陕西师范大学 SHAANXI NORMAL UNIVERSITY

化学化工学院 School of Chemistry & Chemical Engineering

新概念传感器与分子材料研究院 INSTITUTE OF NEW CONCEPT SENSORS AND MOLECULAR MATERIALS

新概念传感器与分子材料研究院 简报 12 2024

Institute of New Concept Sensors and Molecular Materials Newsletter

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研究院师生参加第十届陕西省物理化学发展研讨会暨第一届物理化学博士研究生论坛

INCSMM teachers and students participate in 10th Shaanxi Physical Chemistry Development Seminar and first Doctoral Student Forum

2024 年 11 月 29 日至 12 月 1 日，新概念传感器与分子材料研究院房喻院士及师生二十余人在西安临潼参加了由陕西省化学会物理化学学科委员会主办、西安科技大学承办的第十届陕西省物理化学发展研讨会暨第一届物理化学博士研究生论坛。

在会议上，房喻院士应邀作了题为“CBRN 传感器与分子材料”的大会特邀报告，丁立平教授担任大会主题报告主持人，马佳妮教授担任了博士研究生论坛报告主持人。博士研究生刘向泉在博士研究生论坛作了题为“基于动态共价键薄膜的界面限域制备及其应用”的报告，博士研究生闫珍获得墙报奖一等奖。

From November 29 to December 1, 2024, Prof. Fang Yu and more than 20 teachers and students of the Institute of New Concept Sensors and Molecular Materials participated in the 10th Shaanxi Provincial Physical Chemistry Development Seminar and the first Doctoral Student Forum in Physical Chemistry sponsored by the Physical Chemistry Discipline Committee of Shaanxi Provincial Chemical Society and hosted by Xi’an University of Science and Technology in Lintong, Xi’an.

At the meeting, Prof. Fang Yu was invited to give a special invited report titled “CBRN Sensors and Molecular Materials”, and Prof. Ding Liping and Prof. Ma Jiani served as the moderators of keynote report and doctoral student forum report respectively. INCSMM doctoral student Liu Xiangquan gave a presentation titled “Preparation and Application of Dynamic Covalent Bonds-Based Films Interfacial Limit” at the Doctoral Student Forum, and doctoral student Yan Zhen won the first prize of the Poster Award.

房喻院士出席 2024 年研究生导师能力提升发展论坛并作报告

Fang Yu speaks at SNNU 2024 Graduate Supervisor Ability Enhancement and Development Forum

2024 年 12 月 5 日，房喻院士出席陕西师范大学“智驭未来·引领创新”2024 年研究生导师能力提升发展论坛并作题为“创新驱动发展呼唤面向未来的教育和教师”的报告。

房喻院士从自身求学、人才培养经历入手，强调了导师在研究生成长成才中的重要作用。他指出，作为导师要学会和习惯欣赏、要懂得尊重、要习惯做跨界研究、要实施全面教育，特别是在 AI 赋能下，导师要重视研究生的责任意识和家国情怀教育，要为研究生个性成长提供空间，培养具有家国情怀，能担当民族复兴大任的创新人才。

On December 5, 2024, Prof. Fang Yu attended the 2024 Graduate Supervisor Ability Enhancement and Development Forum of Shaanxi Normal University and delivered a report titled “Innovation-driven Development Calls for Future-oriented Education and Teachers”.

Starting from his own study and talent cultivation experience, Fang Yu emphasized the important role of supervisors in the growth of graduate students. He said that a supervisor should learn and get used to appreciation, know how to respect, get used to doing cross-border research, and implement comprehensive education, and especially with AI empowerment, a supervisor should pay attention to graduate students’ sense of responsibility and the patriotic education, provide space for their personality growth, and cultivate innovative and patriotic talents who can shoulder the responsibility of national rejuvenation.

传感驱动的表界面科学和光物理技术应用研讨会举行

Seminar on Sensor-driven Surface and Interface Science and Photophysical Technology Application held

2024 年 12 月 5 至 7 日，由国家自然科学基金委员会化学科学部资助，陕西师范大学化学化工学院、西安交通大学前沿科学技术研究院承办的“传感驱动的表界面科学和光物理技术应用研讨会”在西安市举行，来自中国、英国的专家学者与陕西师范大学、西安交通大学的教师近 80 人参加了此次会议。

研讨会开幕式由陕西师范大学科技处处长、化学化工学院院长薛东教授主持。开幕式上，陕西师范大学副校长杨祖培教授、西安交通大学副校长单智伟教授分别致辞，对与会的特邀嘉宾学者表示欢迎，并祝会议圆满成功。

开幕式上，国家自然科学基金委化学科学部高飞雪处长讲话，阐释了近年来各类基金项目的申请、资助与政策变动等情况，强调了本次会议研讨应重点关注的核心问题。

之后的学术报告从不同视角、不同领域涵盖了表界面化学基础与应用发展概括以及取得的重要研究进展，内容丰富，讨论热烈，包括华东理工大学田禾院士的“动态化学之大道至简”、西北工业大学苑伟政教授的“仿生微纳结构及其应用”、西安交通大学邵金友教授的“界面润湿与流体微纳制造”、英国 Northumbria 大学 Qiang Wu 副教授的“微纳光纤干涉仪传感器及其应用研究”、中国科学院大连化学物理研究所冯亮研究员的“高性能传感膜研究及应用”、西北工业大学徐亚东教授的“核辐射探测用体块单晶生长与器件制备的表界面问题思考”、北京邮电大学夏安东教授的“溶剂化与激发态构象诱导的对称性破缺电荷转移动力学研究”、北京师范大学崔刚龙教授的“激发态与非绝热过程”、电子科技大学邓旭教授的“表面电荷对固－液界面相互作用的影响机制”、中国科学院福建物质结构研究所徐刚研究员的“内表面敏感型微孔气敏传感材料”、浙江大学彭笑刚教授的“强限域与弱限域半导体纳米晶：光子（激子）操控”、吉林大学汪大洋教授的“表面浸润性的分子尺


开幕式 主持人
传感驱动的表界面科学和
光物理技术应用研讨会


开幕致辞
杨祖培
传感驱动的表界面科学和
光物理技术应用研讨会


开幕致
高飞雪
传感驱动的表界面科学和
光物理技术应用研讨会


Since th of life, the truth is the simples


大会报告
MEMS前沿发展趋势
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❑ 生物：细胞尺度
❑ 光学：波长尺度
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特邀报告
界面润湿调控
邵金友 教授
西安交通大学
传感驱动的表界面科学和


特邀报告
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及其应
传感驱动的表界


特邀报告
冯亮 研究员
高性


传感驱动的表界面科学和
光物理技术应用研讨会
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料及新能源的开发
崔刚龙
Stimulated emission
Energy


特邀报告
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表面电荷对固
邓旭 教授
电子科技大
题目：表面电荷对固
作用的影响
传感驱动的表界面
光物理技术应用研


传感驱动的表界面科学和
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CCP Lab
徐刚 研究员
内表面敏感型微孔气
传感材料
“内表面


NSFC
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射线探测用体块单
件制备的表界面
：徐亚东
传感驱动的表界面科学和
光物理技术应用研讨会


光物理技术应用研讨会
大会报告
强限域与
彭笑刚 教授
浙江大学
题目：强限域与弱限域半导
纳米晶：光子（激子）操控
传感驱动的表界面
光物理技术应用研


光物理技术应用研讨会
特邀报告
表面浸润性的
汪大洋 教授
吉林大学
题目：表面浸润性的分子尺度
模分析与预测
传感驱动的表界面科学和
光物理技术应用研讨会


传感驱动的表界面科学和
光物理技术应用研讨会
大会报告
传感驱动
光物理技
多尺度智
刘鸣华
中国科学
题目：多尺度
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度建模分析与预测”及中国科学院化学研究所刘鸣华研究员的“多尺度智能软物质体系的构建”。

苏州大学迟立峰院士、北京大学黄建斌教授、山东大学郝京诚教授、清华大学李广涛教授以及中国科学院化学所李峻柏研究员分别担任学术报告主持人。

报告结束后的学科发展与自由讨论环节由房喻院士主持，国家自然科学基金委化学科学部杨俊林副主任作总结发言。与会特邀嘉宾从胶体化学学科发展出发，切合传感驱动表界面科学与光物理技术等方面分别进行了发言，大家一致认为传感驱动的表界面科学与胶体化学发展，必须以满足国家的重大应用需求为导向，打破常规，在关注学科发展的同时，应加强多学科交叉，着重于功能表界面的科学基础与关键科学问题，发展多尺度、多梯度功能材料创制理论与多界面表征技术，为我国化学学科的发展贡献力量。

From December 5 to 7, 2024, the "Seminar on Sensor-driven Surface and Interface Science and Photophysical Technology Application", sponsored by the Chemical Science Department of National Natural Science Foundation of China and hosted by the School of Chemistry and Chemical Engineering of Shaanxi Normal University and the Institute of Frontier Science and Technology of Xi'an Jiaotong University, was held in Xi'an City. Nearly 80 experts and scholars from China, the United Kingdom and teachers from Shaanxi Normal University and Xi'an Jiaotong University attended the conference.

The opening ceremony of the seminar was presided over by SNNU Science and Technology Department director and SCCE dean Prof. Xue Dong. At the opening ceremony, SNNU vice president Prof. Yang Zupei and XJTU vice president Prof. Shan Zhiwei delivered speeches respectively, welcoming the guests and scholars and wishing the conference a complete success.

At the opening ceremony, Gao Feixue, director of NSFC Chemical Science Department, gave a speech explaining the application, funding and policy changes of various fund projects in recent years, and emphasized the

core issues that should be focused on during the discussion of this meeting.

The subsequent academic reports covered the basic and application development of surface and interface chemistry and the important research progress from different perspectives and fields, with rich content and heated discussions, including "The True Road to Dynamic Chemistry" by CAS Academician Tian He of East China University of Science and Technology, "Biomimetic Micro-nano Structure and Its Application" by Prof. Yuan Weizheng of Northwestern Polytechnical University, "Interface Wetting and Fluid Micro-nano Manufacturing" by Prof. Shao Jinyou of Xi'an Jiaotong University, "Research on Micro-Nano Fiber Interferometer Sensor and Its Application" by A/Prof. Qiang Wu of Northumbria University, UK, "Research and Application of High-performance Sensing Films" by Research Feng Liang of CAS Dalian Institute of Chemical Physics, "Reflections on Surface and Interface Problems of Bulk Single Crystal Growth and Device Preparation for Nuclear Radiation Detection" by Prof. Xu Yadong of Northwestern Polytechnical University, "Kinetic Studies on Solvation and Symmetry-breaking Charge Transfer Induced by Excited State Conformation" by Prof. Xia Andong of Beijing University of Posts and Telecommunications, "Excited States and Non-adiabatic Processes" by Prof. Cui Ganglong of Beijing Normal University, "Mechanism of Surface Charge Influence on Solid-liquid Interface Interactions" by Researcher Deng Xu of University of Electronic Science and Technology of China, "Internal Surface Sensitive Microporous Gas Sensing Materials" by Researcher Xu Gang of CAS Fujian Institute of Material Structure, "Strongly-confined and Weakly-confined Semiconductor Nanocrystals: Photon (exciton) Manipulation" by Prof. Peng Xiaogang of Zhejiang University, "Molecular-scale Modeling Analysis and Prediction of Surface Infiltration" by Prof. Wang Dayang of Jilin University, and "Construction of Multi-scale Intelligent Soft Matter Systems" by Researcher Liu Minghua of CAS Institute of Chemistry.

CAS Academician Chi Lifeng from Soochow University, Prof. Huang Jianbin from Peking University, Prof. Hao Jingcheng from Shandong University, Prof. Li Guangtao from Tsinghua University and Researcher Li Junbai from CAS Institute of Chemistry served as the moderator of the reports respectively.

The discipline development and free discussion session after the reports was chaired by CAS Academician Fang Yu, and NSFC Chemical Science Department deputy director Yang Junlin made a concluding speech. The guests at the meeting discussed the development of colloidal chemistry, in line with sensor-driven surface and interface science and photophysical technology, etc., and agreed that the development of sensor-driven surface and interface science and colloidal chemistry must be oriented to meet the major application needs of the country, break the routine, and strengthen the cross-discipline while focusing on the development of discipline and the scientific basis and key scientific issues of functional surface and interface, develop the multi-scale and multi-gradient functional material creation theory and multi-interface characterization technology, so as to contribute to the development of chemical science in China.

研究院教师参加第十二届新加坡国际化学会议

INCSMM faculty attend 12th Singapore International Chemistry Conference

2024 年 12 月 9 日至 13 日，新概念传感器与分子材料研究院房喻院士、刘静教授、边红涛教授和马佳妮教授参加了第十二届新加坡国际化学会议（SICC–12）

在会议上，房喻院士应邀作了题为 Adlayer Structure Innovation and Film-based Fluorescent Sensors 的主旨报告，介绍了团队在薄膜荧光传感器领域的最新研究进展，得到了与会专家的高度评价。团队的研究成果，特别是薄膜荧光传感技术以及气体传感器隔膜材料的应用，也引起了企业界同行的浓厚兴趣。

刘静教授作了题为 Regulation of the Switchable Luminescence of Platinum(II) Complexes by Controlling the Assembly Process 的邀请报告，边红涛教授作了题为 Anion Recognition by Macrocyclic Receptors Investigated by Ultrafast IR Spectroscopy 的邀请报告，马佳妮教授作了题为 Fabricating Film-based Emissive Materials Based on Excited State Charge Transfer Processes 的邀请报告。

本次会议由新加坡国家化学会（SNIC）主办，以 Building Chemistry: Bridging Disciplines 为主题，共设立了 24 个专题研讨分会，涵盖有机化学、无机化学及材料化学等多个研究领域，吸引了来自全球超过 2000 位专家学者，共同探讨化学科学的最新发展方向、技术创新及产业化应用前景。

会议期间，房喻院士、刘静教授、边红涛教授和马佳妮教授与众多国际同行开展了深入交流，探讨了未来的合作方向。

From December 9 to 13, 2024, Prof. Fang Yu, Prof. Liu Jing, Prof. Bian Hongtao and Prof. Ma Jiani from the Institute of New Concept Sensors and Molecular Materials attended the 12th Singapore International Chemistry Conference (SICC-12).

At the conference, Prof. Fang Yu was invited to give a keynote report titled “Adlayer Structure Innovation and Film-based Fluorescent Sensors”, introducing the latest research progress of his group in the field of film fluorescent sensors, which was highly evaluated by the experts attending the conference. Fang Group’s research results, especially the film fluorescent sensing technology and the application of gas sensor diaphragm materials, also aroused the strong interest of representatives from the corporate sector.

Prof. Liu Jing gave an invited report titled “Regulation of the Switchable Luminescence of Platinum(II) Complexes by Controlling the Assembly Process”, Prof. Bian Hongtao gave an invited report titled “Anion Recognition by Macrocyclic Receptors Investigated by Ultrafast IR Spectroscopy”, and Prof. Ma Jiani gave an invited report titled “Fabricating Film-based Emissive Materials Based on Excited State Charge Transfer Processes”.

Organized by the Singapore National Institute of Chemistry (SNIC) and themed “Building Chemistry: Bridging Disciplines”, the conference set up a total of 24 symposia covering organic, inorganic and materials chemistry, attracting more than 2,000 experts and scholars from all over the world to discuss the latest development of chemical science, technological innovation and prospects for industrialization.

During the conference, Prof. Fang Yu, Prof. Liu Jing, Prof. Bian Hongtao and Prof. Ma Jiani had in-depth exchanges with many international counterparts and explored the direction of future cooperation.

房喻院士出席中国核工业教育学会发展论坛并作报告

Fang Yu speaks at Development Forum of China Nuclear Industry Education Society

2024 年 12 月 19 日，中国核工业教育学会“学术引领 产教融合”促进核工业教育高质量发展论坛在西安举办，房喻院士出席论坛并作题为《创新驱动发展需要更加重视重大需求牵引的长周期基础研究》的报告，强调深化基础研究将对科学进步产生更深远且持久的影响。

此次活动吸引了来自知名高校、科研院所、行业龙头企业等 200 余家单位的近300名专家学者与行业精英、高校老师及博士生，共同聚焦核工业教育与产业发展。

On December 19, 2024, Prof. Fang Yu attended the Forum on Promoting High-quality Development Education in Nuclear Industry of the China Nuclear Industry Education Society, which was themed “Academic-led Integration of Industry and Education” and held in Xi’an, and delivered a report titled “More Significance Should be Given to Long-term Basic Research Driven by Major Needs in Innovation-driven Development Needs”, emphasizing that deepening basic research will have a more profound and lasting impact on scientific progress.

The event attracted nearly 300 experts, scholars and industry elites, college teachers and doctoral students from more than 200 well-known universities, research institutes and industry leading enterprises to jointly focus on nuclear industry education and industrial development.

房喻院士出席宿迁市人民政府与西安交通大学校地合作签约活动

Fang Yu attends signing ceremony of cooperation between Suqian and XJTU

2024 年 12 月 27 日下午，房喻院士应邀出席宿迁市人民政府与西安交通大学校地合作签约活动。西安交通大学校长、中国工程院院士张立群，宿迁市市委书记盛蕾，市委副书记、市长刘浩等出席活动。

On December 27, 2024, Prof. Fang Yu was invited to attend the signing ceremony of cooperation between Suqian Municipal People’s Government and Xi’an Jiaotong University. XJTU president and of Chinese Academy of Engineering academician Zhang Liqun, Suqian Municipal Party Committee secretary Sheng Lei, deputy secretary and Suqian Municipal Government mayor Liu Hao, attended the event.

刘太宏副教授出席教授接待日活动并作讲座

Liu Taihong gives a a lecture at Professor Reception Day

2024 年 12 月 27 日下午，刘太宏副教授出席化学化工学院举办的“教授接待日”活动，为化学笃学班 2301 全体同学作题为“多向身边优秀的人学习——眼光长远、思想先进”的讲座。

刘老师向同学们讲述了自己的求学、支教、科研历程，强调了“知识改变命运、眼界提升格局、奋斗无怨无悔”的人生理念。讲座结束后，刘老师还对学生关心的考研、课题选择和人生迷茫等话题进行了互动交流。

本次活动由项目班主任薄鑫副研究员主持。

On December 27, 2024, Assoc. Prof. Liu Taihong attended the “Professor Reception Day” activity held by the School of Chemistry and Chemical Engineering and moderated by the head teacher of the project, Assoc. Prof. Bo Xin, and gave a lecture titled “Learn more from the excellent people around you - Long-term vision and advanced thinking” for all the students of Duxue Chemistry Class 2301.

Mr. Liu told the students about his experience of study, volunteer teaching and research, laying emphasis on the life concept of “knowledge changes destiny, vision improves framework, and struggle with no regrets”. After the lecture, Mr. Liu also had an interactive exchange on the topics that students are concerned about, such as postgraduate entrance examination, research topic selection and life confusion.

研究院举办知识产权及专利报告会

Report on intellectual property and patent held

2024 年 12 月 29 日上午，新概念传感器与分子材料研究院举办知识产权及专利报告会，邀请北京集佳知识产权代理有限公司的国际化学涉外专利代理师李慧慧老师作题为“知识产权公益宣传——专利那些事儿”的报告。

李慧慧在报告中重点讲述了知识产权制度概要、专利申请流程、专利要求的布局以及常见撰写缺陷等内容。

报告会由办公室主任杨小刚主持，研究院师生及科研助理参加了报告会。房喻院士在总结中希望发挥专利制度引领作用，保障科技成果转化走深走实。

On December 29, 2024, the Institute of New Concept Sensors and Molecular Materials held a report session on intellectual property and patents, inviting Ms. Li Huihui, an international chemical patent agent from Beijing Jijia Intellectual Property Agency Co., to give a presentation titled “Intellectual Property - Patent Matters”.

In her report, Li Huihui focused on the outline of the intellectual property system, the patent application process, the layout of patent claims, and common drafting defects.

The report was moderated by INCSMM Administrative Office director Yang Xiaogang and attended by faculty members, students and research assistants of the Institute. Prof. Fang Yu, in his summary, hoped that the patent system plays a leading role to ensure the transformation of research achievements in a deep and practical way.

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Review

Recent Advances in Tetra-Coordinate Boron-Based Photoactive Molecules for Luminescent Sensing, Imaging, and Anticounterfeiting

Dingfang Hu, Rongrong Huang,* and Yu Fang*

Cite This: https://doi.org/10.1021/prechem.4c00072 Read Online

四配位硼基光活性分子在荧光传感、生物成像及防伪中的最新进展

Dingfang Hu, Rongrong Huang,* and Yu Fang*. Precis. Chem. 2024, DOI: 10.1021/prechem.4c00072

四配位硼基荧光材料因其独特且可精确调控的光电性能，在化学、生物学和材料科学等领域展现出巨大的应用潜力。通过将硼原子（B）引入有机骨架中，这些材料呈现出显著的结构和电子特性，如高量子产率、可调控的发射波长以及优异的光稳定性。这些分子的独特性能主要源于硼中心的缺电子特性，这种特性促进了与共轭体系的高效相互作用，从而增强了电子离域和电荷转移过程。

本综述聚焦于四配位硼基光活性分子的设计与应用，详述了结构特征如何影响其性能，并探讨了提升性能的策略，包括配体修饰和共轭体系拓展等。此外，还重点讨论其在荧光传感、防伪和成像等领域的作用，并对该领域未来的研究方向进行了展望。

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Tetra-coordinate boron-based fluorescent materials hold considerable promise across chemistry, biology and materials science due to their unique and precisely tunable optoelectronic properties. The incorporation of the heteroatom boron (B) enables these materials to exhibit high luminescence quantum yields, adjustable absorption and emission wavelengths, and exceptional photostability. The distinctive properties of tetra-coordinate boron-based photoactive molecules arise primarily from the electron-deficient nature of the boron center, which facilitates efficient interactions with conjugated systems, and thereby enhances electron delocalization and charge transfer processes.

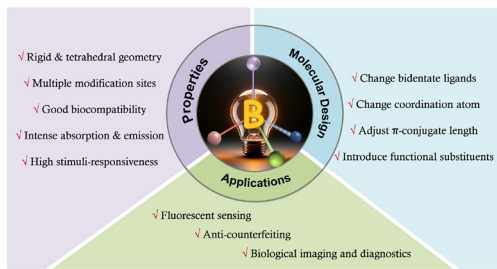

图 1. 四配位硼基光活性材料研究概览

Figure 1. Overview of Topics on Tetra-Coordinate BoronBased Photoactive Materials

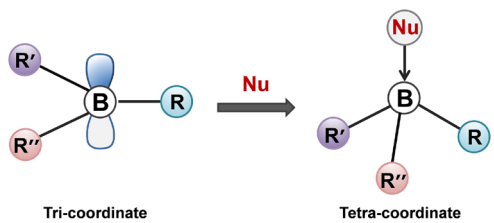

图 2. 三配位有机硼化合物和四配位有机硼化合物的示意图。Nu 代表亲核试剂，三个取代基（R，R'，R"）可以相同也可以不同。

Figure 2. Schematic illustration for the tricoordinate organoboron compounds and the tetra-coordinate organoboron compounds. Nu represents nucleophile, the three substituents (R, R', R") can be identical or differ from one another.

This review examines the molecular design and applications of tetra-coordinate boron-based photoactive molecules. We outline how structural features impact their properties and discuss strategies for enhancing their performance, including ligand modification and the extension of conjugation length, among others. Additionally, we will emphasize their emerging roles in luminescent sensing, anticounterfeiting, and luminescent imaging, and identify the challenges and future directions in this rapidly evolving field.

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Selective phosgene detection both in solution and gas phases via a unique fluorescence bright-off-brighter mechanism

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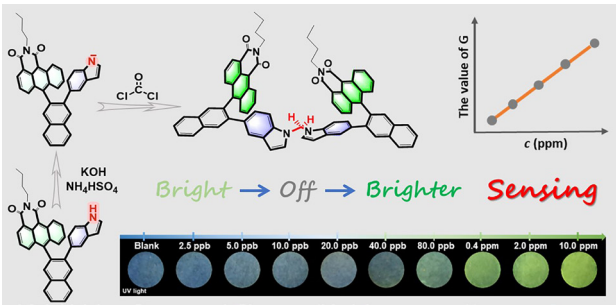
基于‘亮 – 暗 – 更亮’机制的液相与气相光气选择性检测

Mengyu Ji, Nannan Ding, Yan Jiang, Xinyu Gou, Simin Lin, Jiancheng Zhou, Lingya Peng, Haonan Peng, Yu Fang. Sensors and Actuators: B. Chemical 2024, DOI: 10.1016/j.snb.2024.137115



光气（$COCl_2$）是一种高度毒性和挥发性的气体，因其作为化学战剂的使用以及在制药、农药和塑料生产中的重要作用而声名狼藉。基于荧光的方法因其高灵敏度、快速响应和实时监测的潜力，已成为一种非常有吸引力的检测手段。

在本研究中，我们成功开发了一种基于分子内电荷转移（ICT）的荧光探针 EMI–YD，用于选择性和灵敏地检测光气。该探针遵循“亮 – 灭 – 更亮”的荧光调制机制，其中去质子化引起的猝灭在光气作用下被逆转，从而显著增强了荧光。该荧光探针在溶液中对光气表现出令人印象深刻的检测限（DL）为 4.7 nM。此外，EMI–YD 及其去质子化形式 EMI–YD–N 分别用于制造 Film 1 和 Film 2。这两种薄膜在光气检测中互为补充，可以实现气相中对光气的高度选择性和灵敏的定量检测。值得注意的是，在 Film 2 的辅助下，空气中的微量光气（<80 ppb）可以通过裸眼轻松发现。该研究表明，“亮 – 灭 – 更亮”的荧光调制策略为光气检测提供了一种有前景的方法，预计能够集成到便携式检测设备中，为实际的实时监测应用奠定基础。

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Phosgene ($COCl_2$) is a highly toxic and volatile gas, notorious for its use as a chemical warfare agent and as a crucial industrial intermediate in the production of pharmaceuticals, pesticides and plastics. Fluorescence-based methods have emerged as highly attractive due to their high sensitivity, rapid response, and potential for real-time monitoring.

In this study, we successfully developed an ICT-based sensing fluorophore, EMI-YD, for selective and sensitive detection of phosgene. The sensing follows a “bright-off-brighter” fluorescence modulation mechanism, where deprotonation-induced quenching is reversed upon phosgene interaction, resulting in significant fluorescence enhancement. The sensing fluorophore demonstrated an impressive DL of 4.7 nM to the analyte in solution. Furthermore, EMI-YD and its deprotonated form, EMI-YD-N, were respectively used to fabricate Film 1 and

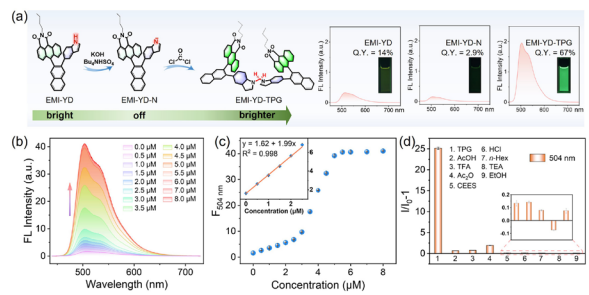

图 1. 三传感原理图及传感行为

Figure 1. Sensing schematic diagram and sensing behavior of EMI-YD in DCM

Film 2. The two films are mutually complementary in phosgene sensing, enabling highly selective and sensitive determination of the analyte in gaseous phase. Notably, assisted by Film 2, trace amount (< 80 ppb) of phosgene in air could be easily found with naked-eye. This work demonstrates that the "bright-off-brighter" fluorescence modulation strategy offers a promising approach for phosgene detection, which is expected to be integrated into portable detection devices, laying the foundation for practical, real-time monitoring applications.

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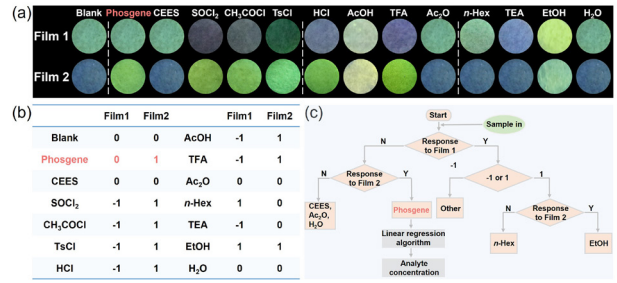

图 2. 膜 1 和膜 2 暴露于各种蒸汽下的照片及逻辑分析过程
Figure 2. Photographs of Film 1 and Film 2 exposed to various vapors and the logical analysis process

RESPONSIVE MATERIALS
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A nanofilm-based fluorescent sensor for determination and identification of gas-phase alkylamine

Jiahui Hu, Xiangquan Liu, Hexi Wei, Rongrong Huang, Binbin Zhai, Yan Luo, Junbao Yan, Lingya Peng, Mei Liu ✉, Yu Fang ✉

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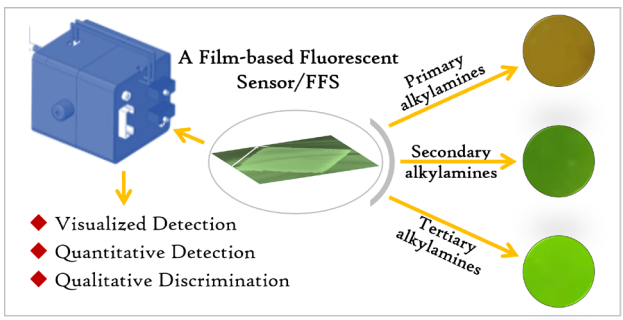
一种基于纳米薄膜的荧光传感器用于气相烷基胺的测定与识别

Jiahui Hu, Xiangquan Liu, Hexi Wei, Rongrong Huang, Binbin Zhai, Yan Luo, Junbao Yan, Lingya Peng, Mei Liu, Yu Fang, Responsive Mater. 2024, e20240026. DOI:10.1002/rpm.20240026.



挥发性烷基胺是化学、制药和农业工业中的重要原料和中间化合物。然而，它们的毒性带来了严重的职业安全风险。长期暴露于烷基胺蒸气中可能引起眼部、鼻部和咽喉的刺激，头痛，面部潮红，以及神经系统疾病的发生。快速便携地检测挥发性烷基胺对于减轻其对人类健康的不良影响，以及推动大气颗粒物形成研究、早期疾病诊断和食品变质监测具有重要意义。

在本研究中，我们特别设计并制备了一种新型的荧光纳米薄膜 BT–TPATH，该纳米薄膜通过富电子的 4,4',4″ – 三氮基三苯基肼（TPATH）与缺电子的 4,7– 二苯甲醛 – 苯并噻二唑（BT–2CHO）在空气 / 二甲基亚硫酰胺（DMSO）界面上进行的动态缩合反应制备而成（图 1a）。所制备的纳米薄膜对初级、次级和三级烷基胺蒸气表现出显著的荧光响应。利用 BT–TPATH 纳米薄膜对烷基胺的独特响应，开发了一种基于 BT–TPATH 纳米薄膜的荧光传感器（FFS）。该传感器不仅对多种烷基胺提供快速且可逆的响应，还能根据烷基胺的独特恢复时间和响应强度区分初级、次级和三级烷基胺（图 1b）。理论计算表明，氢键作用和微环境效应是导致纳米薄膜荧光红移和猝灭的原因。与传统方法相比，该荧光传感器提供了一种快速、可逆且方便的检测和区分烷基胺的方法。我们相信，所开发传感器的独特区

分能力在诸如食品新鲜度快速监测、疾病诊断以及各类工业过程中的安全评估等关键应用中具有巨大潜力。

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Volatile alkylamines constitute essential raw materials and transitional compounds within the domains of chemical, pharmaceutical, and agricultural industries. Nonetheless, their toxicity presents serious occupational safety risks. Continuous exposure to alkylamine vapors can induce ocular, nasal, and pharyngeal irritation, headaches, facial erythema, as well as the development of neurological disorders. The rapid and portable detection of volatile alkylamines is essential for mitigating their adverse impacts on human health, as well as for advancing research in atmospheric particle formation, early disease diagnosis, and food spoilage monitoring.

Herein, we specially designed and prepared a novel fluorescence nanofilm of BT-TPATH via dynastic condensation of electron-rich 4,4',4"-nitrilotribenzohydrazide (TPATH) and electron-deficient 4,7-diphenylaldehyde-benzothiadiazole (BT-2CHO) at the air/DMSO interface. The nanofilm as prepared exhibits distinct fluorescent responses to primary, secondary, and tertiary alkylamine vapors. Leveraging the unique response of the BT-TPATH nanofilm to alkylamines, a BT-TPATH nanofilm-based FFS was developed. This sensor not only provides a fast and reversible response to a range of alkylamines but also differentiates between primary, secondary, and tertiary alkylamines based on their unique recovery times and response intensities. Theoretical calculations suggest that hydrogen bonding interaction and microenvironment effects account for the observed red-shift and quenching of the nanofilm's fluorescence. Compared to traditional methods, this FFS offers a rapid, reversible, and convenient approach for the detection and differentiation of alkylamines. We believe the matchless distinguish ability of the sensor as developed holds great potential for key applications, such as rapid monitoring of food freshness, disease diagnosis, and safety assessments in various industrial processes.

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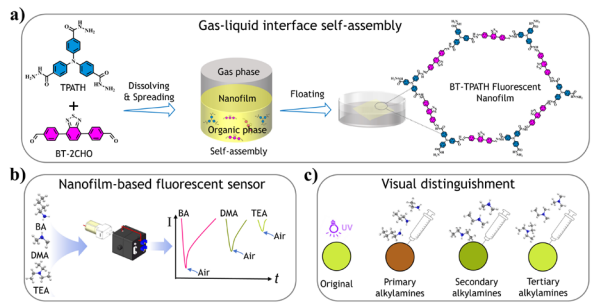

图 1.(a) 构建单元的结构与纳米薄膜在湿润空气 /DMSO 界面制备的示意图。(b) 基于纳米薄膜的荧光传感器的示意图，用于高效检测和区分烷基胺。(c) 通过所制备的纳米薄膜进行初级、次级和三级烷基胺的视觉区分示意图。

Figure 1. (a) Structures of the building blocks & schematic representation of the preparation of the nanofilm at the humid air/DMSO interface. (b) Schematic diagram of a nanofilm-based fluorescence sensor for efficient detection and distinguishment of alkylamines. (c) Schematic diagram of visual differentiation of primary, secondary, and tertiary alkylamines by the prepared nanofilm. DMSO, dimethyl sulfoxide.

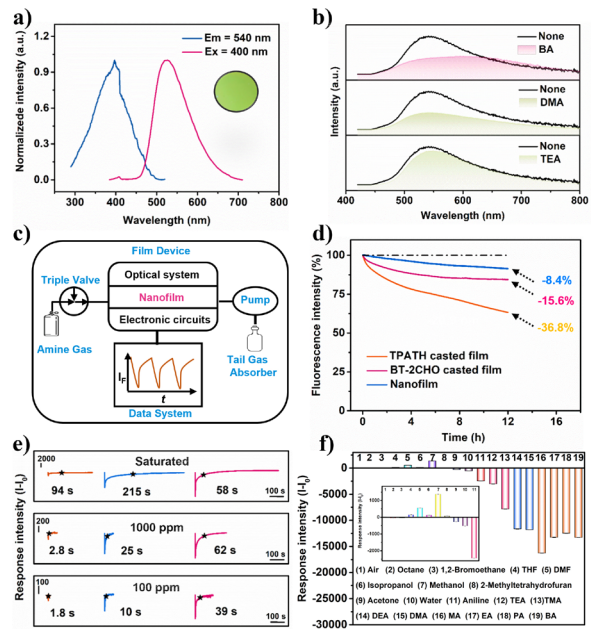

图 2. (a) 纳米薄膜的荧光激发（蓝线）和发射（红线）光谱（λ ex = 400 nm，λ em = 540 nm）。(b) BT−TPATH 纳米薄膜在暴露于饱和正丁胺(BA)、二甲胺(DMA)和三乙胺(TEA)蒸气前后的荧光发射光谱(λ ex = 400 nm)。(c) 传感器装置的示意图，主要由三部分组成：气体供应单元、基于纳米薄膜的传感器和数据采集系统。(d) 制备的纳米薄膜（黑线）及相关薄膜在紫外光照射下（λ ex = 400 nm）连续监测 12 小时后的荧光发射强度变化。(e) 在三种不同浓度下：饱和浓度、1000 ppm 和 100 ppm 时，BA（红线）、DMA（蓝线）和 TEA（橙线）达到 90% 信号恢复的恢复时间。(f) 纳米薄膜荧光传感器对各种烷基胺和一些潜在干扰物的响应。图 2e 中的“星号”符号表示荧光强度恢复到其初始值的 90% 时的点。

Figure 2. (a) Fluorescence excitation (blue line) and emission (red line) spectra of the nanofilm (λex = 400 nm, λem = 540 nm). (b) Fluorescence emission spectra of the BT-TPATH nanofilm before and after exposure to saturated butylamine (BA), dimethylamine (DMA), and triethylamine (TEA) vapors (λex = 400 nm). (c) Schematic of the sensing device, which mainly consists of three parts, a gas supply unit, the nanofilm-based sensor, and a data collection system. (d) Changes in the fluorescent emission intensity of the fabricated nanofilm (black line) and the relevant films continuously monitored under UV light illumination (λex = 400 nm) for 12 h. (e) Recovery times for 90% signal recovery of BA (red line), DMA (blue line), and TEA (orange line) at three different concentrations: saturated concentration, 1000 ppm, and 100 ppm. (f) Responses of the nanofilm-based fluorescent sensor to various alkyl amines and some potential interferences. The "star" symbol in Figure 2e stands for the point at which the fluorescence intensity recovers to 90% of its initial value. (h) Two-dimensional PCA score plot for discriminating the tested chemicals.

RESEARCH ARTICLE

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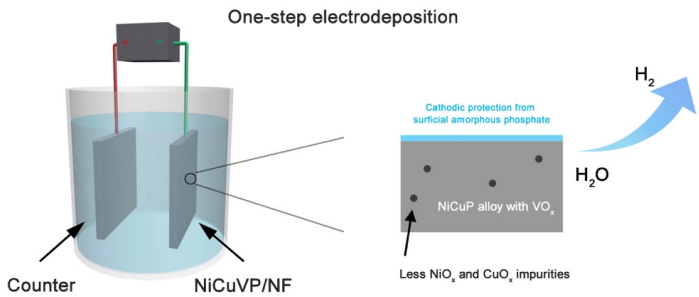
Surficial Engineering of Cathodic Protection Strategy via P-Doped NiCuV Monolithic Electrode for Enhanced Hydrogen Evolution Reaction in Alkaline Media

Huizhen Han, Shiyi Tao, Yu Sun, Yuxin Luo, Yulian Zhao, Somnath Mukherjee, Yi Ma, Xin Bo,* and Zenglin Wang**

磷掺杂镍铜钒电极构筑表面工程阴极保护策略促进碱水析氢反应

Huizhen Han#, Shiyi Tao#, Yu Sun, Yuxin Luo, Yulian Zhao, Somnath Mukherjee, Yi, Ma*, Xin Bo*, Zenglin Wang*; Adv. Sustainable Syst. 2024, 2400815. DOI:/10.1002/adsu.202400815



工业碱水制氢条件下的浓碱会对电极造成腐蚀，为此，本研究通过电沉积方法将磷共掺杂至 NiCuV 整体式电极中，在表面工程调控方面取得了阴极保护效果。在碱性介质中，在 1A cm^{-2} 的极高电流密度下，电极表现出增强的电化学析氢催化行为和恒定的耐久性，其过电位仅为 –0.75 V，持续时间超过 270 小时。阴极保护策略通过形成磷酸盐表面层来优化电荷密度，从而实现了对特定的金属（合金）相的抗氧化保护。同时，P 掺入调节了电极的分级多孔结构，提升电化学比表面积。此外，基于此材料构建的阴离子交换膜水电解槽（AEMWE），在使用 NiCuVP 作为析氢阴极、NiFeCr–LDH 作为析氧阳极时，在 80 ° C、2 V 槽电压和 30 wt.%KOH 电解质工业模拟条件下，其运行电流度可达 912 mA cm^{-2}。本研究还系统地讨论了电化学比表面积、氧化还原行为和表面亲水性等影响活性和耐久性的因素。本研究为 AWE 和 AEMWE 阴极的防腐和活性增强提供了一种实用的方案。

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The concentrated alkaline passivates the monolithic electrode for electrochemical hydrogen evolution reaction (HER) in the alkaline water electrolysis (AWE) industry. Herein, a surface engineering of cathodic protection via one-step co-electrodeposition of P into NiCuV is presented and the achieved monolithic electrode exhibits an enhanced electrochemical catalytic behavior and constant durability with a feedback potential of -0.75 V versus the reversible hydrogen electrode (RHE) under an extremely high current density of 1A cm^{-2} for more than 270 h in alkaline media. The strategy of cathodic protection optimizes the charge density redistribution by forming a phosphate surface layer. This preserves the particular metal (alloy) phase from oxidation while also modulating the heterarchical porous structure through P incorporation. Furthermore, an anion-exchange membrane water electrolysis (AEMWE) with the NiCuVP serving as the HER catalyst and the NiFeCr LDH as the OER catalyst is constructed, which exhibits a current density of 912 mA cm^{-2} at 2 V at 80 °C with 30 wt.% KOH electrolytes. The resultant factors for activity and durability such as the electrochemical specific area, redox behaviors and surface hydrophilicity are also systematically discussed. This research presents a practical protocol for the anticorrosion and active enhancement of AWE and AEMWE cathodes.

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安徽北方微电子研究院集团有限公司一行来访

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2024 年 12 月 15 日上午，安徽北方微电子研究院集团有限公司党委书记、所长陈丙根一行七人在西安交通大学仪器科学与技术学院党委书记韦学勇教授的陪同下到访新概念传感器与分子材料研究院进行交流。

房喻院士带领陈丙根一行参观了研究院展厅，并介绍了研究院的研究方向、科研成果和转化应用等方面的情况。

在随后举行的交流座谈会上，研究院副院长丁立平教授介绍了研究院基本情况，专职科研人员罗艳彦作了题为“新概念薄膜荧光传感器化学量、物理量”的专题报告。

接下来，双方就双方就有毒气体、化学战剂、微压力的超灵敏检测和柔性表皮电极等展开交流。

陈丙根分享了国内传感器现状及未来趋势，强调新概念传感器需多种材料融合以满足国家需求，希望双方在多方面开展深入合作。

最后，房喻院士作了总结讲话，指出未来双方将结合研究院新敏感材料创制优势和西安交通大学、安徽北方微电子在微纳加工、器件封装的优势，联合推进新概念型传感器研发。

安徽智能传感器研究院副院长王世和、安徽北方微电子集团公司（MEMS 技术方向）青年科技带头人凤瑞、科技产业部副部长孙贝贝、晶圆制造技术负责人王文婧、智能传感器系统副总师李坤和综合管理部部长潘大卓随同来访，研究院彭浩南教授、刘太宏副教授、办公室主任杨小刚和秘书左振男参加了座谈交流。

On December 15, 2024, seven guests from Anhui North Microelectronics Research Institute Group Co., Ltd., headed by party secretary and director Chen Binggen and accompanied by Prof. Wei Xueyong, party secretary of School of Instrument Science and Technology of Xi’an Jiaotong University, visited the Institute of New Concept Sensor and Molecular Materials.

Prof. Fang Yu led Chen Binggen and his delegation to visit the exhibition room of the Institute and briefed them about the research direction, research achievements and transformation and application of the institute.

At the subsequent meeting, INCSMM vice dean Prof. Ding Liping introduced the basic situation of the institute, and research assistant Luo Yanyan presented a report titled “Chemical and Physical Quantities of New Concept Film Fluorescence Sensors”.

Next, the two sides exchanged views on ultra-sensitive detection of toxic gases, chemical warfare agents, micro-pressures, and flexible skin electrodes.

Chen Binggen shared the current situation and future trends of sensors in China, emphasizing that new concept sensors need to integrate a variety of materials to meet national needs, and hoped that the two sides would deepen cooperation in various areas.

Finally, Prof. Fang Yu made a concluding speech, pointing out that in the future the two sides will combine the advantages of INCSMM in the creation of new sensitive materials and the advantages of Xi’an Jiaotong University and Anhui North Microelectronics in micro and nano processing and device packaging, and jointly promote the research and development of new concept sensors.

Wang Shihe, vice dean of Anhui Intelligent Sensor Research Institute, Feng Rui, Youth Science and Technology Leader of Anhui North Microelectronics (MEMS Technology Direction), Sun Beibei, vice director of Science and Technology Industry Department, Wang Wenjing, head of Wafer Manufacturing Technology, Li Kun, deputy chief of Intelligent Sensor System, and Pan Dazhuo, director of Comprehensive Management Department, accompanied Chen Binggen in the visit. INCSMM Prof. Peng Haonan, A/Prof. Liu Taihong, Administrative Office director Yang Xiaogang and secretary Zuo Zhennan participated in the meeting.

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