kgd 二维层的柱层型稀土 MOF 化合物。单晶结构分析表明，由于连接层与层之间柱子的不同，这些化合物形成 trk、zma 和 tpk 三类不同拓扑的柱层型稀土 MOF 结构（图 1）。基于该系列 MOF 材料的微孔特性与惰性孔表面，四种 MOF 材料均表现出乙烷 / 乙烯反向分离的潜力，其中 Tb–NTB–1,4–NDC 的性能最佳。这一结果通过混合气体动态穿透实验得到了验证。这项工作为基于少见的稀土 kgd 型 SBL 柱层 MOF 新材料的系统和网格化构筑提供了重要的依据。

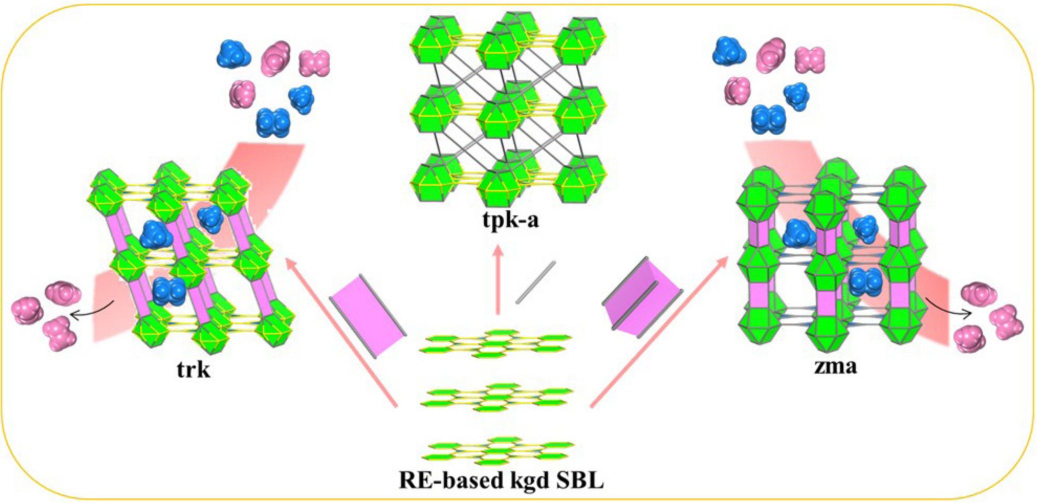

图 1. 列柱层稀土 MOF 的组装和乙烯 / 乙烷分离示意图

Figure 1. Schematic representation of the assembly and C2H4/C2H6 separation for the series of pillar-layered RE MOFs

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全文链接：https://pubs.rsc.org/en/content/articlepdf/2023/QI/D3QI00103B

The industrial demand for ethylene is increasing, efficient purification of ethylene from ethane is of significant importance but challenging. Pillar-layered metal-organic frameworks (MOFs) have aroused extensive attention due to their application potential in gas separation, storage and catalysis, etc. Herein, five pillar-layered RE(rare-earth)-MOFs based on rare kgd supermolecular building layers (SBLs) were successfully prepared under solvothermal conditions by means of $Tb(NO_3)_3×6H_2O$ as the metal source, single tritopic $H_3NTB$ (4,4',4''-nitrilotribenzoic acid) or mixed H3NTB with a series of ditopic ligands with distinct lengths as the bridge linkers. Single crystal structure analyses showed that three types of pillar-layered RE-MOFs were isolated due to the difference of pillars between the exclusive kgd SBLs, i.e., trk, zma and tpk topological networks. The $N_2$ isotherms exhibit that the first four MOFs feature microporous characteristics.

Furthermore, the single component of $C_2H_6$, $C_2H_4$, $C_2H_2$ and $CO_2$ sorption isotherms show that the four materials exhibit reverse $C_2H_6/C_2H_4$ separation as well as $C_2H_2$-selective adsorption for $C_2H_2/CO_2$ mixture. Among them, Tb-NTB-1,4-NDC displays the best separation potential as revealed by ideal adsorption solution theory and dynamic column breakthrough experiments.

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Full Text Link: https://pubs.rsc.org/en/content/articlepdf/2023/QI/D3QI00103B

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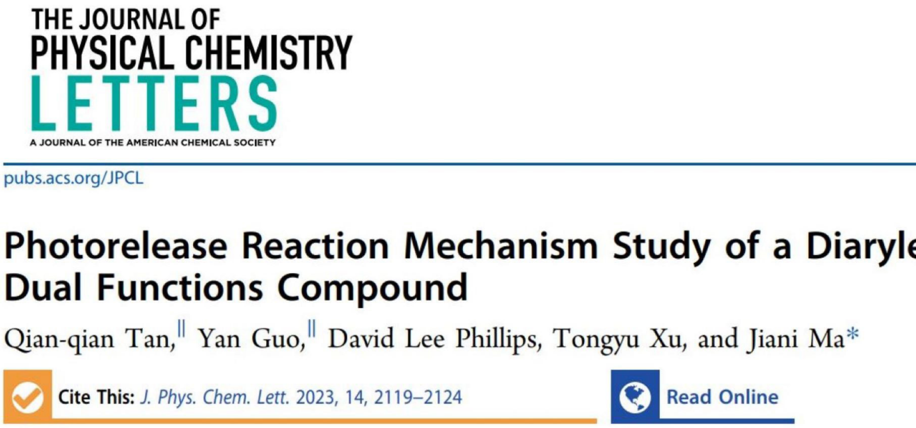

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Photorelease Reaction Mechanism Study of a Diaryle
Dual Functions Compound

Qian-qian Tan,‖ Yan Guo,‖ David Lee Phillips, Tongyu Xu, and Jiani Ma*

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# 二芳基乙烯保护双官能团化合物的光释放反应机理研究

二芳基乙烯化合物（DAE）由于其热稳定性，抗疲劳性和超快响应在信息存储、光开关及智能材料等领域有潜在的应用前景。由于其光致变色量子产率较高，基于 DAE 的光掩蔽基（PPG）成为目前有机功能分子的研究热点。要开发和设计出性能优异的多功能光致变色有机分子体系，必须要了解该类分子体系激发态的光化学反应过程，解析其详细的光化学反应途径和机理。基于二芳基乙烯单元开发设计的光掩蔽基，由于分子体系大、分子构型复杂、光化学反应途径多，使其机理研究成为挑战；此外，光致变色单元和有机活性官能团在光化学反应时都会表现出新的分子行为，并协同影响整个分子的整体性质。那么，对中间体进行时间分辨跟踪，同时结合中间体共振态可选的化学键振动信息，即时间分辨共振拉曼光谱技术，成为反应机理研究的不二之选。。

本工作中，我们通过时间分辨光谱和 DFT 计算相结合对化合物 1o 进行系统性研究。利用时间分辨光谱研究了 1o 的光物理和光化学过程，探究其光脱保护反应机制。通过激发态理论计算模拟了 1o 的光化学反应势能面。

在强极性溶剂 DMSO 中，只监测到 1o 的非活性构型（P）的光物理过程。因此，在 DMSO 中，fs–TA 主要探测的是 P 构型的激发态。在极性较低的溶剂 1,4–dioxane 中，监测到 AP 构型被激发后的光环化－脱保护过程，时间分辨共振拉曼光谱探测到光脱保护产物。通过激发态理论计算模拟了 1o 的光化学反应势能面，活性基团位于闭环同侧的构型可发生协同消除反应脱去 AcOH/MeOH；活性基团位于闭环异侧的构型通过 [1,5]–H shift 释放 AcOH/MeOH。在这两种途径中，AcOH 的释放比 MeOH 的释放更具竞争性。结合淬灭实验表明 1o 的光脱保护过程没有碳正离子和碳负离子的生成。综上，提出了化合物 1o 在 1,4–dioxane 中的光脱保护反应机理。

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Letter

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Diarylethene derivatives (DAE) have potential applications in information storage, optical switching and smart materials due to their thermal stability, fatigue resistance and rapid response. Due to its high photochromic quantum yield, DAE-based photolabile protecting group (PPG) have become a research hotspot in the field of photodeprotection. In order to develop and design multifunctional photochromic organic molecular systems with excellent properties, it is necessary to understand the photochemical reaction process of excited states of such molecular systems, and analyze the detailed photochemical reaction pathways and mechanisms. However, the conventional steady-state technique cannot obtain the necessary and accurate information of the core excited state intermediates. Incorporating organic functional groups into photochromic units, fascinating photo-functional properties could be expected. Within the specific molecular structures, both the photochromic unit and organic functional groups would exhibit novel molecular activities during photochemical reaction and synergistically affect the overall molecular properties.

In this work, compound 1o was studied systematically by time-resolved spectroscopy and DFT calculation. The photophysical and photochemical processes of 1o were studied by time-resolved spectroscopy, and the mechanism of photodeprotection reaction was explored. The potential energy surface of 1o photochemical reaction was calculated and simulated by excited state theory.

In the strongly polar solvent DMSO, the photophysical processes for the P conformer of 1o were detected. Therefore, fs-TA mainly observed excited states of P conformer. In the solvent 1,4-dioxane with low polarity, the photocyclization and deprotection process after the AP conformer was excited were monitored, and the photodeprotection product was detected by time-resolved resonance raman spectroscopy. The potential energy surface for photochemical reaction of 1o was calculated and simulated by the excited state theory. The conformer in which the active group is located on the same side of the ring plane can undergo concerted elimination reaction to remove AcOH/MeOH. The conformer with active group on opposite sides of the ring plane release AcOH/MeOH by [1,5]-H shift. In both pathways, the release of AcOH is more competitive than that of MeOH. Combined with quenching experiments, it was found that there was no formation of carbocation and carboanion in the photorelease process of 1o. In summary, photodeprotection reaction mechanism of compound 1o in 1,4-dioxane was proposed.

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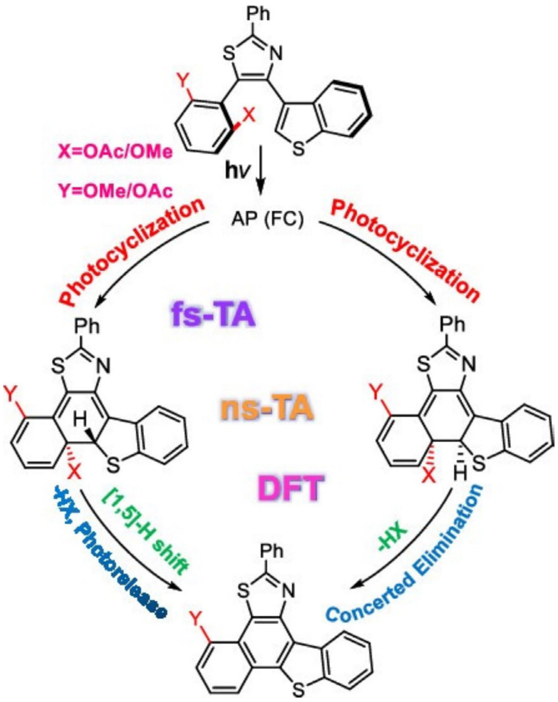


图 1. 1o 在 1,4–dioxane 中的光释放反应机理

Figure 1. Proposed Photorelease Reaction Mechanism of 1o in 1,4-dioxane

# 团队赴国家毒品实验室陕西分中心座谈

## Fang Group visit Shaanxi Branch of National Narcotics Lab

2023年2月3日上午，化学化工学院副院长丁立平、刘成辉，光子鼻与分子材料团队教师刘静、彭浩南、刘太宏、杨小刚前往国家毒品实验室陕西分中心参观访问，并进行座谈交流。

陕西分中心主任姚震对来访各位专家教授表示欢迎，介绍了中心基本情况和承担西北区域内芬太尼类物质毒品的制贩滥用情况的监测预警，毛发验毒、污水测毒及常规毒品的检验鉴定等工作，以及在相关技术领域开展科技攻关的情况，并表示希望与陕西师范大学化学化工学院拓宽合作渠道，在人才共育、技术共研、资源共享等方面展开深度交流合作，共同推动双方技术进步。

丁立平介绍新概念传感器与分子材料研究院相关情况，介绍了团队在毒品检测研究方面研发的纳米光感材料、薄膜材料和探测仪器，可用于毒品的灵敏检测和检验鉴定，适用于一线实战人员使用进行现场快检，并表示愿意与中心开展人才共育、技术共研，实现资源共享。

在座谈会上，彭浩南老师介绍了荧光薄膜活性层结构调控及传感应用，刘太宏老师介绍了薄膜基荧光传感器创制及毒品高灵敏度检测，刘成辉副院长介绍了癌干细胞识别与在体荧光成像技术的应用。

On February 3, 2023, Ding Liping and Liu Chenghui, vice deans of Shaanxi Normal University’s School of Chemistry and Chemical Engineering, and Photonic Nose and Molecular Materials group members Liu Jing, Peng Haonan, Liu Taihong and Yang Xiaogang, visited the Shaanxi Branch of the National Narcotics Laboratory and held a discussion with the hosts.

Yao Zhen, director of the Shaanxi Branch, welcomed the visitors, briefed about the branch and its work in monitoring and early warning of the manufacture and trafficking of fentanyl drugs in northwest China, and hair drug testing, sewage drug detection and conventional drug inspection and identification, as well as scientific and technological research in related technical fields, and expressed his hope to broaden cooperation with SNNU’s School of Chemistry and Chemical Engineering to carry out in-depth exchanges and cooperation in talent co-education, joint research, resource sharing, jointly promoting the technological progress of both sides.

Ding Liping briefed about SNNU's Institute of New Concept Sensor and Molecular Materials, and the nano photosensitive materials, film materials and detection instruments developed by its researchers in drug detection research, which can be used for sensitive detection and identification of drugs, suitable for

front-line use for on-site rapid inspection, and said INCSMM would carry out talent co-education, joint research and resource sharing with the branch.

At the meeting, Prof. Peng Haonan introduced the structure regulation and sensing application of the active layer of fluorescent films, Prof. Liu Taihong introduced the creation of film-based fluorescent sensors and the high-sensitivity detection of drugs, and Prof. Liu Chenghui introduced the application of cancer stem cell identification and in vivo fluorescence imaging technology.

# 西安交通大学刘峰教授应邀作学术报告

## XJTU Prof. Liu Feng invited to share his research

2023 年 2 月 23 日下午，光子鼻与分子材料团队邀请西安交通大学材料科学与工程学院物理化学系刘峰教授在致知楼 1668 报告厅为团队全体成员作报告。报告由刘静教授主持，团队全体教师、博士、硕士研究生参加了本次报告会。

刘峰教授主要从事于功能软材料的设计 / 合成、表征以及应用等方面的研究工作，以软材料为主要研究对象，以分子设计合成、分子自组装、功能材料与器件为研究方向，在软材料的基础理论、制备合成、物理与化学特性、以及器件性能等方面开展跨学科的前沿性研究。

在题为《液晶自组装：分子取向与位置有序性的协同作用》的报告中，刘峰教授介绍了超分子手性的自发产生机理是当前手性研究的重点与难点，针对超分子手性自发产生机制这一科学问题提出了较为独特的见解。刘峰教授基于烷基链温度响应性这一设计理念进行性能调控，研究了超分子手性的组装行为，并且已经通过实验数据验证了机理的科学性，在超分子化学和液晶领域中具有重要的指导意义。

报告结束后，刘峰教授与在场师生就相关问题进行了讨论，并与参会老师合影留念。

On the afternoon of February 23, 2023, the Photonic Nose and Molecular Materials group invited Prof. Liu Feng from the Department of Physical Chemistry, School of Materials Science and Engineering, Xi’an Jiaotong University, to give a report to the group in the lecture hall 1668 of Zhizhi Building.

The report was chaired by Prof. Liu Jing, and all teachers, doctoral and master’s students of the group attended the report.

Prof. Liu Feng is mainly engaged in the design/synthesis, characterization and application of functional soft materials, using soft materials as the main research object to carry out interdisciplinary frontier research on the basic theory, preparation and synthesis, physical and chemical properties, and device properties of soft materials in the research direction of molecular design and synthesis, molecular self-assembly, functional materials and devices.

In the report titled Self-assembly of Liquid Crystals: A Synergistic Effect of Molecular Orientation and Positional Order, Liu Feng introduced that the spontaneous generation mechanism of supramolecular chirality is the focus and difficulty of current chiral research, and put forward a unique insight into the scientific problem of spontaneous generation mechanism of supramolecular chirality. Liu Feng studied the assembly behavior of supramolecular chirality based on the design concept of tem-perature responsiveness of alkyl chains, and has verified the scientific nature of the mechanism through experimental data, which has important guiding significance in the field of supramolecular chemistry and liquid crystal.

After the presentation, Liu Feng discussed relevant issues with the teachers and students present, and took a group photo with the teachers.

# 房喻院士赴南通市通州区访问考察

# Fang Yu visits Tongzhou District of Nantong City

2023 年 2 月 28 日，房喻院士赴南通市通州区访问考察，并与南通市科技局党组成员、局长助理孙青山，通州区委常委、组织部部长、统战部部长施骁毅等会面座谈。

房喻介绍了团队以传感器和软物质为两大方向开展基础研究和应用研究取得的成果，对南通市、通州区高度重视人才和科技创新工作表示赞赏，并表示将发挥“朋友圈”资源优势，助力推介宣传通州人才发展环境，引荐更多人才来通州共谋发展。

施骁毅对房喻一行的到来表示欢迎，对陕西师范大学给予通州区的关心支持表示感谢，并表示通州产业基础扎实，创新氛围浓厚，希望通过借力校企创新合作、联合攻关，不断突破关键技术，打造具有区域影响力的人才发展高地。

房喻还实地考察了江海储能技术有限公司、江苏拓邦环保科技有限公司。

On February 28, 2023, Prof. Fang Yu visited Tongzhou District, Nantong City, and met and talked with local officials including Sun Qingshan, member of the CPC Party Group and assistant director of Nantong Science and Technology Bureau, and Shi Xiaoyi, member of the Standing Committee of the Tongzhou District Party Committee, director of the Organization Department and director of the United Front Work Department.

Fang Yu briefed about his group's achievements in basic and applied research in the two directions of sensors and soft matter, expressed appreciation for Nantong City and Tongzhou District for valuing talents and technological innovation, and said that he would use the resource advantages of his "circle of friends" to help promote the talent development environment in Tongzhou and introduce more talents to Tongzhou for common development.

Shi Xiaoyi welcomed Fang Yu, thanked Shaanxi Normal University for its support to Tongzhou District, and said that Tongzhou has a solid industrial foundation and a strong innovation atmosphere, and hoped to make break through in key technologies and create a talent development highland with regional influence through school-enterprise innovation cooperation and joint research.

After the meeting, Fang Yu visited Jianghai Energy Storage Technology Co., Ltd. and Jiangsu Tuobang Environmental Protection Technology Co., Ltd.

# 基础科学的作用
## ——从阅读早期Science一篇文章说起
## The role of basic science
## ——Beginning from reading an early Science article

文 / 房 喻 by Fang Yu

多年前我就阅读过美国第一届物理学会会长Henry Augustus Rowland在美国科学促进会（AAAS）以“为纯科学而呼吁（A Plea for Pure Science）”为题发表的演说（全文见：Science, 1883, IL(29):242–250）。由于该文内容涉及何谓大学、何谓大师、何谓科学、何谓教育，大学教授应该是一个什么样子，青年学者应该如何成长，社会怎么才能够进步等等，内容远远超过演讲题目的字面含义，读后触动太大，因此，就利用了当时的校长身份，推荐《陕西师大报》全文刊发了中文翻译稿。自己动手写的两千多字导读稿也一并发表。

最近，在阅读文献时，不经意间发现Science杂志在1916年也发表了一篇呼吁社会各界要重视科学研究重要性的评述文章。文章题名为“科学研究对于工业的重要性（The Importance of Scientific Research to the Industries, Science, 1916, XLIV(1135): 456–459）”。出于好奇，想看看Rowland文章之后30多年，至今超过了100年的那个时期，学者们到底是怎么认识科学研究的，特此花了一点时间，仔细阅读了这篇文章。读后，真的感觉我们国家现在发展所面临的一系列问题，实际上西方发达国家在早期发展中也遇到过。我们的知识界，特别是科技界理性地研究西方，了解早期西方学者在国家现代化建设中的所思所想，对于我们明确认识，强化责任担当，为国家现代化建设做出应有的贡献无疑具有重要的裨益。

该文作者，C.Alfred Jacobson来自美国内华达大学，是一位虔诚的爱国者。作者立足美国国家利益，结合国内外科学研究促进产业发展典型案例，以全球视野全面论述科学研究对于工业发展，国家综合实力提升的重大意义。作者特别强调立竿见影的实用研究并不应该成为科学研究的主流，也不是真正意义上的科学研究。产业界和政府真正要重视的是那些聚焦揭示事务发展基本规律和底层原理，有望能够在未来为国家发展带来变革性技术进步，功在千秋、利在后代（注意：不是功在当代、利在千秋）的基础研究。

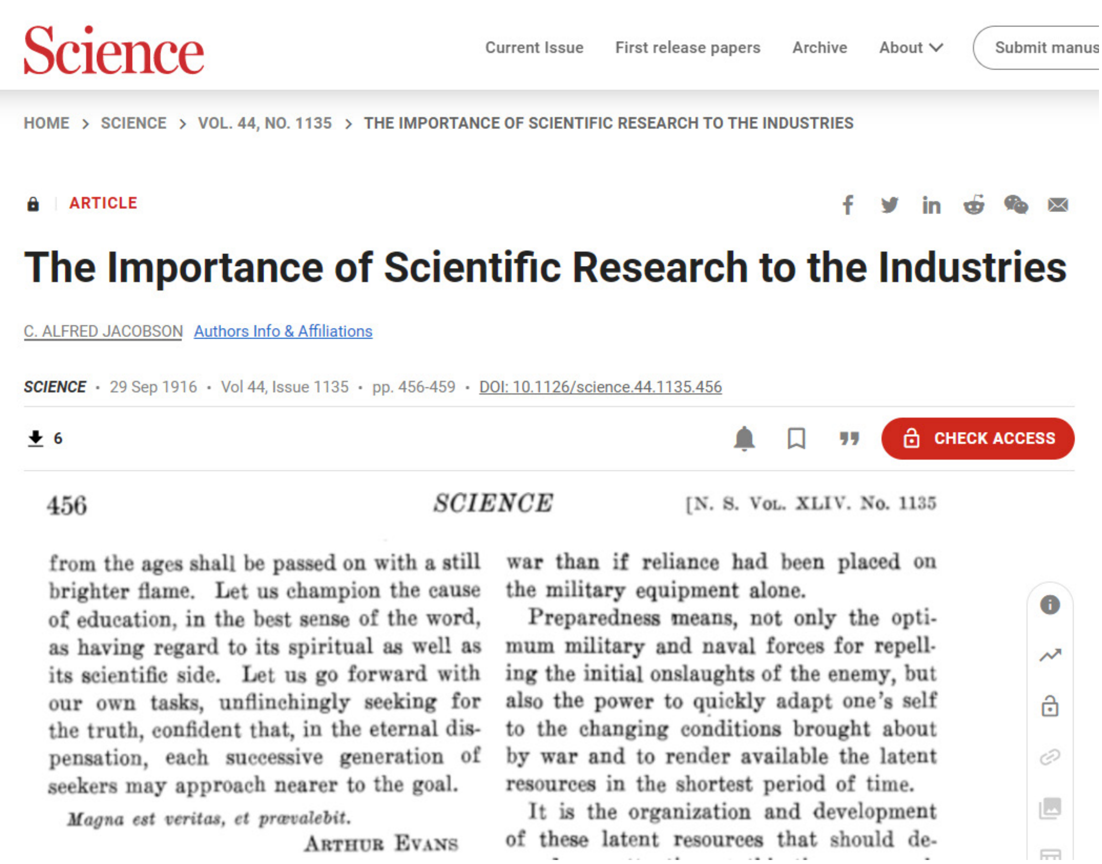
作者还指出，从事这些研究的人往往不被同时代的人所理解，甚至常常遭人嘲讽。特别难能可贵的是，一百多年前的作者就认识到“从长远的眼光看，所有的基础研究都是有应用价值的”。此外，作者还指出，高效的科学研究需要建立在组织、协作之上。作者秉持的“今天看是完美无缺的东西明天终将被扬弃”观念就是我们今天倡导的居安思危，不断创新精神。

在文章最后，作者借用法国著名化学家Dumas在法国–普鲁士战争刚刚结束之后（1870年）的一次演讲所强调的“未来属于科学”和“只有提高科学水平，法国才可以繁荣振兴”来结束自己对科学研究重要性的论述。

读了这篇文章，我们起码可以得到以下几条启示：（1）真正意义上的科学研究是那些追求事物发展内在规律的研究；（2）科学研究不能急功近利，真正的学者必须有所坚守，必须耐得住寂寞；（3）政府、企业需要给予科学研究更多的支持；（4）社会需要给予科学工作者更多的包容；（5）国家的繁荣，产业的发展必须植根于不断创新。不思进取、固步自封只会走向衰败。

今日的颠覆性技术之所以多在美国本土产生，与他们持之以恒，着眼于长远的科学文化建设一定是密不可分的。正是这种坚持，社会政府对于非常规思维才有了更多的包容，科学怪才、商业奇才才得以不断涌现。经过建国70多年，特别是改革开放40多年的建设，我国经济社会有了长足的发展，但与建设长达数百年的西方发达国家相比较，我们发展面临的问题依然很多。特别是在当前，国家现代化建设面临前所未有的压力，如何破局？需要上下一心，团结一致，共同努力。其中，知识界价值取向是否正确，科学界责任担当是否到位将是一个十分重要的方面。

众所周知，2022年是联合国大会批准的“基础科学促进可持续发展国际年（IYBSSD 2022）”，旨在提高全球对基础科学重要性的认识，理解基础科学对实现可持续发展目标的价值和贡献。由于疫情原因，这项活动顺延到2022年7月至2023年6月底。在全球重视科学，特别是基础科学重要性的今天，作为科学研究起步晚，对科学研究，特别是基础科学研究重要性认识长期不足而又面临发展重任的民族的一员，认真学习理解这篇文章，对于我们端正价值取向，强化责任担当无疑具有现实的意义。



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HOME > SCIENCE > VOL. 44, NO. 1135 > THE IMPORTANCE OF SCIENTIFIC RESEARCH TO THE INDUSTRIES

ARTICLE

The Importance of Scientific Research to the Industries

C. ALFRED JACOBSON Authors Info & Affiliations

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from the ages shall be passed on with a still brighter flame. Let us champion the cause of education, in the best sense of the word, as having regard to its spiritual as well as its scientific side. Let us go forward with our own tasks, unflinchingly seeking for the truth, confident that, in the eternal dispensation, each successive generation of seekers may approach nearer to the goal.

*Magna est veritas, et prævalebit.*

Arthur Evans

war than if reliance had been placed on the military equipment alone.

Preparedness means, not only the optimum military and naval forces for repelling the initial onslaughts of the enemy, but also the power to quickly adapt one's self to the changing conditions brought about by war and to render available the latent resources in the shortest period of time.

It is the organization and development of these latent resources that should de-

Years ago, I read a speech by Henry Augustus Rowland, president of the first American Physical Society, entitled "A Plea for Pure Science" at the American Association for the Advancement of Science (AAAS) (see Science, 1883, IL(29):242-250). Since the content of the article involves what is a university, what is a master, what is science, what is education, what a university professor should look like, how young scholars should grow, how society can progress, etc., which far exceeds the literal meaning of the speech topic, I was touched too much after reading it, so I took advantage of my position as the president at that time to recommend the Chinese translation of the article to be published in the Shaanxi Normal University Gazette, along with a guide of more than 2,000 words which I wrote for the article.

Recently, while reading literature, I accidentally found that the journal Science also published a review article in 1916 calling on all sectors of society to pay attention to the importance of scientific research. The article is titled The Importance of Scientific Research to the Industries, Science, 1916, XLIV(1135): 456-459. Out of curiosity, I wanted to see how scholars understood scientific research at a time more than 30 years after Rowland's article and more than 100 years ago from now, so I took a little time and carefully read this article. After reading it, I really feel that a series of problems facing our country's development now have actually been encountered by Western developed countries in their early development. If our intellectuals, especially the scientific and technological circles, could rationally study the West and understand what early Western scholars thought in their country's modernization process, it would be undoubtedly of great benefit to clearing our understanding, strengthening our responsibility, and making due contributions to China's modernization drive.

The author, C. Alfred Jacobson, from the University of Nevada, is a devout patriot. Based on the national interests of the United States, combined with typical cases of scientific research at home and abroad to promote industrial development, the author comprehensively discusses the significance of scientific research to industrial development and the improvement of national comprehensive strength from a global perspective. The author emphasizes that immediate practical research should not become the mainstream of scientific research, nor is it scientific research in the true sense of the word. What industry and government really need to pay attention to is those basic laws and fundamental principles governing the same, which is expected to bring transformative technological progress to the development of the country in the future, and the contribution is in the future, and the benefit is for future generations (Please note: not contribution is in the contemporary, the benefit is for the future).

The authors also point out that those who engage in these studies are often not understood by their contemporaries and are often ridiculed. What is particularly valuable is that the author realized more than a hundred years ago that "in this day and age no sane person would dare to say that a certain piece of fundamental research will be of no practical value for a hundred years to come." In addition, he also claims that efficiency points to centralization and coordination. His concept that "the ne plus ultra of today will be scrapped tomorrow" is the spirit of thinking of danger in peace and constantly innovating that we advocate today.

At the end of the article, Jacobson borrows from a speech given by the famous French chemist Dumas in 1870, just after the end of the French-Prussian War, to emphasize that "the future belongs to science" and "it is by the exaltation of science that France will recover her prestige." to end his discourse on the importance of scientific research.

After reading this article, we can at least get the following insights: (1) scientific research in the true sense is those that pursue the internal laws of the development of things; (2) scientific research cannot be rushed to achieve quick results, and true scholars must stick to it and endure loneliness; (3) the government and enterprises need to give more support to scientific research; (4) society needs to give more tolerance to scientists; (5) the prosperity of a country and the development of an industry must be rooted in continuous innovation. Not thinking of progress and resting on one's laurels will only lead to decay.

The reason why today's disruptive technologies are mostly produced in the United States must be inseparable from their persistence and long-term scientific cultural construction. It is precisely because of this insistence, the society and the government have become more tolerant of unconventional thinking, and scientific geeks and business wizards continue to emerge. After more than 70 years since the founding of the People's Republic of China, especially more than 40 years of reform and opening up, China's economy and society have made great progress, but compared with the developed Western countries that have been built for hundreds of years, we still face many problems in our development. Especially at present, China's modernization is facing unprecedented pressure, so how do we change the situation? It takes solidarity, unity and joint efforts. Among them, whether the value orientation of the intellectual community is correct and whether the responsibility of the scientific community is in place will be a vitally important.

As we all know, 2022 is the International Year of Basic Sciences for Sustainable Development (IYBSSD 2022), approved by the United Nations General Assembly, which aims to raise global awareness of the importance of basic sciences and understand their value and contribution to the achievement of the Sustainable Development Goals. Due to the pandemic, the campaign was postponed from July 2022 to the end of June 2023. Today, when the world attaches great importance to science, especially basic science, as a member of a nation that started late in scientific research and has a long lack of understanding of the importance of scientific research, especially basic scientific research, and is facing the heavy task of development, seriously studying and understanding this article is undoubtedly of practical significance for us to correct our value orientation and strengthen our responsibility.