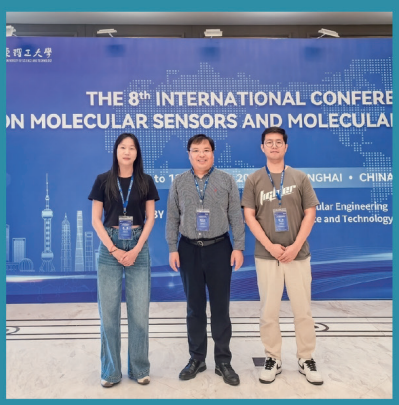
陕西师范大学 SHAANXI NORMAL UNIVERSITY

西安交通大学 XIAN JIAOTONG UNIVERSITY

2025年10月
October, 2025

简报
Newsletter

新概念传感器与分子材料研究院
Institute of New Concept Sensors and Molecular Materials



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2024 级博士生开题汇报暨研究生学术论坛举行

Class of 2027 Doctoral Proposal Presentation and Graduate Student Academic Forum Held

2025 年 10 月 8 日，陕西师范大学新概念传感器与分子材料研究院在报告厅举办了 2024 级博士生开题汇报暨研究生学术论坛。汇报会分别由丁立平教授、刘凯强教授、马佳妮教授和彭军霞教授主持，研究院教师、研发工程师及研究生等近百人参加。

来自研究院、物理学与信息技术学院和人工智能与计算机学院的 15 位博士研究生分别就自己的科研工作进展、取得成绩和未来毕业论文工作计划进行了汇报，其中有物理化学专业博士研究生 Ishfaq Ullah、张泽华、谭淑文、马欣欢、张力之、马雅蕾、李仁杰、程洋、于敬华、张书林、邢梦轩、黄嘉莉和申超文，物理学与信息技术学院博士研究生刘腾及人工智能与计算机学院的博士研究生石志伟。

开题汇报之后，研究生们回答了评委老师提出的问题，与老师讨论了相关问题，并对之后的研究和工作进行了探讨和展望。

房喻院士发表总结讲话，从博士生开题的要求和意义出发，用一副对联“细琢精雕璞玉终成器，厚积薄发桃李自成蹊”鼓励导师和学生共同努力，在科研中做好各自的工作，未来为国家多做一些有意义的工作。

On October 8, 2025, the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University held a proposal Presentation and a graduate academic forum for Class 2027 doctoral students in the lecture hall. The event was moderated by Prof. Ding Liping, Prof. Liu Kaiqiang, Prof. Ma Jiani and Prof. Peng Junxia in sections, and was attended by nearly 100 faculty, R&D engineers and graduate students from the institute.

Fifteen doctoral students from the institute, School of Physics and Information Technology and School of of Artificial Intelligence and Computer Science presented reports on the progress of their research work, achievements made, and future plans for their dissertation projects, including Ishfaq Ullah, Zhang Zehua, Tan Shuwen, Ma Xinhuan, Zhang Lizhi, Ma Yalei, Li Renjie, Cheng Yang, Yu Jinghua, Zhang Shulin, Xing Mengxuan, Huang Jiali and Shen Chaowen in Physical Chemistry, Liu Teng from School of Physics and Information Technology, and Shi Zhiwen from School of of Artificial Intelligence and Computer Science.

After the proposal report, the graduate students answered the questions raised by the judges, discussed the relevant issues and the prospect of

the future research and work with the teachers.

In his concluding speech, Prof. Fang Yu began by discussing the requirements and significance of doctoral thesis proposals, then he quoted a pair of couplets “Through meticulous carving and polishing, the raw jade eventually becomes a masterpiece; With deep accumulation and gradual release, the peach and plum trees naturally form a path”, to encourage both supervisors and students to work together to fulfill their respective roles in research, striving to contribute more meaningful work to the nation in the future.

刘太宏副教授参加第八届分子传感器与分子逻辑门国际会议

Liu Taihong presents at 8th International Conference on Molecular Sensors and Molecular Logic Gates

2025 年 10 月 9 至 12 日，陕西师范大学新概念传感器与分子材料研究院刘太宏副教授和研究生陈永和闫珍参加了在上海举办的第八届分子传感器与分子逻辑门国际会议。

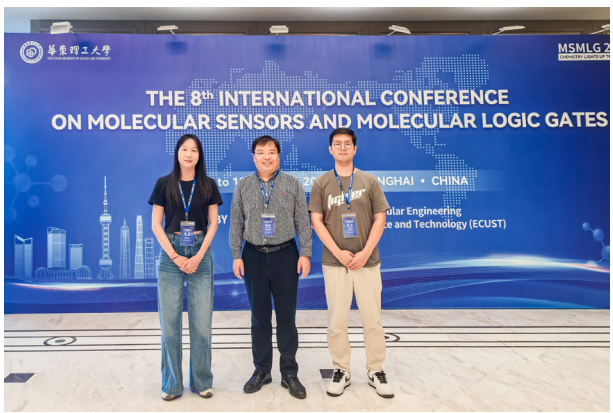
刘太宏副教授在 Luminescent System and Mechanism 分会作了题为 Two-photon absorption and ultrafast excited-state dynamics of multipolar chromophores 的英文报告。陈永、闫珍做了墙报展示，闫珍获得优秀墙报奖。

本次会议由华东理工大学主办，来自世界各地的 400 余位专家学者参会。

From October 9 to 12, 2025, Assoc. Prof. Liu Taihong and graduate students Chen Yong and Yan Zhen from the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University attended the 8th International Conference on Molecular Sensors and Molecular Logic Gates held in Shanghai.

Liu Taihong presented an English report titled Two-photon absorption and ultrafast excited-state dynamics of multipolar chromophores at the Luminescent System and Mechanism session. Chen Yong and Yan Zhen presented their posters, with Yan Zhen receiving the Outstanding Poster Award.

The conference was hosted by East China University of Science and Technology, with over 400 experts and scholars from around the world in attendance.



薄鑫参加吉林省氢能多元化应用专题培训并作报告

Bo Xin presents at Special Training of Diversified Applications on Hydrogen Energy in Jilin

2025 年 10 月 14 日，陕西师范大学新概念传感器与分子材料研究院薄鑫副研究员参加了在长春工程学院举行的“吉林省氢能多元化应用专题培训”，并作题为“高效电解水制氢关键催化剂”的报告。

On October 14, 2025, Assoc. Prof. Bo Xin from the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University attended the Special Training of Diversified Applications on Hydrogen Energy in Jilin” held at Changchun Institute of Technology, presenting a report titled Critical Catalysts for Efficient Water Electrolysis for Hydrogen Generation.

房喻院士应邀在中国科学院大连化物所作第 49 期张大煜讲座

Fang Yu delivers at DICP Zhang Dayu Lectureship (49) at CAS Dalian Institute of Chemical Physics

2025 年 10 月 16 日上午，房喻院士应邀在中国科学院大连化学物理研究所作了题为“传感驱动的分子材料创新：从荧光传感到高增益透镜”的第 49 期张大煜讲座。

大连化物所李灿院士、张涛院士、副所长王峰、科研及职能部门相关人员等 180 余人通过线下和线上方式参加了报告会，报告会由大连化物所仪器分析化学研究室主任冯亮研究员主持。报告结束后，副所长王峰向房喻院士颁发了张大煜讲座证书。

“张大煜讲座”是 2006 年大连化物所为缅怀我国催化科学先驱、大连化物所创始人张大煜先生，追忆他高尚的风格、严谨的治学态度以及为中国化学化工事业和大连化物所的发展做出的卓越贡献，在张大煜先生诞辰百年之际设立，邀请国内外著名专家学者来所讲学。“张大煜讲座”是大连化物所最高层次的学术讲坛。主讲者将在讲学结束后受聘为大连化物所荣誉教授。

On October 16, 2025, Prof. Fang Yu was invited to deliver a lecture titled “Sensor-Driven Innovation in Molecular Materials: From Fluorescent Sensors to High-Gain Lens” at the 49th Zhang Dayu Lectureship at the Dalian Institute of Chemical Physics, Chinese Academy of Sciences.

Over 180 attendees, including Academician Li Can, Academician Zhang Tao, deputy director Wang Feng, and

relevant personnel from research and administrative departments of the Dalian Institute of Chemical Physics, participated in the lecture both in-person and online. The event was chaired by Researcher Feng Liang, director of the Instrumental Analytical Chemistry Laboratory at the institute. After the lecture, Wang Feng presented Fang Yu with the Zhang Dayu Lectureship Certificate.

The Zhang Dayu Lectureship was established in 2006 by the Dalian Institute of Chemical Physics to commemorate Mr. Zhang Dayu, a pioneer of catalytic science in China and founder of DICP, marking the centenary of his birth. The lectureship honors his noble character, rigorous scholarly approach, and outstanding contributions to China's chemical industry and the development of DICP by inviting renowned experts and scholars from home and abroad to deliver lectures at the institute. The Zhang Dayu Lectureship represents the highest-level academic forum at the Dalian Institute of Chemical Physics. Following their lectures, speakers are honored with the title of Honorary Professor at the Dalian Institute of Chemical Physics.

房喻院士携研究院教师参加首届 CBRN 传感科学论坛

Fang Yu and INCSMM teachers attend First Forum on CBRN Sensing Science

2025 年 10 月 16 日下午，陕西师范大学 / 西安交通大学新概念传感器与分子材料研究院房喻院士一行参加了由中国科学院化学物理研究所仪器分析化学研究室主办的第一届 CBRN（化学、生物、放射性、核素）传感科研论坛。

房喻院士应邀为本次论坛致辞，丁立平教授和何刚教授分别作了题为“薄膜荧光传感器创制和 CBRN 传感性能研究”和“面向射线探测的高性能发光材料及器件”的交流报告，彭浩南教授、刘太宏副教授和刘忠山副教授参与了学术交流。

中国科学院大连化物所、陕西师范大学、中国科学院福建物质结构研究所、中国科学院新疆理化所、中国科学院沈阳自动化研究所，以及吉林大学、西安交通大学、苏州大学等单位的 30 余位学者，以及来自国家市场监督管理总局技术创新中心、大连化物所科研及职能部门的 50 余人出席本次论坛。

10 月 17 日上午，房喻院士应邀在中国科学院大连化物所英歌石科学城园区作了题为“科学研究与人才培养——我的一些思考”的报告，大连化物所研究生和青年科研人员通过线上和线下形式听取了报告。

访问期间，房喻院士一行还参观走访了大连化物所分子催化与原位表征研究组、催化与新材料研究室、生物能源化学品研究组和化学传感器研究组等相关实验室，并与科研人员进行了学术交流。

On the afternoon of October 16, 2025, Prof. Fang Yu and his colleagues from the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University and Xi'an Jiaotong University attended the First Forum on CBRN (Chemical, Biological, Radiological, Nuclear) Sensing Science hosted by the Laboratory of Instrumental Analytical Chemistry at the Institute of Chemical Physics, Chinese Academy of Sciences.

Fang Yu was invited to deliver an opening address at the forum. Prof. Ding Liping and Prof. He Gang presented reports titled “Development of Film-based Fluorescent Sensors and Research on Their CBRN Sensing Performance” and “High-Performance Luminescent Materials and Devices for Radiation Detection,”

respectively. Prof. Peng Haonan, Assoc. Prof. Liu Taihong, and Assoc. Prof. Liu Zhongshan participated in the academic exchange.

Over 30 scholars from the Dalian Institute of Chemical Physics, Shaanxi Normal University, CAS Fujian Institute of Structure Chemistry, CAS Xinjiang Institute of Physics and Chemistry, CAS Shenyang Institute of Automation, as well as Jilin University, Xi'an Jiaotong University, and Soochow University attended the forum. Additionally, more than 50 participants from the National Market Supervision and Administration Administration's Technology Innovation Center and DICP research and administrative departments were present.

On the morning of October 17, Fang Yu presented a report titled "Scientific Research and Talent Cultivation: My Reflections" at DICP Yinggeshi Science City Park. Graduate students and young researchers from the institute attended the lecture both online and in person.

During the visit, Fang Yu and his colleagues toured relevant laboratories at the Dalian Institute of Chemical Physics, including the Molecular Catalysis and In-Situ Characterization Research Group, the Catalysis and New Materials Research Laboratory, the Bioenergy Chemicals Research Group, and the Chemical Sensors Research Group, engaging in academic exchanges with the research staff.

"第一届 CBRN 传感科学论坛" 会议纪要

当前全球安全形势与非传统安全风险交织叠加，CBRN（化学、生物、放射、核）威胁日益呈现多元化与场景化特征，对食品环境监测与公共安全领域的联网感知与快速筛查能力提出了迫切需求。为破解我国在 CBRN 快速检测领域依赖进口设备、缺乏原创理论支撑的瓶颈，2025 年 10 月 15 日至 17 日，由中国科学院大连化学物理研究所仪器分析化学研究室主办的第一届"CBRN 传感科学论坛"在大连召开。来自陕西师范大学、西安交通大学、苏州大学、吉林大学、大连理工大学、中国科学院福建物构所、沈阳自动化所、新疆理化所及相关企业的 30 余位专家应邀出席本次论坛，国家市场监督管理总局技术创新中心、大连化物所科研及职能部门的 50 余人参与了本次交流活动。陕西师范大学的房喻院士及大连化物所副所长王峰研究员分别为本次论坛致辞，仪器分析化学研究室主任冯亮研究员主持会议。论坛通过学术报告与讨论，聚焦传感器原理创新、材料开发与技术进步，促进了学科的交叉与合作。讨论围绕着三个主题展开：光化学传感与分子色度学、半导体电化学传感与表界面科学，以及多维传感融合与智能化平台。

第一主题：光化学传感与分子色度学

邀请报告 1:

薄膜基荧光传感器创制及 CBRN 传感性能研究

报告人：丁立平 教授

单　位：陕西师范大学

围绕 CBRN 防御需求，通过荧光传感单元的创新设计和界面限域自组装技术，开发高性能纳米膜材料及荧光传感器。采用激发态质子转移、分子内电荷作用调 控等策略，构建多模式响应机制。所研薄膜具备高灵敏度、快速响应与优异的稳 定性，实现了对多种 CBRN 待测物低至 ppb 级的高灵敏快速检测。

邀请报告 2:

荧光闪烁传感

报告人：徐兆超 研究员

单　位：大连化物所

围绕"荧光闪烁传感"展开，介绍了利用荧光分子闪烁特性进行超分辨成像与纳米尺度传感的新思路。传统荧光探针通常依赖荧光强度变化来实现识别

和成像，而我们通过调控分子的闪烁行为，不仅突破了光学衍射极限，实现了高时空分辨的超分辨成像，还利用闪烁对环境的敏感响应，将其转化为新的传感信号，从而在纳米尺度上实现对不同生物功能单元的精准识别与动态监测，揭示细胞内复杂生命过程的时空特征。

邀请报告 3:

时间分辨成像：从机制解析到传感应用

报告人：田文明 研究员

单　位：大连化物所

系统介绍了时间分辨光谱成像技术在光电材料机制解析及传感应用中的创新突破。超快瞬态吸收 / 反射成像技术实现电子 / 空穴信号独立解析，时间分辨率 <1 ps；超快近场成像突破衍射极限，时空分辨可视化方法直接观测电荷分离、迁移动态过程；荧光寿命与强度多参数检测提升传感器选择性、抗干扰性，延长使用寿命。研究涵盖了光电材料（如钙钛矿太阳能电池）微观机制解析（晶界效应、电荷动力学）、薄膜传感器均一性评估及传质动力学分析，为 CBRN 传感设计提供新维度。

邀请报告 4:

可视化爆炸物、毒品、毒剂传感检测技术

报告人：蔡珍珍 副研究员

单　位：新疆理化所

围绕着公共安全领域痕量毒品、爆炸物、危化品等，开展了一系列高灵敏度传感单元设计与开发的研究，提出了可视化人工嗅觉等策略，实现皮克级目标物漂浮微粒的直接检测，开发了荧光－比色多模式传感探针与便携检测装备，已在公安实战与大型活动（如亚运会）中应用。

邀请报告 5:

高性能敏感膜

报告人：冯亮 研究员

单　位：大连化物所

通过优化比色传感薄膜中的传质与反应平衡，实现 ppb 级高灵敏度检测，解决了化学传感灵敏度、抗干扰及现场应用中的难题；通过创新膜结构设计，克服了高湿环境干扰；结合多特征阵列与深度学习算法，提升阵列传感器在复杂环境下的识别精度。成果已应用于工业毒气预警、病毒快速检测、农药残留筛查及密闭环境气体监测，已服务于达沃斯论坛等重大活动的安全保障，并实现产业化。

第一轮讨论：

◇ 究竟什么称之为传感器？单纯的探针是否能叫传感器？

在“智能传感器”重点研发专项中，传感器的范畴一般定义为器件，然而其核心在于传感单元的设计。无论是以材料学还是以分子设计为基础，都是传感中不可或缺且至关重要的部分。领域内大家应当求同存异，相互欣赏，共同推进我 国高性能传感器的良性发展。

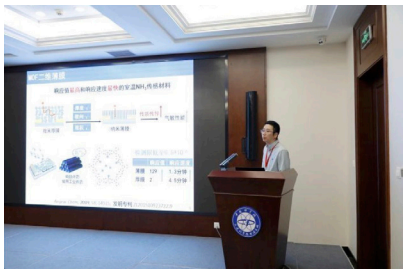
◇ 极低浓度的气体是如何配制，如何验证的？

通过多级稀释与采用 FTIR 等手段进行验证，但在极低气体浓度下的验证仍存在挑战。在实际应用中需要充分考虑是否有管道吸附等因素。

◇ 一次性的传感器是否能算得上传感器？

一般认为监测型长期使用的器件才算得上传感器，但需要针对实际应用中的不同场景，如检测卡、检测试纸等一次性产品在特定场景下也具有互补价值。宜采取“具体问题具体分析”的策略综合评判(case by case)。

第二部分：半导体电化学传感与表界面科学



邀请报告 1:

MOF 薄膜气敏传感材料

报告人：徐刚 教授

单　位：福建物构所

针对传统传感材料常温敏感性低、选择性不足等瓶颈，提出 MOF 薄膜实现从“外表面气敏”到“内表面气敏”的路径。所制备的二维 MOF 薄膜实现室温下 0.5 ppm 氨气的快速高响应检测；三维 MOF 薄膜通过孔道富集与光协同效应，对 RDX 爆炸物检测灵敏度可达 ppt 级，较传统方法提升 12 个数量级。为硝铵炸药、TATP、RDX 等危险品提供超灵敏检测平台，推动 CBRN 传感技术向常温、快速、 精准方向发展。

邀请报告 2:

面向射线探测的高性能发光材料及器件

报告人：何刚 教授

单　位：西安交通大学

针对 X 射线检测“卡脖子”难题，研发高性能发光材料及柔性器件，支撑医疗影像、核安全等国家战略需求。发展有机 / 无机协同光电材料体系，结合直接 型与间接型探测，实现高灵敏度与低噪声。首创柔性射线检测器件，全有机发光体系实现透明闪烁屏；三维 / 二维铅基钙钛矿异质结膜支持曲率半径 <1cm 弯曲成像，自驱动灵敏度达领先水平。与秦洲核安共建联合研究院，开发 QZ 系列便携式辐射监测仪，应用于福清核电、十四运会等场景。

邀请报告 3:

基于 MEMS 气体传感器阵列的人 工嗅觉平台及应用

报告人：孙旭辉 教授

单　位：苏州大学

通过阵列传感与模式识别突破单一传感器选择性瓶颈，实现气味数字化。所开发的基于 MEMS 气体传感器阵列的人工嗅觉平台，集成了多种纳米气敏材料（如金属氧化物、MOF、碳基等）、低功耗芯片与 AI 算法，可应用于厨房安全（燃气 检测）、食品新鲜度分析（果蔬、熟肉）、医疗诊断、工业监测（储能安全、化工泄漏）及智能家电（微波炉糊味检测）等领域。

邀请报告 4:

原位穆斯堡尔谱解析动态单原子催化机制

报告人：李旭宁 研究员

单　位：大连化物所

重点介绍了穆斯堡尔谱技术在单原子催化动态机制解析中的创新应用。研发高能量分辨穆谱仪与原位反应池（适用热 / 电催化），结合快速冷冻技术（捕获 中间物种），突破传统光谱定量探测瓶颈。构筑单原子铁 / 锡模型催化剂，揭示 CO_2 还原制 CO/ 甲酸过程中位点电子结构动态演变；结合 XAS 等表征技术阐明催化机制，为原子调控为基础的传感机理研究提供定量依据。

邀请报告 5:

二维 MoS_2 表界面调控与催化

报告人：胡景庭 研究员

单　位：大连化物所

报告重点探讨了二维催化材料，特别是 MoS_2 在催化领域的应用。通过在 MoS_2 面内引入硫空位，实现低温、高效、长寿命 CO_2 加氢制甲醇；开发的富边 MoS_2 纳米片阵列实现 CO 加氢高选择性制多碳醇；突破二维材料放大瓶颈，推进吨级催化剂生产。此外，基于“吸附 – 电子转移 – 脱附”层面的共性过程，推断二维催化材料在气体与生物传感上具备良好前景，关键在于表界面与电子结构的精细调控。

邀请报告 6:

全固态气体传感器的构筑

报告人：卢革宇 教授

单　位：吉林大学

聚焦固态气体传感器灵敏度提升难题，提出混成电位新原理，突破传统能斯特方程限制，实现高温超灵敏传感；AI 辅助开发 87 种氧化物敏感电极，设计效 率大幅提升；飞秒激光直写等微纳界面构筑技术增强三相反应界面活性；通过分等级结构与异价掺杂（如 Sb/Co 掺杂 SnO_2）优化识别 / 转换界面，使半导体传感器的灵敏度显著提升。技术应用于空间站环控生保、化学战剂侦测、大气环境监 测及车载 NOx 传感器等领域，实现国产化替代。

第二轮讨论：

◇ 传感器的稳定性和灵敏度通常是相互矛盾的，追求灵敏度，就可能不稳定，因为太活泼，粒子越小，能量越大，活性越好，就越不稳定，很多实验室做的性能非常好的材料，在实际中就用不上，这是产业化过程中最大的一个问题，很多材料稳定性不到半年，甚至不足一个月；MOFs 也一样，导电性不够，稳定性也不太好，煅烧完后就变成不一样的化合物了，如何考虑这些问题？

在气体传感领域里面，其实已经做了比较多的 MOFs 传感的工作，很多还是可以稳定存在。至于兼容 MOFs 导电性的同时，还保证其稳定，目前来说的确是比较困难的。当前的策略是放弃导电性，仅仅把 MOFs 当成功能材料，和导电材料配合使用，各做各的事。

◇ 单原子催化剂活性很高，稳定性是不是就不好？比

如铁，常规空气中放置都能生锈，何况高活性状态下。如何把活性状态封闭在一个限制的空间里，在热的作用下能够合理释放出来，半导体传感器本身是个热的过程，把活化物种放在介孔或限域空间里是否可行？

传感器不是单独的存在，窗口材料很重要。本次会议组织很好，包括了很多催化方向的报告，其实我们细看半导体传感，都是表界面、物理化学的事情，催化在这些研究上下的功夫很大，机理过程研究得很明白，值得我们很好的借鉴，引导我们来思考传感的问题。

◇ 催化是大事，传感只是小事，国家不一定会投入多少来研究传感？

传感虽然事小，但极其重要，我们要从不同的方向去发声，尤其是我们智能传感器口的专家，要在各个层面共同发声。传感器非常重要，是数据获取的关键抓手，其细分领域很多。传感的市场化目前确实不太好做，物理量传感用途很广，但化学量传感市场低迷，如何市场化挣钱一直是瓶颈，也一定程度上阻碍了化学传感器的研究，但未来整体来看还是向好的。

◇ 单原子催化剂的研究如何给传感带来启示？

半导体金属氧化物传感目前基本还是基于表面活性氧活化的单一原理，单原子催化剂研究中的概念，如单原子位点活化氧气，同时另一个位点选择性吸附，两者协同叠加，产生更好的效果，可以借鉴到传感器的设计理念中，引导传感器朝着传感位点微环境可设计的角度发展。

◇ 在人工嗅觉中，比如报告中提到的花香识别，有的花香可能就只是一两个成分的微小差异，或比例不一样而已，人工嗅觉是否能够识别？

理论上说，只要传感器单元够用，识别能力肯定是跟得上的。但这个也受到工业上传感器材料的限制，目前没有那么多稳定的传感单元材料可用。同时，这个也需要辩证的看问题，主要还是依赖于应用场景。在特定场景下，场景固定了，可能最后筛选出来只要几个传感器就足够用，比如说微波炉食品加热，确定了十 几种预制食品后，两三个传感器就足以区别出披萨、牛排等不同食品，不需要那么多个传感单元。所以说，目前最大的挑战其实还是如何获得稳定的传感器。

第三部分：多维传感融合与智能化平台

邀请报告 1:

分子侦察兵——紫外拉曼光谱在化学防护检测体系中的应用

报告人：王珣 高级工程师

单　位：大连化物所

介绍了紫外拉曼光谱技术在防化领域的创新应用，突出了其作为"指纹光谱"在分子识别中的独特价值。自主研制的紫外拉曼装备系列，突破高背景荧光干扰的技术瓶颈，实现高灵敏、秒级快速探测；开发表面化学沾染非接触检测技术，在化学战剂（如沙林模拟剂 DMMP）、爆炸物、体液等复杂场景进行了验证；首创深紫外拉曼专用镜头，提出拉曼－荧光联合探测方案，推动化学/生物威胁一体化侦测。研究成果涵盖技术原理、装备研制、多环境验证（土壤、织物、水浸工况）及实战应用（战场、案件取证），为公共安全与军事防化提供关键技术支撑。

邀请报告 2:

高性能质谱仪器的创制及应用

报告人：花磊 研究员

单　位：大连化物所

介绍了质谱与离子迁移谱技术的创新研发及产业化应用，聚焦国家安全、环境监测与精准医疗等领域快速检测需求。突破真空紫外单光子电离技术，开

发复合软电离源，实现 ppt 级高灵敏度检测；首创非放射性离子源离子迁移谱仪，替代传统放射源，解决安全监管难题；推进微型化与高分辨设计，质量分辨率达国际领先水平；技术适配多场景：如时间分辨热闪蒸进样用于白酒风险物快检、分层热解析用于血药浓度分析等。高灵敏的质谱探测器亦是 CBRN 检测的重要手段。

邀请报告 3:

极端环境化学测量仪器 / 传感器

报告人：耿旭辉 研究员

单　位：大连化物所

面向载人航天、深海探测等国家重大需求，开展极端环境化学测量仪器与传感器创新研究，攻克高灵敏度、高精度及环境适应性等关键技术难题。空间站气相色谱仪：突破超低功耗色谱柱加热、抗氧化检测器等关键技术，体积 / 功耗 / 重量仅为国际同类 50%，实现免维护在轨运行；深海原位仪器：首台 4500 米级气相色谱 – 质谱联用仪，攻克耐压、在线除水等瓶颈，填补深海原位分析空白；微光探测器：通过电路优化设计，信噪比提升 2 个数量级，替代进口光电倍增管；系列传感器：如荧光传感器（叶绿素、原油溢油等）、毒剂探测器，性能达国际领先。技术成果涵盖微型气相色谱、高灵敏光学检测、特种气体传感及样品前处 理技术，应用于航天舱内监测、深海能源勘探等领域，支撑国家战略安全。

邀请报告 4:

面向 CBRN 的电化学传感技术

报告人：卢宪波 研究员

单　位：大连化物所

聚焦 CBRN 检测挑战，面向环境监测与生命健康，开发具备快速、便携、低成本优势的电化学传感器。首创高稳定性酶单分子纳米胶囊传感器，突破热 / 溶剂耐受瓶颈；引入导电 COFs、MOFs 等纳米材料，利用协同催化机制提升灵敏度（检出限达 ppt 级）；丝网印刷工艺制备可抛型传感器芯片，实现批量化生产与多目标检测；创新柔性传感器（如鱼载水凝胶传感器），可实时监测水生生物心跳、温度等健康指标。技术体系涵盖有机磷农药 / 战剂快检、霉菌毒素多目标检测及柔性传感应用，服务于应急监测、粮食安全等领域。

邀请报告 5:

微型储能与传感集成系统设计构筑

报告人：师晓宇 研究员

单　位：大连化物所

聚焦物联网与可穿戴设备需求，设计微型储能与传感一体化系统，实现小型化、柔性化及自供电功能。二维传感创新：开发双介孔聚吡咯 / 石墨烯、单原子负载石墨烯传感材料，显著提升气体传感响应性（如氨气检测限达 ppm 级）；集成技术突破：构建平面微型超级电容器 – 气体传感微系统，实现储能与传感深度融合与协同工作；柔性传感平台：研制无线充电 – 应变传感系统，利用

MXene 材料实现无缝集成，并在 500% 拉伸下保持信号稳定；材料制造工艺：采用光刻微加工、3D 打印等技术，实现高精度、可延展的柔性器件制备。技术成果涵盖二维材料设计、微型器件构筑（如自驱动双通道气体传感系统、多能耦合微系统），推动其在健康监测、环境检测等应用场景。

邀请报告 6:

面向 CBRN 探测与处置的特种机器人技术

报告人：王挺 研究员

单　位：沈阳自动化所

聚焦 CBRN（化学、生物、放射、核）威胁应对，研发特种机器人技术以替代人工执行高风险环境下的探测与处置任务。针对狭小空间气味寻源难题，提出触嗅融合的贝叶斯估计算法与灯丝扩散模型，实现复杂气流条件下的危险源精准定位；开发开阔空间视－嗅协同技术体系，结合多光谱“鹰眼视觉”与 4D 语义地图，提升广域危险源识别与溯源能力；创新沉浸式遥操作系统，集成力反馈机械臂与高机动性作业工具，增强远距离临场操作精度。相关成果已应用于核生化监测、废墟生命探测等场景，显著提升应急救援效率与人员安全。

第三轮讨论：

◇ CBRN 的范围到底涵盖哪些？

CBRN 的精确范畴涵盖与国防安全直接相关的领域，包括军工毒气、生物武器、化学毒剂、辐射污染、核污染等，对上述风险源的快速预警与检测是国家现代军事能力的重要支撑；广义而言，CBRN 还延伸至公共安全领域，包括爆炸物、工业毒气、细菌病毒、农药投毒等，对其快速检测是保障人民生命财产安全的关键。相应的侦测体系可覆盖多种技术路线，包括离子迁移谱、质谱、红外、拉曼、各类传感器，以及盖格计数器等多模态探测（传感）侦测手段。

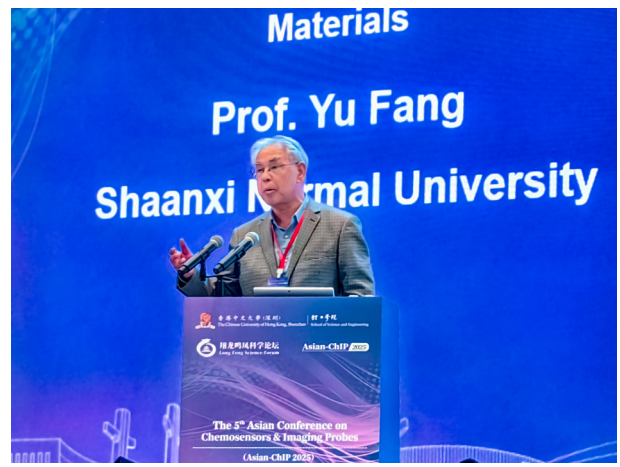
房喻院士出席第五届亚洲化学传感器与成像探针会议并作报告

Fang Yu speaks at Fifth Asian Conference on Chemosensors and Imaging Probes

2025 年 10 月 18 日，房喻院士应邀赴香港中文大学（深圳）出席翔龙鸣凤科学论坛之传感前沿研讨会·第五届亚洲化学传感与成像探针学术会议（Asian-ChIP 2025），并作题为“传感器驱动的分子材料创新”的报告。

此次会议由香港中文大学（深圳）理工学院、广东省高等学校聚集体科学基础研究卓越中心、深圳大学主办。

亚洲化学传感与成像探针学术会议作为本领域的高水平国际学术会议，自 2015 年以来已在首尔、北京、阿姆利则等地成功举办四届，广受学界与产业界的高度认可。



On October 18, 2025, Prof. Fang Yu was invited to attend the Sensing Frontiers Symposium of the Long Feng Science Forum and the 5th Asian Conference on Chemosensors and Imaging Probes (Asian-ChIP 2025) at The Chinese University

of Hong Kong, Shenzhen, and delivered a presentation titled "Sensor-Driven Innovation in Molecular Materials".

The conference is jointly organized by the School of Science and Engineering at The Chinese University of Hong Kong, Shenzhen, Guangdong Basic Research Center of Excellence for Aggregate Science, and Shenzhen University.

The Asian Conference on Chemical Sensing and Imaging Probes, as a high-level international academic conference in this field, has been successfully held four times since 2015 in Seoul, Beijing, and Amritsar, garnering widespread recognition from both academia and industry.

房喻院士出席 UltrafastX 2025 国际会议并作报告

Fang Yu speaks at UltrafastX 2025

2025 年 10 月 24 日，房喻院士应邀赴厦门出席第三届 UltrafastX 国际会议并作题为“传感器驱动的荧光材料创新”的大会报告，分享了薄膜荧光传感的最新研究进展与成果。

本次会议以搭建超快科学领域国际交流平台为宗旨，聚焦学术前沿、技术创新与产业发展，吸引来自十余个国家的三百余名专家学者参会。

会议由中国科学院西安光机所、北京大学、中国科学院物理研究所、厦门大学、陕西省光学学会主办，Ultrafast Science、《光子学报》、iOptics、超快光科学与技术全国重点实验室、阿秒科学与技术研究中心，中国科学院物理研究所超快物质科学中心、厦门大学萨本栋微米纳米科学技术研究院、福建省光学学会承办。

On October 24, 2025, Prof. Fang Yu was invited to attend the 3rd International Conference on UltrafastX (UltrafastX 2025) in Xiamen and delivered a plenary report titled "Sensors-Driven Innovation in Fluorescent Materials", sharing the latest research progress and achievements in film-based fluorescence sensing.

The conference aims to establish an international exchange platform in the field of ultrafast science, focusing on academic frontiers, technological innovation, and industrial development, which attracted over 300 experts and scholars from more than

ten countries.

The conference was hosted by the Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences; Peking University; the Institute of Physics, Chinese Academy of Sciences; Xiamen University; and the Shaanxi Optical Society. It is organized by Ultrafast Science, the Chinese Journal of Photonics, iOptics, the State Key Laboratory of Ultrafast Optics Science and Technology, the Research Center for Attosecond Science and Technology, the Center for Ultrafast Matter Science at the Institute of Physics, Chinese Academy of Sciences, the Pen-Tung Sah Institute of Micro-Nano Science and Technology at Xiamen University, and the Fujian Optical Society.

房喻院士出席中国化学会第九届全国卟啉、酞菁及相关材料学术研讨会暨第三届亚洲卟啉、酞菁及相关材料学术会议

Fang Yu attends 9th National Conference on Porphyrins, Phthalocyanines, and Related Materials (NCPP-9) and 3rd Asian Conference on Porphyrins, Phthalocyanines, and Related Materials (ACPP-3)

2025 年 10 月 26 日，房喻院士应邀出席中国化学会第九届全国卟啉、酞菁及相关材料学术研讨会（NCPP–9）暨第三届亚洲卟啉、酞菁及相关材料学术会议（ACPP–3）闭幕式，并与大会主席姜建壮教授及曹睿教授共同主持大会报告。

陕西师范大学新概念传感器与分子材料研究院彭浩南教授、刘太宏副

教授、薄鑫副研究员参会并分别作了题为“荧光功能分子动态组装、器件化及气相传感应用”“激发态动力学调控和双光子激发荧光”和“温和条件制备高效氮掺杂碱性电解水催化剂”的报告。

此次会议于 10 月 23 日至 26 日在西安举办，由中国化学会无机化学学科委员会和陕西师范大学联合主办，陕西师范大学化学化工学院承办。

中国科学院化学所李玉良院士、华东理工大学朱为宏院士及来自韩国、以色列、俄罗斯、德国、法国和美国的 11 位学者受邀作大会报告。

此外，来自中国、英国、韩国、以色列和日本的专家学者、陕西师范大学研究生及国际来华留学生 300 余人参会。

October 26, 2025, Prof. Fang Yu attended the closing ceremony of the 9th National Conference on Porphyrins, Phthalocyanines and Related Materials (NCPP-9) and the 3rd Asian Conference on Porphyrins, Phthalocyanines and Related Materials (ACPP-3), and co-chaired the plenary report session with conference chairs Prof. Jiang Jianzhuang and Prof. Cao Rui.

Prof. Peng Haonan, Assoc. Prof. Liu Taihong, and Assoc. Prof. Bo Xin from the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University attended the conference and presented reports titled “Dynamic Assembly, Device Integration, and Gas-Phase Sensing Applications of Fluorescent Functional Molecules”, “Excited-State Dynamics Regulation and Two-Photon-Excited Fluorescence” and “Mild-Conditional Preparation of the Efficient Nitrogen Doped Catalysts for Alkaline Water Electrolysis” respectively.

The conference held in Xi’an from October 23 to 26 was jointly hosted by the Inorganic Chemistry Discipline Committee of the Chinese Chemical Society and Shaanxi Normal University, and organized by the School of Chemistry and Chemical Engineering at Shaanxi Normal University.

Academician Li Yuliang from the Institute of Chemistry, Chinese Academy of Sciences, Academician Zhu Weihong from East China University of Science and Technology, and 11 scholars from South Korea, Israel, Russia, Germany, France, and the United States were invited to deliver plenary reports.

Additionally, over 300 participants attended the conference, including experts and scholars from China, the United Kingdom, South Korea, Israel, and Japan, as well as graduate students and international students from Shaanxi Normal University.

彭灵雅参加计算有机催化国际会议 2025

Peng Lingya attends International Conference on Computational Organic-synthesis Catalysis 2025

2025 年 10 月 24 日至 27 日，陕西师范大学新概念传感器与分子材料研究院彭灵雅老师参加了在广东省深圳市举行的 2025 计算有机催化国际会议，并获最佳墙报奖。

本次会议由南方科技大学化学系主办，北京大学深圳研究生院与南方科技大学深圳格拉布斯研究院协办。

From October 24 to 27, 2025, Dr. Peng Lingya from the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University attended the International Conference on Computational Organic-synthesis Catalysis (ICCOC2025) held in Shenzhen, Guangdong Province, and won the Best Poster Award.

The conference is hosted by the Department of Chemistry at Southern University of Science and Technology, and co-organized by Peking University Shenzhen Graduate School and SUSTech Shenzhen Grubbs Institute.

房喻院士做客赣南师范大学明湖讲坛

Fang Yu speaks at Minghu Forum of Ganzhou Normal University

2025 年 10 月 31 日下午，房喻院士应邀赴赣南师范大学做客明湖讲坛第 66 期，作题为《科学研究与人才培养——我的一些思考》的专题报告。

赣南师大党委副书记、校长陈义旺主持报告会，师生代表 300 余人听取了报告。

On October 31, 2025, Prof. Fang Yu was invited to deliver a special report titled “Scientific Research and Talent Cultivation: My Reflections” at the 66th Minghu Forum hosted by Ganzhou Normal University.

GNNU Party Committee deputy secretary and president Chen Yiwang presided over the event, which was attended by over 300 faculty members and students.

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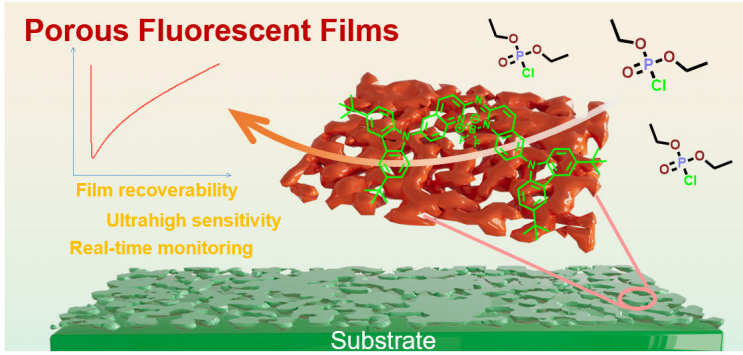
Steric hindrance-engineered porous fluorescent films for ultrafast and ultrasensitive detection of nerve agent simulants

Yuxuan Liu,†[a] Min Qiao,†[a] Jiali Liu,†[b] Gege Wang,[a] Siyue Wang,[a] Ruijuan Wen,[a] Yaxin Zhai,*[b] Liping Ding,*[a] Xiaolin Zhu*[a] and Yu Fang[a]

基于位阻工程的多孔荧光膜实现神经毒剂模拟物超灵敏快速检测

Yuxuan Liu,† Min Qiao,† Jiali Liu,† Gege Wang, Siyue Wang, Ruijuan Wen, Yaxin Zhai,* Liping Ding,* Xiaolin Zhu,* Yu Fang. Chem. Sci., 2025, 16, 16924-16935. DOI: 10.1039/d5sc05184c



神经毒剂（如沙林）因其剧毒性和对公共安全的潜在威胁，已成为国际防化领域的重要研究对象。这类有机磷化合物通过不可逆地抑制乙酰胆碱酯酶，导致神经递质乙酰胆碱异常积累，从而引发严重的神经功能紊乱。尽管《化学武器公约》已明确禁止此类武器，但新型毒剂变体的出现及其潜在的恐怖主义用途，使得开发高灵敏度、快速响应的现场检测技术成为迫切需求。

本研究设计了一种基于空间位阻工程的二氟化硼复合薄膜材料 BODIQU tBuCZ，用于神经毒剂模拟物 DCP 的超灵敏检测。通过策略性地引入大体积叔丁基基团，我们有效抑制了不利的 π … π 堆积行为，并构建出具有 38.76% 自由体积的多孔三维网络结构，实现了分析物的快速传输。综合结构与光谱分析验证了该设计原理及其对材料光物理性质和传感动力学的影响。所制备的 BODIQU tBuCZ 传感器表现出卓越性能：具备超低检测限、约 3 秒的超快响应时间，以及在超过 50 次测试循环中仍保持的显著稳定性。本研究提出了一种可推广的空间位阻工程策略，为构建高性能荧光薄膜提供了新途径，也为神经毒剂的实时监测提供了理想平台。

第一作者：陕西师范大学硕士研究生刘语轩、博士后乔敏，湖南师范大学硕士研究生刘家利

通讯作者：陕西师范大学朱晓林副研究员、丁立平教授，湖南师范大学翟亚新教授

全文链接：https://pubs.rsc.org/en/Content/ArticleLanding/2025/SC/D5SC05184C

Nerve agents such as sarin, with their high toxicity and public safety risks, are a major concern in chemical defense. These organophosphorus compounds irreversibly inhibit acetylcholinesterase, causing dangerous accumulation of acetylcholine and severe neurological failure. Despite their prohibition under the Chemical Weapons Convention, the ongoing threat of novel variants and potential terrorist use drives the urgent demand for highly sensitive, rapid-response detection systems.

Here, we report a steric-hindrance-

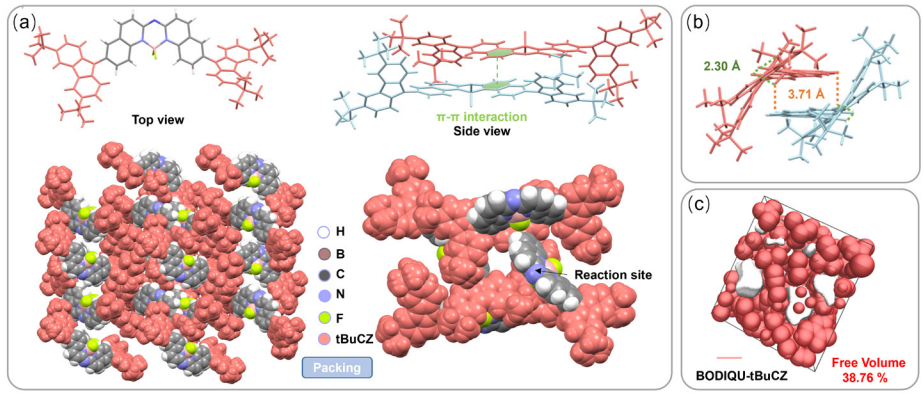


图 1. BODIQU−tBuCZ 分子的单晶结构表征

Figure 1. Single crystal structure characterization of the BODIQU-tBuCZ

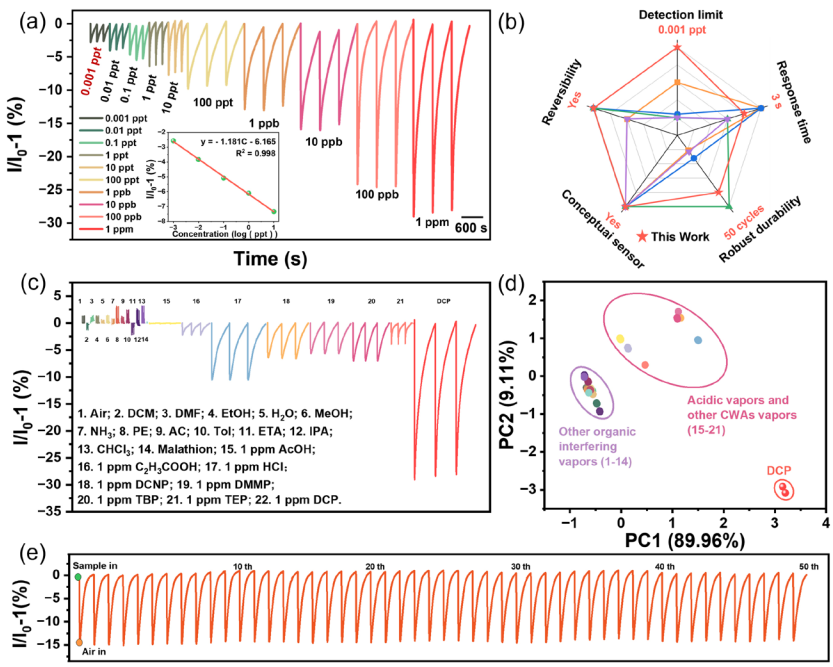


图 2. BODIQU−tBuCZ 薄膜传感测试结果分析

Figure 2. Sensing performance of BODIQU-tBuCZ films

engineered boron difluoride composite film (BODIQU-tBuCZ) for ultrasensitive detection of the nerve agent simulant DCP. By strategically incorporating bulky tert-butyl groups, we suppressed π-π stacking and constructed a porous 3D network with 38.76% free volume, which facilitates rapid analyte diffusion. Structural and spectroscopic studies validated our design strategy and its effect on photophysical properties and sensing kinetics. The developed sensor achieves an ultra-low detection limit, a ~3-second response, and robust stability for over 50 cycles. This work establishes a generalizable steric hindrance engineering approach for creating high-performance fluorescent films, providing a promising platform for real-time nerve agent monitoring.

First Authors: Liu Yuxuan, master's student, Qiao Min, postdoctoral researcher, Shaanxi Normal University; Liu Jiali, master's student, Hunan Normal University

Correspondence Authors: A/Prof. Zhu Xiaolin, Prof. Ding Liping, Shaanxi Normal University; Prof. Zhai Yaxin, Hunan Normal University

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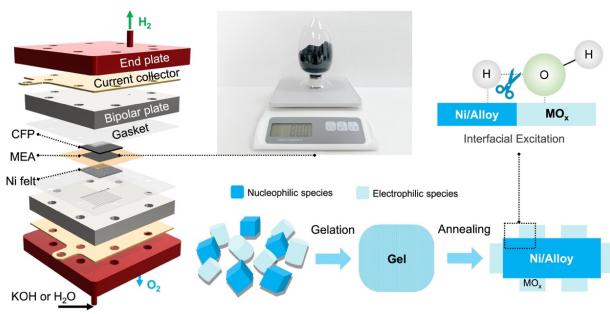
Gram-scale synthesis of N-NiMo/MoO_2 heterostructures to boost hydrogen evolution in low-alkalinity anion exchange membrane water electrolysis

Yu Sun [a,b,1], Manman Qi [c,1], Xin Tan [d,*,1], Shiyi Tao [a], Chen Jia [b], Yachao Zeng [c], Yulian Zhao [a], Kaiqiang Liu [a], Sean C. Smith [e], Lingxing Zan [f], Somnath Mukherjee [a], Kamran Dastafkan [b], Zenglin Wang [a], Yi Ma [a,*], Xin Bo [a,*], Chuan Zhao [b,*]

绿色宏量制备非均相析氢催化剂

Yu Sun1,2, #, Manman Qi3, #, Xin Tan4, #, *, Shiyi Tao1, Chen Jia2, Yachao Zeng3, Yulian Zhao1, Kaiqiang Liu1, Sean C. Smith5, Lingxing Zan6, Somnath Mukherjee1, Kamran Dastafkan2, Zenglin Wang1, Yi Ma1, *, Xin Bo1, *, and Chuan Zhao2, *, Nano Energy, 2025, 146, 111489. DOI: 10.1016/j.nanoen.2025.111489



阴离子交换膜电解水技术为绿色氢气生产提供了一种实用途径。然而，碱性介质中的阴极析氢反应仍因缺乏非贵金属基高效催化剂而难以实现工业化。本研究通过凝胶法合成了一种异质结构催化剂，该催化剂结合了亲核与亲氧组分，可促进水解离并增强析氢催化性能，其特点在于 N 掺杂 NiMo 合金与 MoO_2 颗粒间形成了丰富的界面。该异质结构催化剂在碱、中性介质中展现出卓越的析氢反应活性，与 60% 铂碳催化剂相当，能够实现 >1 A cm^{-2} 的高电流密度并保持长期稳定性。通过 AEMWE 模拟显示，即使在稀释的 0.1 M KOH 电解质中，以 1 A cm^{-2} 电流密度时电池电压仍低至 1.87 V。密度泛函理论计算证实了界面激发机制：MoO_2 团簇与氮掺杂 NiMo 合金协同作用，促进水分解并优化 *H 吸附，从而加速氢析出动力学。本研究为规模化制备高性能、非贵金属基电催化剂提供了实用方案，适用于阴离子交换膜电解水制氢的实际应用。

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通讯作者：陕西师范大学马艺副教授和薄鑫副研究员，澳大利亚新南威尔士大学赵川院士

全文链接：https://doi.org/10.1016/j.nanoen.2025.111489

Anion exchange membrane water electrolysis (AEMWE) presents a practical approach for green H_2 production. However, the cathodic hydrogen evolution reaction (HER) in basic media is still sluggish as the lack of the cost-efficient catalysts for further industrialization. Here, the heterostructured catalysts combining nucleophilic and oxophilic components facilitate water dissociation and enhance HER and synthesized via a facile gel-route, featuring abundant interfaces between N-doped NiMo alloy and MoO_2 particles. The heterostructured catalyst exhibits exceptional HER activity comparable to 60%PtC catalysts in basic media (pH = 7~14), delivering high current densities of >1 A cm^{-2} with long-term durability. AEMWE simulation demonstrates a low cell voltage of 1.87 V at 1 A cm^{-2}, even with dilute 0.1 M KOH electrolyte. DFT calculations support the interfacial excitation that MoO_2 clusters and N-doped NiMo alloy act synergistically to facilitate water dissociation and optimize *H binding, thereby accelerating hydrogen evolution kinetics. This work offers a practical approach for scalable fabrication of high performance, nonprecious-metal-based electrocatalysts for real application of AEMWE.

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Corresponding Authors: A/Prof. Ma Yi and A/Prof. Bo Xin, Shaanxi Normal University; Prof. Zhao Chuan, University of New South Wales

Full Text Link: https://doi.org/10.1016/j.nanoen.2025.111489

ADVANCED OPTICAL MATERIALS

Research Article | Full Access

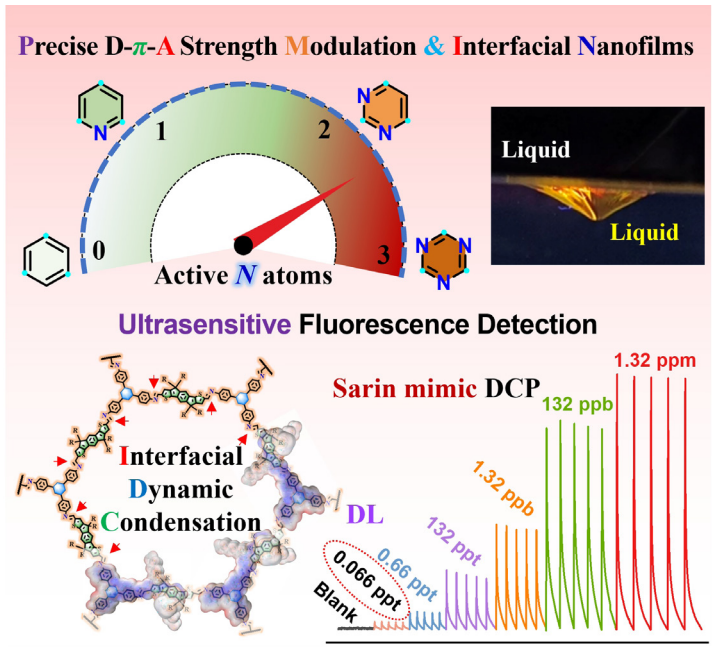
Precise Donor-π-Acceptor Strength Modulation in Interfacial Nanofilms Toward Ultrasensitive Fluorescence Detection

Jinghua Yu, Haixia Chang, Wendan Luo, Liping Ding, Taihong Liu, Yu Fang

First published: 23 October 2025 | https://doi.org/10.1002/adom.202502848

精准调控界面纳米膜中推拉电子强度实现超灵敏荧光检测

Jinghua Yu, Haixia Chang, Wendan Luo, Liping Ding,* Taihong Liu,* and Yu Fang. Adv. Optical Mater. 2025, e02848. DOI: https://doi.org/10.1002/adom.202502848



二维共价有机框架材料（2D COFs）因其可调控的孔道结构和电子性能，在传感、催化、光电器件等领域展现出广阔前景。然而，由于分子内旋转、分子内振动以及较强的分子间 π－π 相互作用，大多数二维共价有机框架材料在固态时呈现弱发光甚至不发光的状态。因此，精确调控界面纳米膜中 D–π–A 推拉电子强度以实现高性能荧光传感仍然是一个重大挑战。

本工作选用具有强给电子能力的茚并二噻吩（IDT）作为电子给体，与具有不同氮原子数量的杂环三苯胺类电子受体（TAPB、TAPP、TAPM 和 TAPT），通过液－液界面席夫碱型动态缩合策略，基于成功制备了四种纳米薄膜（IDT–TAPB、IDT–TAPP、IDT–TAPM 和 IDT–TAPT）。该类薄膜具有结构均一、表面光滑、厚度可调等特点，且通过调节受体中氮原子的数量，实现了对分子内 D–π–A 强度的原子级精准调控，进而影响纳米薄膜材料的能级结构分布、分子内电荷转移（ICT）效率和荧光性能等。实验与理论计算表明，IDT–TAPM 纳米薄膜因其中心嘧啶环结构具有较强的电子亲和性与质子结合能力，在接触沙林模拟物氯磷酸二乙酯（DCP）气体时表现出显著的荧光增强与光谱红移。

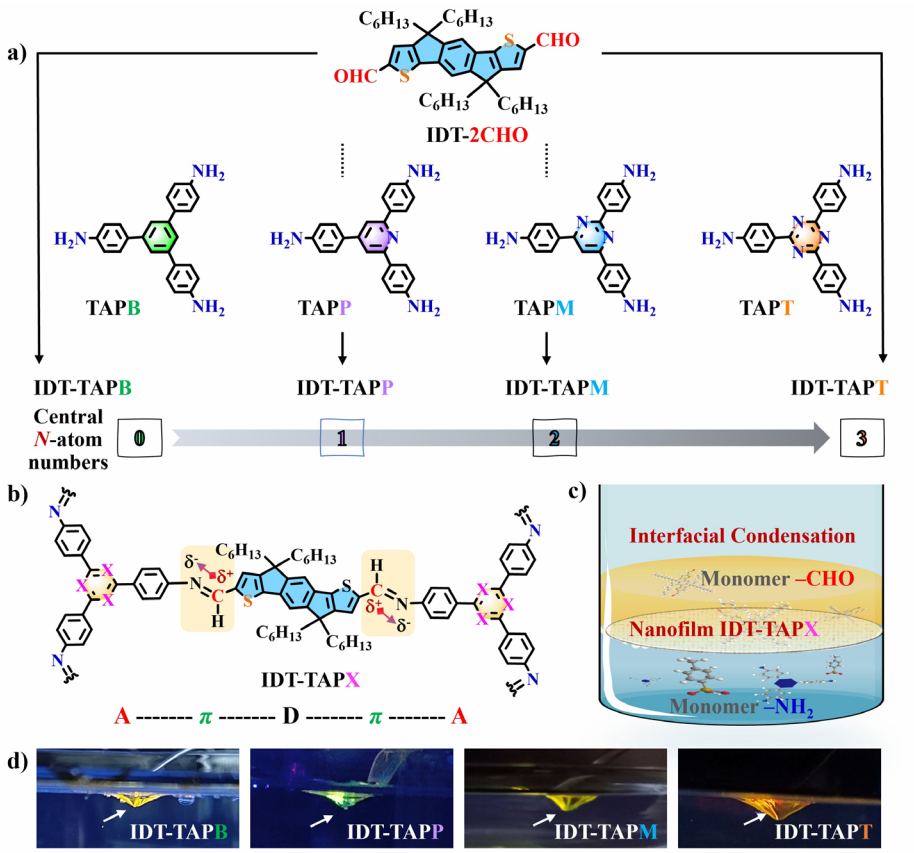


图 1. a）组装单体的分子结构和四种纳米薄膜的结构示意图；b）分子骨架中不同的 D–π–A 强度特征分析；c）基于液 – 液界面缩合策略制备纳米薄膜；d）紫外光照射下四种纳米薄膜漂浮在水面上的光学图片

Figure 1. a) Molecular structures of the monomers and schematic description of the four nanofilms, b) Different D-π-A strength properties along the molecular skeletons, c) Schematic description for preparing the nanofilms based on the liquid-liquid interfacial condensation strategy. d) Photographs of the as-fabricated four nanofilms floating on the water surface under UV light.

结合实验室叠层式薄膜传感器研制，IDT–TAPM 纳米薄膜传感器对 DCP 气体表现出响应快速（响应时间小于 3 s）、检测范围宽（DCP 浓度范围 0.1 ppb – 132 ppm）和检测限极低（检出限约为 0.066 ppt），远低于沙林毒剂的立即危及生命健康浓度（7 ppb）。此外，IDT–TAPM 纳米薄膜传感器在 55 次循环使用后仍保持稳定，表现出良好的光化学稳定性与重复使用性。

该工作不仅提出了一种通过调控界面纳米薄膜分子内 D–π–A 强度以实现荧光开启和超灵敏荧光检测的新策略，也为开发具备 SWaP–C 特点的新一代化学战剂检测设备奠定了材料与器件基础。

第一作者：陕西师范大学博士研究生于敬华
通讯作者：陕西师范大学刘太宏副教授、丁立平教授
全文链接：https://doi.org/10.1002/adom.202502848

Two-dimensional covalent organic framework materials (2D COFs) have shown broad prospects in the fields of sensing, catalysis, and optoelectronic devices due to their adjustable pore structure and electronic properties. However, a majority of COFs are non-emissive or weakly emissive in the solid state owing to the intramolecular rotation and vibration together with strong π-π interactions. Therefore, achieving precise donor-π-acceptor (D-π-A) strength modulation for high-performance fluorescence sensing remains a significant challenge.

In this work, four fluorescent nanofilms IDT-TAPB, IDT-TAPP, IDT-TAPM and IDT-TAPT were successfully prepared via the Schiff-base condensation reaction of 4,4,9,9-tetrahexyl-4,9-dihydro-s-indaceno[1,2-b:5,6-b']dithiophene-2,7-dicarbaldehyde (IDT-2CHO) and one of the heterocyclic triphenyl-amines with different nitrogen atoms, namely 1,3,5-tris(4-aminophenyl)-benzene (TAPB), 4,4',4''-(pyridine-2,4,6-triyl) trianiline (TAPP), 4,4',4''-(pyrimidine-2,4,6-triyl)trianiline (TAPM), and 2,4,6-tris(4-aminophenyl)-1,3,5-triazine (TAPT) under liquid-liquid interfacial condition. Four nanofilms showed the uniform structure, smooth surface,

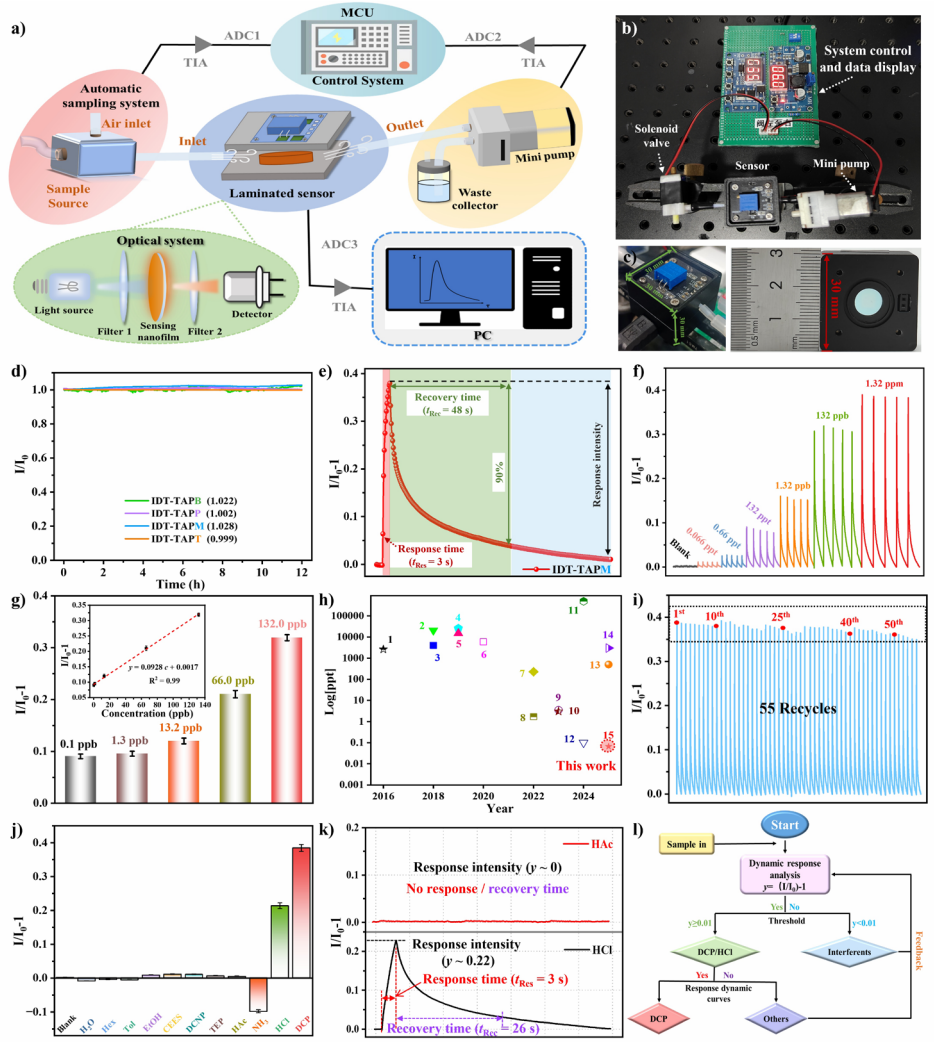


图 2. 基于叠层式薄膜荧光传感器平台的传感测试结果分析

Figure 2. Sensing performance analysis based on the laminated sensor platform

adjustable thickness and different D-π-A strength. Through incorporating diverse electron-withdrawing acceptors, an atomically precise approach was demonstrated to tune D-π-A strength, which affected the energy level structure, intramolecular charge transfer (ICT) efficiency and fluorescence performance of the nanofilms. The experimental and theoretical calculations showed that the IDT-TAPM nanofilm had the strongest electron affinity and proton binding ability due to its central pyrimidine ring structure, and exhibited the most significant fluorescence enhancement and red shift when exposed to DCP vapor, which was an optimal sensing material. In the test of the laminated sensor based on the nanofilm, IDT-TAPM nanofilms showed fast response to DCP (fluorescence "turn on" within 3 s), wide detection range (0.1 ppb-132 ppm) and low detection limit (0.066 ppt), significantly lower than the Immediately Dangerous to Life and Health (IDLH) level of sarin. In addition, IDT-TAPM nanofilms remained stable over 55 cycles, with excellent photochemical stability and reversibility.

This study presented a novel strategy for enabling turn-on, ultrasensitive fluorescence detection through precise D-π-A modulation in interfacial nanofilms, thereby paving the way for next-generation, portable detectors with high reliability for chemical warfare agents. These sensing nanofilms hold significant potential for broad applications in military protection, environmental surveillance, and public safety.

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浙江大学马光中研究员应邀作报告

Researcher Ma Guangzhong from Zhejiang University invited to give a report

2025 年 10 月 14 日下午，浙江大学马光中研究员应邀来新概念传感器与分子材料研究院访问，并作题为“非标记化学显微成像”的学术报告。

马光中研究员的报告聚焦化学反应的可视化研究中近年来发展的非标记成像技术，从技术原理出发，介绍基于散射、反射和干涉的非标记成像技术，并介绍了其课题组在该领域的研究，包括化学 / 电化学成像及生物传感方面的进展。

报告会由彭浩南教授主持，研究院师生 40 余人参加了报告会。

On October 14, 2025, Researcher Ma Guangzhong from Zhejiang University was invited to visit the Institute of New Concept Sensors and Molecular Materials and presented a report titled “Label-Free Chemical Microscopy”.

Ma’s presentation focused on label-free imaging techniques—a rapidly evolving field in chemical reaction visualization. Beginning with fundamental principles, he introduced label-free imaging technologies based on scattering, reflection, and interference, and outlined his group’s contributions in this domain, including advancements in chemical/electrochemical imaging and biosensing.

The session was hosted by Prof. Peng Haonan, with over 40 faculty members and students from the institute in attendance.

西咸新区泾河新城第三学校师生来院科普参观学习

Xixian New Area Jinghe New City No. 3 School teachers and students received for science popularization tour

2025 年 10 月 17 日上午，西安市西咸新区泾河新城第三学校七年级四个班学生和老师共 160 余人来到新概念传感器与分子材料研究院进行科普参观学习，感受科技魅力，感悟科学风采。

研发工程师罗艳彦向同学们介绍了研究院基本情况、科研团队、科研概况和发展理念，带领他们参观了研究院成果展厅，讲解了传感器技术在环境监测、医疗健康、国防安全等领域的重要作用，以及房喻院士团队研发的爆炸物探测仪、毒品探测仪等科研成果转化产品。

On October 17, 2025, Over 160 students and teachers from four seventh-grade classes at Jinghe New City No. 3 School in Xixian New Area, Xi'an, visited the Institute of New Concept Sensors and Molecular Materials for a science popularization tour to feel the charm of science and technology.

Research and Development Engineer Luo Yanyan introduced the basic situation, research team, research overview and development concept of the institute to the students, led them to visit the institute's achievements exhibition hall and laboratory, explained the important role of sensor technology in environmental monitoring, medical health, national defense, public security and other fields, and the products such as explosive detection device and illicit drug detection device transformed from the research results developed by Prof. Fang Yu's group.

中山大学巢晖教授应邀作报告

Prof. Chao Hui from Sun Yat-sen University invited to give a report

2025 年 10 月 22 日下午，中山大学巢晖教授应邀到访陕西师范大学新概念传感器与分子材料研究院，并作题为“金属配合物抗肿瘤研究”的学术报告。

巢晖教授的报告聚焦金属配合物在抗癌药物研究领域取得的突破性进展。针对外源性金属配合物普遍存在的难靶向、难摄取等问题，巢晖教授团队在金属配合物，尤其在铂系金属（如钌、铱）配合物的研究中，通过巧妙的分子设计和光物理性质调控，实现了对肿瘤细胞内不同细胞器的靶向富集和特异性杀伤。此外，他们利用金属配合物丰富的光物理和化学催化性质，开发了具有光动力治疗功能的新型双光子诊疗试剂。在交流环节，巢晖教授与在场师生就相关科学问题及临床应用问题进行了探讨。

报告会由刘太宏副教授主持，研究院师生 40 余人参加了报告会。

On October 22, 2025, Prof. Chao Hui from Sun Yat-Sen University was invited to visit the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University, and presented a report titled “Anti-tumor Research of Metal Complexes”.

Prof. Chao's presentation focused on the breakthrough of metal complexes in the field of anticancer drug research. Addressing common challenges such as poor targeting and low cellular uptake of exogenous metal complexes, Chao's team have achieved targeted enrichment and specific killing of different organelles in tumor cells through ingenious molecular design and photophysical property regulation in the study of metal complexes, especially platinum-based metal (such as ruthenium and iridium) complexes. Furthermore, leveraging the rich photophysical and chemical catalytic properties of metal complexes, they developed novel two-photon theranostic agents with photodynamic therapy capabilities. During the discussion session, Prof. Chao engaged in exchanges with faculty and students on related scientific issues and clinical applications.

The report was chaired by Assoc. Prof. Liu Taihong, with over 40 faculty members and students from the institute in attendance.

中国科学院化学所李玉良院士来访

Academician Li Yuliang from CAS Institute of Chemistry received

2025 年 10 月 24 日上午，中国科学院化学研究所李玉良院士一行到访陕西师范大学新概念传感器与分子材料研究院。副院长丁立平教授带领李玉良院士和福建师范大学张章静教授参观了研究院综合展厅，介绍了研究院的基本情况、发展理念、科研方向、技术优势、研究成果等，并与陕师大化学化工学院党委书记高玲香教授一起与李院士一行进行了交流座谈。

On October 24, 2025, Academician Li Yuliang from the Institute of Chemistry, Chinese Academy of Sciences visited the Institute of New Concept Sensors and Molecular Materials at Shaanxi Normal University. INCSMM vice dean Prof. Ding Liping led Academician Li and Prof. Zhang Zhangjing from Fujian Normal University on a tour of the exhibition room, introducing the institute's basic profile, development philosophy, research directions, technological strengths, and research achievements. Subsequently, Prof. Gao Lingxiang, Party Secretary of SNNU School of Chemistry and Chemical Engineering, joined the guests for an exchange and discussion session.

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