陕西师范大学 SHAANXI NORMAL UNIVERSITY

化学化工学院 School of Chemistry & Chemical Engineering

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光子鼻与分子材料团队 简 报

Photonic Nose and Molecular Materials Group Newsletter

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房喻院士出席榆林学院（绥德师范）建校 100 周年学术论坛并作主旨报告

Fang Yu delivers keynote speech at 100th anniversary forum of Yulin College (Suide Normal School)

2023 年 5 月 3 日，房喻院士出席榆林学院（绥德师范）建校 100 周年学术论坛——能源与生态高端论坛，并作题为《基础科学的重要性—以化学学科为例》的主旨报告。

在报告中，房喻院士在简要介绍基础科学的重要性、化学学科发展简史的基础上，从双碳目标、粮食安全、生命健康等角度阐述了化学学科的地位和作用，指出化学学科发展未来要涉猎的领域和问题，进而介绍了目前全世界传感器领域产业产值、市场占有情况、可能遇到的卡脖子危机等有关现状，以及敏感材料创制、机制研究和市场应用等情况。他强调，基础科学具有突出的源头创新作用，作为基础科学的重要组成部分，化学科学的基础性、渗透性、应用性决定了化学科学“既能顶天，又能立地”，决定了化学科学对国家现代化建设，对民族伟大复兴，对人类文明可持续发展所起到的无可替代的作用。

本次论坛由陕西省科学技术协会与榆林市人民政府主办，榆林学院承办，是榆林学院（绥德师范）建校 100 周年庆祝活动中最重要的学术活动之一，以能源高端化、低碳化、多元化利用和黄土高原生态修复、黄沙治理、黄河流域生态保护为主线进行研讨，共同探究能源与生态领域的基础理论、关键技术与创新应用，为推动榆林市能源高效利用和生态文明建设提供有力的理论支撑。

省内外有关院校、院所科研团队负责人，省市有关部门负责人，榆林学院校友与师生代表，省、市媒体代表 400 余人参加论坛。

On May 3, 2023, the Energy and Ecology High-end Forum was held as part of the 100th anniversary celebrations of Yulin College (Suide Normal School) and focused on the discussion of basic theories, key technologies, and innovative applications in the fields of energy and ecology, mainly exploring the efficient utilization of energy and ecological civilization construction to provide robust theoretical support.

In his speech titled “The Importance of Basic Science - The Example of the Chemical Discipline”, Academician Fang Yu briefly introduced the importance of basic science and the development history of the chemical discipline. He elaborated on the status and role of the chemical discipline from the perspectives of dual-carbon goals, food security, and health, and pointed out the areas and problems that the development of the chemical discipline would involve in the future. He further introduced the current situation of the global sensor industry's output, market shares, and potential bottlenecks, as well as the situation of sensitive material creation, mechanism research, and market applications. He stressed that basic science has an outstanding role in original innovation

and as a significant part of basic science, the fundamental, penetrating and practical nature of chemical science determine its irreplaceable role in the modernization of the country, the great rejuvenation of the nation, and sustainable development of human civilization.

The forum was hosted by the Shaanxi Association for Science and Technology and Yulin Municipal People's Government and organized by Yulin College. It is one of the most important academic activities in the 100th anniversary celebration of Yulin College (Suide Normal School), with over 400 attendees including leaders of relevant departments from provincial and municipal level, representatives of research teams from universities and institutions inside and outside the province, alumni and teachers and students representatives from Yulin College, and representatives of provincial and municipal media. The forum focused on the topics of high-end energy, low-carbon utilization, and multi-dimensional utilization, and the ecological restoration of the Loess Plateau, the treatment of desertification, and the ecological protection of the Yellow River Basin.

房喻院士为西安铁一中学生作报告

Fang Yu gives report to Xi'an Tieyi Middle School students

2023 年 5 月 10 日，中国科学院院士、西安市科协主席房喻教授应邀赴西安铁一中参加由西安市科协、西安广播电视台（集团）主办的“院士进校园”科普报告会活动，作题为《基础科学的重要性——以化学学科为例》的专题报告。

此次活动以线上、线下相结合的形式，在西安铁一中滨河高级中学、西安国际港务区铁一中陆港高级中学、陕西省西安中学、西安市经开第三中学、宜昌市第一中学、宜昌市夷陵中学 6 所学校设立分会场，进行直播。省、市科协，西安广播电视台（集团），碑林区有关领导参加。

房喻院士用形象生动的语言从基础科学的价值和化学学科的作用两个方面展开报告，他讲述了我国老一辈科学家科研报国的光荣传统；追求真理、勇攀高峰的科学精神；勇于创新、严谨求实的学术风气。他用科学家的故事激励学生，让大家领悟到科学家的崇高精神和优秀品质。

房喻院士讲到：“在我看来，化学学科的特征在于创造新物质、发现新功能、实现新应用，也就是说，化学学科能够，也应该做‘顶天立地’的研究。”房喻说，中国错过了前三

次工业革命，一定要抓住以大数据和人工智能为核心的第四次工业革命。报告中，他还向师生介绍了传感器的现状、未来以及他在传感器领域的研究成果。

房喻院士还勉励同学们继承弘扬好、实践好科学家精神，把个人理想和国家重大需求相结合，勇当新兴领域与交叉领域的开拓者、关键科技领域的领跑者，抢占世界科技发展的制高点，为民族复兴、国家繁荣进步作出更大贡献。

On May 10, 2023, Prof. Fang Yu, academician of the Chinese Academy of Sciences and chairman of the Xi'an Association for Science and Technology, was invited to Xi'an Tieyi Middle School to participate in the "Academicians Enter Campus" science popularization event hosted by Xi'an Science and Technology Association and Xi'an Radio and Television (Group), and gave a report titled "The Importance of Basic Science - Taking Chemistry as an Example".

The event was broadcast live in 6 schools, including Xi'an Tieyi Middle School Binhe High School, Xi'an International Port District Tieyi Zhonglugang High School, Shaanxi Xi'an Middle School, Xi'an Jingkai No. 3 Middle School, Yichang No. 1 Middle School, and Yichang Yiling Middle School. Officials of the provincial and municipal science and technology associations, Xi'an Radio and Television Station (Group), and Beilin District participated.

Fang Yu used vivid language to speak from two aspects of the value of basic science and the role of chemistry, and he talked about the glorious tradition of China's older generation of scientists in scientific research to serve the country; the scientific spirit of pursuing truth and bravely scaling the peak; and innovative, rigorous and realistic academic atmosphere. He used the stories of scientists to inspire students and let them realize the noble spirit and excellent qualities of scientists.

Fang Yu said, "In my opinion, the characteristics of chemistry discipline are to create new substances, discover new functions, and realize new applications, that is, chemistry can and should do research that 'stands firm on the ground and reach to the sky'." Fang Yu said that China missed the first three industrial revolutions and must seize the fourth one with big data and artificial intelligence as the core. In the report, he also introduced the current status and future of sensors and his research results in the field of sensors to teachers and students.

Fang Yu also encouraged the students to inherit, carry forward and practice the spirit of scientists, combine personal ideals with major national needs, bravely become pioneers in emerging fields and interdisciplinary fields, and leaders in key scientific and technological fields, seize the commanding heights of world scientific and technological development, and make greater contributions to national rejuvenation and national prosperity and progress.

房喻院士赴长安大学为研究生指导教师培训作报告

Fang Yu gives report for in-training postgraduate advisors at Chang'an University

2023 年 5 月 12 日下午，房喻院士应邀赴长安大学，在学术交流中心报告厅为研究生指导教师培训作了题为"科学和教育极端重要"的专题报告。

在报告中，房喻院士从习近平总书记在中共中央政治局第三次集体学习时强调切实加强基础研究，夯实科技自立自强根基的重要指示精神出发，结合世界发达国家对基础研究的重视程度及自己在化学领域的研究经历，强调了基础研究的重要性。

他从老一辈科学家的家国情怀谈到教育的重要性，教育对提高人民综合素质、促进人的全面发展、增强中华民族创新创造力、实现中华民族伟

大复兴具有决定性意义。

最后，他向研究生指导教师提出四点忠告：一是要学会欣赏，要习惯欣赏；二是要懂得尊重是做好教师、做好导师的前提；三是要习惯做跨界研究，习惯做合作研究；四是要切实实施全面教育，做有情怀的人。

On May 12, 2023, Prof. Fang Yu was invited to Chang'an University and gave a special report titled "Science and Education Are Extremely Important" for in-training postgraduate advisors in the lecture hall of the Academic Exchange Center.

Speaking from the spirit of the important instruction of General Secretary Xi Jinping during the third collective study of the Political Bureau of the CPC Central Committee, which emphasized the importance of effectively strengthening basic research and consolidating the foundation of scientific and technological self-reliance and self-improvement, Fang Yu underscored the importance of basic research in his report, using developed countries' emphasis on basic research and his own research experience in the field of chemistry as examples.

He talked about the importance of education from the patriotic sentiments of the old generation of scientists, and the decisive significance of education in improving the overall quality of people, promoting all-round human development, enhancing the innovation and creativity of the Chinese nation, and achieving the great rejuvenation of the Chinese nation.

Finally, he offered four pieces of advice to postgraduate advisors: firstly, learn to appreciate and get used to appreciating; secondly, understand that respect is a prerequisite for being a good teacher and mentor; thirdly, get used to doing interdisciplinary research and collaborative research; and fourthly, effectively implement holistic education and be a person with patriotic sentiments.

房喻院士参加深圳砺剑防卫公司股东会和董事会

Fang Yu attends shareholders and board meetings of Shenzhen SRED Company

2023 年 5 月 13 日，房喻院士参加深圳砺剑防卫技术有限公司 2022 年度股东会和第三届董事（监事）会第四次会议。会议审议并表决通过了深圳砺剑防卫技术有限公司 2022 年度董事会工作报告、2022 年度经营情况报告的议案和 2023 年经营发展计划的议案。

深圳砺剑防卫技术有限公司股东及股东代表常州神力电机股份有限公司副总经理兼董事会秘书蒋国峰，砺剑防务集团总裁吴曼，陕西师范大学资产经营有限责任公司总经理梁高全，砺剑防卫董事长蔡文斌，砺剑防卫董事、陕西师范大学新概念传感器与分子材料研究院办公室主任杨小刚列席会议。

房喻院士一行还参观了砺剑防卫公司展厅，了解公司最新产品的研发和生产情况。

On May 13, 2023, Prof. Fang Yu attended the 2022 annual shareholders' meeting and the fourth meeting of the third board of directors (supervisors)

of Shenzhen SRED Security and Surveillance Technology Co. Ltd. The meeting reviewed and voted on the proposals of 2022 annual report of the board of directors, 2022 annual report of operation and 2023 business development plan of the company.

Shareholders and shareholder representatives of Shenzhen SRED Security and Surveillance Technology Co. Ltd., including Jiang Guofeng, deputy general manager and secretary of the board of directors of Changzhou Shenli Electrical Machine Inc., Wu Man, president of SRED Security and Surveillance Group, Liang Gaoquan, general manager of Shaanxi Normal University Asset Management Co., Ltd., Cai Wenbin, chairman of SRED Security and Surveillance Group, Yang Xiaogang, SRED Security and Surveillance director and Administrative Office director of Shaanxi Normal University Institute of New Concept Sensors and Molecular Materials, attended the meeting.

Fang Yu and his colleagues also visited SRED Security and Surveillance's exhibition hall to learn about the development and production of the company's latest products.

房喻院士获颁爱丁堡仪器 50 周年友谊奖

Fang Yu receives Edinburgh Instruments 50th Anniversary Friendship Award

2023 年 5 月 20 日至 21 日，房喻院士参加了在广东珠海举办的爱丁堡仪器 2023 年分子光谱最新技术及应用研讨会，获颁“爱丁堡仪器 50 周年友谊奖”，并作为特邀代表在会议开幕式上作了题为“薄膜荧光传感器 –– 从敏感材料到硬件结构”的主旨学术报告。

与房喻院士一同获颁 50 周年友谊奖的还有中国科学院理化技术研究所李嫕研究员、南京大学电子科学与工程学院陈健教授。

爱丁堡仪器公司是主要从事光谱，特别是荧光光谱技术与仪器研发的专门公司，在全球享有盛誉。早在

英国留学期间，房喻院士就在兰卡斯特大学高分子中心和英国达斯伯里同步辐射光源开始使用该公司生产的、全球差不多最早的，以 199 为代号的单光子计数荧光光谱仪。

几十年来，房喻院士以各种静态和时间分辨荧光技术为主要手段开展有机分子和有机分子系统的光物理基础与应用研究，发展的薄膜荧光传感器技术入选国际纯粹与应用化学联合会（IUPAC）2022 年度十大化学新兴技术。

From May 20 to 21, 2023, Prof. Fang Yu attended the Edinburgh Instruments 2023 Latest Technologies and Applications Conference of Molecular Spectroscopy in Zhuhai, Guangdong, and was awarded the 50th Anniversary Friendship Award by Edinburgh Instruments.

He was invited to give a keynote speech titled Film-based Fluorescent Sensors - From Sensing Materials to Hardware Structures at the opening ceremony of the conference.

The Award was also presented to Prof. Li Yi of the Institute of Physical and Chemical Technology of the Chinese Academy of Sciences, and Prof. Chen Jian of the School of Electronic Science and Engineering of Nanjing University.

Edinburgh Instruments is a company specializing in the development of spectroscopy, particularly fluorescence spectroscopy techniques and instruments, and is reputed worldwide. As early as during his study in the UK, Fang Yu started using Edinburgh Instruments' single photon counting fluorescence spectrometer, which was codenamed 199 and was almost the earliest in the world, at the Lancaster University Polymer Center and the Synchrotron Radiation Facility (SRF) at Daresbury.

For decades, Fang Yu has been conducting fundamental and applied research on the photophysics of organic molecules and organic molecular systems using various static and time-resolved fluorescence techniques as the main methods, and the film-based fluorescent sensor technology he developed was selected as one of the 2022 top ten emerging technologies in chemistry by the International Union of Pure and Applied Chemistry (IUPAC).

团队师生参加中国化学会第 9 届全国多酸化学学术研讨会

Fang Croup teachers and students participate in CCS 9th National Polyacid Chemistry Symposium

2023 年 5 月 24 日至 27 日，光子鼻与分子材料团队刘凯强教授、薛东旭教授、刘忠山副研究员、研究生苏雅娇、牛丽、孙中文参加了在吉林省长春市召开的可持续能源材料交叉论坛：中国化学会第 9 届全国多酸化学学术研讨会和第 5 届全国有机多孔材料学术研讨会。

研讨会由中国化学会无机化学学科委员会、东北师范大学、中国民主同盟吉林省委员会联合主办，多酸与网格材料化学教育部重点实验室承办。

在研讨会上，刘凯强教授作了题为“分子凝胶中的限域结晶”的邀请报告，薛东旭教授作了题为“新型金属有机骨架材料的调控合成和气体存储与分离”的邀请

报告，刘忠山副研究员作了题为“共价有机框架成型新策略”的口头报告。研究生苏雅娇作了题为“多级孔共价有机框架整体材料的制备”的墙报展示，并获评“优秀墙报奖”。

From May 24 to 27, 2023, Prof. Liu Kaiqiang, Prof. Xue Dongxu, Assoc. Prof. Liu Zhongshan and graduate students Su Yajiao, Niu Li and Sun Zhongwen from the Photonic Nose and Molecular Materials Group participated in the Sustainable Energy Materials Interdisciplinary Forum: the Chinese Chemical Society 9th National Polyacid Chemistry Symposium and the 5th National Organic Porous Materials Symposium held in Changchun, Jilin Province.

The symposium was co-sponsored by CCS's Inorganic Chemistry Committee, Northeast Normal University, Jilin Provincial Committee of the China Democratic League, and organized by the Ministry of Education Key Laboratory of Polyacid and Grid Materials Chemistry.

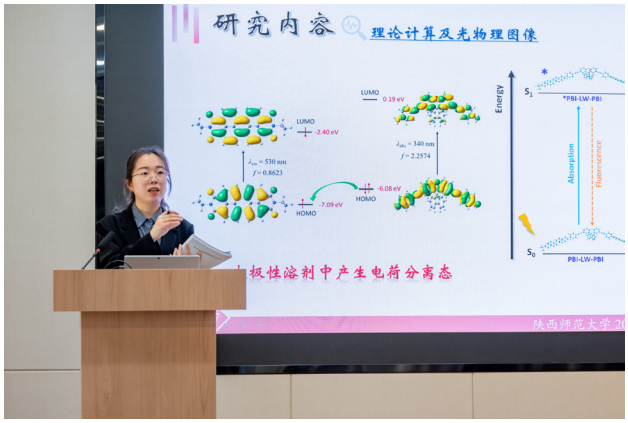
At the symposium, Liu Kaiqiang gave an invited report titled Confined Crystallization in Molecular Gels, Xue Dongxu gave an invited report titled Regulatory Synthesis and Gas Storage and Separation of New Metal-Organic Framework Materials, and Liu Zhongshan gave an oral report titled New Strategy for Covalent Organic Framework Molding. Su Yajiao gave a poster presentation titled Preparation of Multi-level Pore Covalent Organic Framework Integral Materials and won the Excellent Poster Award.

2023 届研究生通过毕业论文答辩

Class of 2023 graduate students pass dissertation and thesis defense

5 月 30 日下午，光子鼻与分子材料研究团队 2023 届 4 名博士研究生和 18 名硕士研究生分四组在致知楼和新概念传感器与分子材料研究院完成了论文答辩。

徐文君、李敏、乔敏和周德霞四位博士研究生分别进行了题为“多级电荷转移分子体系的构建、光物理性质和功能应用”、“小分子基荧光材料功能应用中的衬底与涂层结构效应”、“基于单—荧光探针的交互响应传感体系的构建与区分识别性能研



究”和“基于主－客体相互作用离子识别的超快动力学研究”的毕业论文陈述。

刘珊珊、赵佳音、关望和朱淋等 18 位硕士研究生也分别进行了毕业论文陈述。

在同学们进行了毕业论文陈述之后，由来自西安交通大学的刘峰教授和张明明教授，西北工业大学的孔杰教授，中国科学院大连化学物理研究所的任泽峰研究员为代表的 20 位校外专家和 12 位校内专家组成的答辩委员会的各位专家老师对同学们进行了提问，与同学们讨论了相关问题，并对毕业论文的进一步完善提出了修改意见。

经过讨论，答辩委员会一致认为 22 位同学研究内容充分，回答问题清楚，逻辑合理，同意通过答辩并建议授予相应的博士和硕士学位。

On the afternoon of May 30th, 4 doctoral students and 18 master's students of the Class of 2023 from the Photonic Nose and Molecular Materials Group completed their thesis defense in four sessions at the Zhizhi Building and the Institute of New Concept Sensors and Molecular Materials building.

Four doctoral students, Xu Wenjun, Li Min, Qiao Min and Zhou Dexia, gave their graduation thesis presentations titled Construction, Photophysical Properties and Functional Applications of Multi-level Charge Transfer Molecular System, Substrate and Coating Structural Effects in the Functional Application of Small Molecule-based Fluorescent Materials, Construction and Discrimination Recognition Performance of Interactive Response Sensing System Based on Single Fluorescent Probe, and Ultrafast Dynamics Based on Host-Guest Interactive Ion Recognition, respectively.

Liu Shanshan, Zhao Jiayin, Guan Wang and Zhu Lin and other 14 master's students also presented their graduation theses.

After the students made their thesis presentations, the defense committees composed of 20 external experts and 12 internal experts represented by Prof. Liu Feng and Prof. Zhang Mingming from Xi'an Jiaotong University, Prof. Kong Jie of Northwestern Polytechnical University, and Prof. Ren Zefeng from the Dalian Institute of Chemical Physics, Chinese Academy of Sciences, asked questions to the students, discussed relevant issues with them, and proposed amendments for the further improvement of the theses.

After discussion, the defense committees unanimously agreed that the 22 students had presented sufficient research content, answered questions clearly with reasonable logic, and agreed to pass their defenses and recommend the awarding of corresponding doctoral and master's degrees to them.

刘静教授参加国家自然科学基金委“界面化学与污染控制”研讨会

Liu Jing speaks at NSFC seminar on Interface Chemistry and Pollution Control

2023 年 5 月 6 日至 7 日，刘静教授参加了在井冈山召开的“界面化学与污染控制”研讨会，并作了题为“荧光纳米膜的控制制备及对气相小分子污染物的高效检测”的主题报告。

研讨会由国家自然科学基金委化学科学部主办、井冈山大学承办。来自 20 余家高校及科研院所的近 30 位专家代表以及化学科学部相关工作人员参加了本次会议。

From May 6 to 7, 2023, Prof. Liu Jing attended the seminar on Interface Chemistry and Pollution Control held in Jinggangshan, and gave a keynote report titled "Controlled Preparation of Fluorescent Nanomembranes and Efficient Detection of Gas Phase Small Molecule Pollutants.

The symposium was sponsored by the Department of Chemical Science of the National Natural Science Foundation of China and hosted by Jinggangshan University. Nearly 30 representatives from more than 20 universities and research institutes and staff of the Department of Chemical Sciences attended the meeting.

边红涛教授、马佳妮教授参加第一届光谱技术及应用大会并作报告

Bian Hongtao and Ma Jiani give reports at the First Conference on Spectroscopic Technology and Application

2023 年 5 月 7 日至 9 日，边红涛教授和马佳妮教授参加了甘肃省敦煌市召开、由中国光学工程学会举办的“第一届光谱技术及应用大会暨第九届中国激光诱导击穿光谱学术会议暨第六届燃烧诊断会议”，并分别作了题为“溶液中离子识别的超快动力学研究”和“有机分子光化学反应机制”的学术报告。

From May 7 to 9, 2023, Prof. Bian Hongtao and Prof. Ma Jiani attended the First Conference on Spectroscopy Technology and Application and the 9th China Laser-Induced Breakdown Spectroscopy Conference and 6th Conference on Combustion Diagnosis held in Dunhuang, Gansu Province, and gave reports titled Ultrafast Kinetics of Ion Recognition in Solution and Photochemical Reaction Mechanism of Organic Molecules respectively.

薄鑫副研究员访问南京理工大学和天能集团

Bo Xin visits Nanjing University of Science and Technology and Tianneng Group

2023 年 5 月 17 日，团队成员薄鑫副研究员访问了南京理工大学化工学院及动能学院，并作了题为“高效电解水催化剂的设计与应用”的学术报告。期间，与南京理工大学陈胜教授、段静静教授、西南交通大学李义兵教授就氢能源、碳中和等相关研究进行了交流。次日，四人一行访问了浙江天能氢能源科技有限公司，参观了工业化燃料电池生产线，并与天能集团张树国博士、曹寅亮博士就先进催化剂的应用与扩散电极的拓展交换了意见。

On May 17, 2023, associate researcher Bo Xin visited the School of Chemical Engineering and School of Energy and Power Engineering at Nanjing University of Science and Technology and gave a report titled Design and Application of Efficient Electrolytic Water Catalysts. During the visit, Bo also exchanged ideas with NUST Prof. Sheng Chen and Prof. Jingjing Duan and Southwest Jiaotong University Prof. Yibing Li on hydrogen energy and carbon neutrality. The next day, they visited Tianneng Group’s industrial fuel cell production line and exchanged opinions with Dr. Shuguo Zhang and Dr. Yinliang Cao on the application of advanced catalysts and the expansion use of gas diffusion electrode.

房喻院士出席陕西省第五届丝绸之路青年学者论坛

Fang Yu attends Shaanxi Province 5th Silk Road Young Scholars Forum

2023 年 5 月 25 日，房喻院士出席在西安举行的陕西省第五届丝绸之路青年学者论坛开幕式。

此次论坛的主题为“集聚天下英才、智创三秦未来”，省长赵刚出席开幕式并讲话。省委常委、省委宣传部部长孙大光介绍了陕西省科技和人才情况。

西安交通大学党委书记卢建军致辞。西北工业大学校长宋保维，中国科学院院士张国伟、何雅玲，中国工程院院士郑南宁、樊代明、张涌出席。

On May 25, 2023, Prof. Fang Yu attended the opening ceremony of the 5th Silk Road Young Scholars Forum of Shaanxi Province held in Xi’an.

At the the opening ceremony of the forum themed Gathering Talents from the World and Creating the Future of Shaanxi, Shaanxi province governor Zhao Gang delivered a speech. Sun Daguang, member of the Standing Committee of the Provincial Party Committee and director of the Publicity Department of the Provincial Party Committee, introduced the situation of science and technology and talents in Shaanxi province.

Xi’an Jiaotong University Party Committee Secretary Lu Jianjun spoke at the ceremony. Northwestern Polytechnical University president Song Baowei, Chinese Academy of Sciences academicians Zhang Guowei and He Yaling, and Chinese Academy of Engineering academicians Zheng Nanning, Fan Daiming and Zhang Yong, attended the meeting.

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Towards a scalable and controllable preparation of highly-uniform surface-enhanced Raman scattering substrates: Defect-free nanofilms as templates

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均匀表面增强拉曼散射衬底的可扩展和可控制备：无缺陷纳米膜作为模板

由于表面增强拉曼技术的无损、无标记、超高灵敏度和基于振动指纹的鉴别能力，一直是一个强有力的检测手段，因而被广泛应用于多个领域。虽然科学家们已通过多种方法制备出具有高灵敏度的 SERS 衬底，然而制备均匀且可重复性好的 SERS 衬底仍是一个挑战。由贵金属纳米结构制备的 SERS 衬底相较于半导体而言，往往具有更高的灵敏度。通过自上而下的热沉积和电子束蒸发等方法在制备均匀和重复性好的 SERS 衬底方面有很大优势，但其需要昂贵的设备和苛刻的实验条件。而自下而上的湿化学方法相对简单且成本低，但由于金属纳米结构容易聚集的性质导致制备的 SERS 衬底均匀性差。

据此，我们报道了一种基于模板的策略，用于严格控制和容易放大制备均匀的 SERS 衬底，即 AgNPs/ 纳米薄膜，其中使用的模板是柔性、透明、自支撑、无缺陷和具有机械强度的纳米薄膜。利用纳米薄膜将 $AgNO_3$ 的溶液与 $NaBH_4$ 的溶液分离，从而限制了

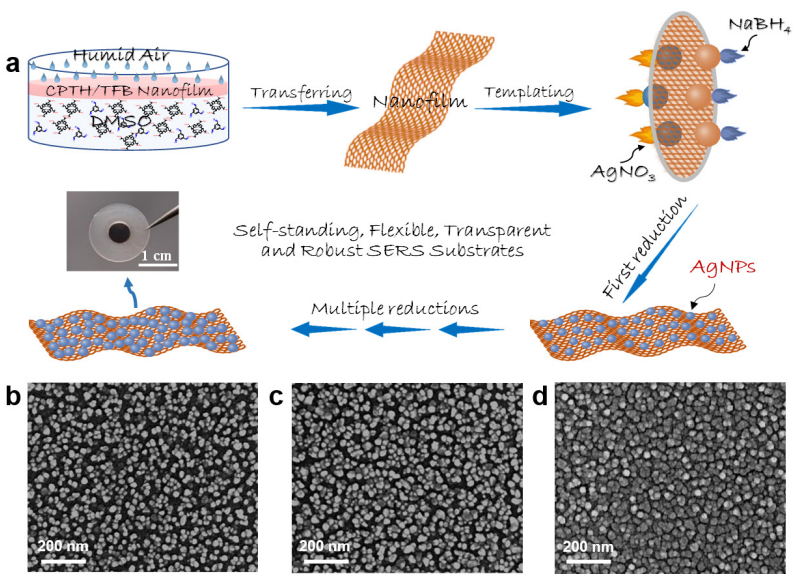

图 1. a）SERS 衬底制备过程示意图。b–d）通过更换反应溶液次数制备的具有不同银纳米颗粒粒径和间隙的 SERS 衬底。
Figure 1. a) Schematic diagram of the SERS substrates preparation process. b-d) SERS substrates with different the sizes and gaps of prepared AgNPs by refreshing solution times.

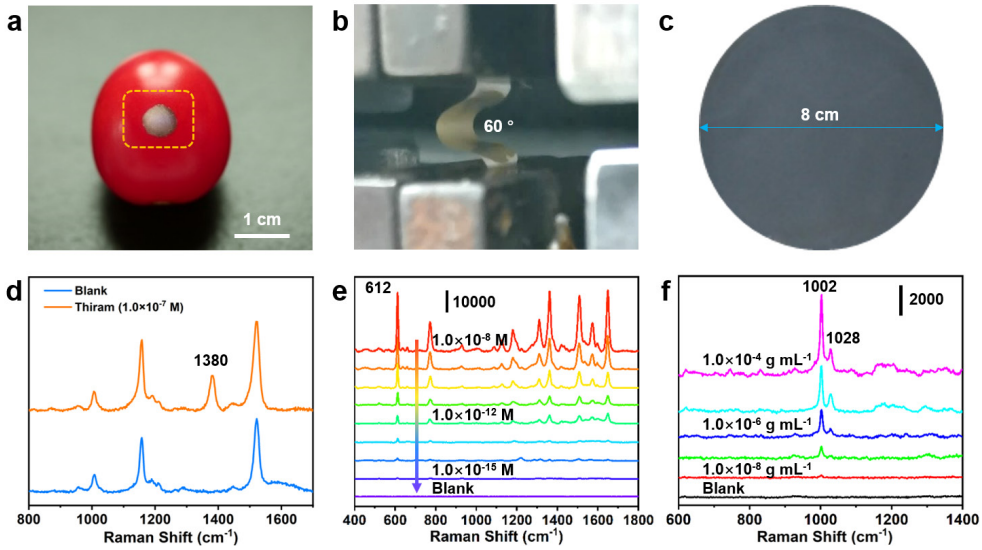

图 2. a–c）SERS 衬底的自粘附性、柔性和放大制备展示。d–f）SERS 衬底对分析物的检测能力。

Figure 2. a-c) Self-adhesive, flexible, and scalable preparation of SERS substrate. d-f) The detection ability of SERS substrate for analytes.

银纳米颗粒在纳米薄膜上的生长。此外，通过改变反应物的浓度和更换反应溶液次数来调节 AgNPs 的尺寸和其间隙。所获得的 SERS 衬底能够自粘附到不同性质和形态的表面，确保原位和实时 SERS 检测。该 SERS 衬底对罗丹明 6G 的增强因子可达 5.8×10^{10}，检测限为 1.0×10^{-15} mol L^{-1}。此外，500 次弯曲试验和一个月的储存没有显示出明显的性能衰减，高达 50.0 cm^2 的放大制备对结构和传感性能的影响可以忽略不计。使用常规手持式拉曼光谱仪对圣女果上的福美双和甲醇中的芬太尼可以实现灵敏检测，证明了 AgNPs/ 纳米膜在现实生活中的适用性。因此，这项工作为使用湿化学法制备大面积的高质量 SERS 衬底提供了可靠的策略。

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通讯作者：陕西师范大学房喻院士、彭军霞副教授

全文链接：https://www.sciencedirect.com/science/article/pii/S0021979723009335?via%3Dihub

Due to its nondestructive, label-free, ultrahigh sensitivity and the vibrational fingerprint-based discriminative capability, surface-enhanced Raman scattering technology has always been a powerful detection method and has been widely used in multiple fields. Although scientists have prepared highly sensitive SERS substrates through various methods, production of uniform and reproducible SERS substrates remains a challenge. Generally, SERS substrates with noble metal nanostructures possess higher sensitivity compared to semiconductors. The top-down methods such as thermal deposition and e-beam evaporation have great advantages in the preparation of uniform and reproducible SERS substrates, but it requires expensive equipment and harsh experimental conditions. The bottom-up wet-chemical methods are relatively simple and cost-effective, but prepared SERS substrates have poor uniformity due to the easy aggregation of metal nanostructures.

Herein, we report a template-based strategy for the strictly controllable and handily scalable preparation of a very uniform SERS substrate, Ag nanoparticles (AgNPs)/nanofilm, where the template used is a flexible, transparent, self-standing, defect-free and robust nanofilm. The nanofilm separates the solution of $AgNO_3$ from that of $NaBH_4$, restricting on film growth of AgNPs. The sizes of AgNPs and the gaps between them can be readily tuned via adjusting the dosages of the reactants and the reaction time. Importantly, the obtained SERS substrates are highly self-adhesive, allowing on-site and in-situ SERS detection of complicated samples. The enhancement factor (EF) of the substrate for rhodamine 6G could reach 5.8×10^{10} with a detection limitof 1.0×10^{-15} mol L^{-1}. Moreover, 500 bending tests and one-month storage showed no observable performance degradation, and up to 50.0 cm^2 scaled-up preparation depicted negligible effect upon the structure and the sensing performance. The real-life applicability of AgNPs/nanofilm was demonstrated by the sensitive detection of tetramethylthiuram disulfide on cherry tomato and fentanyl in methanol with a routine handheld Raman spectrometer. This work thus provides a reliable strategy for large area wet-chemical preparation of high-quality SERS substrates.

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Full Text Link: www.sciencedirect.com/science/article/pii/S0021979723009335?via%3Dihub

南方科技大学陆为教授应邀作学术报

Prof. Cheng-Lung Chen and Prof. Liu Xiaogang invited to give reports

2023 年 5 月 9 日上午，南方科技大学化学系陆为教授应光子鼻与分子材料团队邀请在致知楼 1668 报告厅为团队成员作报告。报告由刘静教授主持，团队老师和学生参加了本次报告会。

在题目为“光照活化磷光（PAP）：光化学除氧和视觉化应用”的报告中，陆为教授介绍了其团队的发现：有机金属配合物的长寿命磷光可以在光化学除氧溶剂的溶液中通过可控的光照可逆地激活，这些牺牲性溶剂可以释放溶液中的光氧化张力并保护长寿命三重激发态，并证明了 PAP 是具有长寿命三重激发态的有机金属配合物的一般属性。在阐明 PAP 机制后，其团队还在实施 PAP 的多个技术应用。

报告结束后，陆为教授与在场师生就相关问题进行了讨论。

On May 9, 2023, Prof. Lu Wei from the Department of Chemistry of Southern University of Science and Technology (SUST) was invited by the Photonic Nose and Molecular Materials Group to give a report to the group members in the 1668 Lecture Hall of Zhi Zhi Building. The report was hosted by Prof. Liu Jing and attended by the group teachers and students.

In the report titled Photoactivated Phosphorescence (PAP): Photochemical Deoxidation and Visualisation Applications, Lu Wei presented his group’s research findings that long-lived phosphorescence of organometallic complexes can be reversibly activated by controlled light exposure in solutions of photochemical deoxidising solvents, which are sacrificial solvents that release the photooxidation tension in solution and protect the long-lived triplet excited state, and demonstrate that PAP is a general property of organometallic complexes with long-lived triplet excited states. After elucidating the PAP mechanism, his group is also implementing several technical applications of PAP.

After the report, Lu Wei discussed related issues with the teachers and students present.

天津大学马骁楠教授应邀作报告

Tianjin Univ. Prof. Ma Xiaonan invited to give report

2023 年 5 月 12 日上午，光子鼻与分子材料团队邀请天津大学马骁楠教授在致知楼 1568 会议室为团队成员作报告。报告由马佳妮教授主持，团队老师和博士、硕士研究生参加了本次报告会。

马骁楠教授的研究兴趣主要在有机及钙钛矿半导体中的激发态动力学探测、光学微腔中的激发态 – 光场相互作用、微纳尺度激发态行为调控等方面。本次报告主要介绍课题组近期基于飞秒瞬态吸收光谱实验与热振动相关函数方法对几种新兴 OLED 材料光物理机制的研究，并揭示这些超快机制如何对后续慢弛豫过程产生直接影响并在 OLED 性能发挥上产生积极调控作用。

报告结束后，马骁楠教授与在场师生就报告相关内容进行了讨论，并与参会师生合影留念。

On May 12, 2023, Prof. Ma Xiaonan of Tianjin University was invited by the Photonic Nose and Molecular Materials Group to give a report to the group members in the Meeting Room 1568 of Zhi Zhi Building. The report was hosted by Prof. Ma Jiani and attended by group teachers and students.

Prof. Ma’s research interests include excited state dynamics detection in organic and perovskite semiconductors, excited state-light field interaction in optical microcavities, and micro-nanoscale excited state behavior regulation. In the report, he mainly introduced their recent research on the photophysical mechanisms of several emerging OLED materials based on femtosecond transient absorption spectroscopy experiments and thermal vibration correlation function methods, and revealed how these ultrafast mechanisms directly affect the subsequent slow relaxation process and play a positive regulatory role in OLED performance.

After the report, Prof. Ma discussed related issues with the teachers and students present, and took a photo with them.

南京大学谢代前教授应邀作报告

Nanjing Univ. Prof. Xie Daiqian invited to give report

2023 年 5 月 13 日下午，光子鼻与分子材料团队邀请南京大学谢代前教授在长安校区致知楼 1568 会议室为团队成员作报告。报告由王文亮教授主持，团队老师和博士、硕士研究生参加了本次报告会。

谢代前教授介绍了其团队新近发展的包含最近邻耦合的非含时传能动力学高效新方法，他们获得了 HF 化学激光器中重要的 H2–HF 和 HF–HF 传能过程的速率常数等态 – 态动力学性质，并与统计量子模型结合研究了超冷分子反应 KRb+KRb 等体系的量子动力学，揭示了新的微观动力学机制。

报告结束后，谢代前教授与在场师生就相关问题进行了讨论，并与参会师生合影留念。

On May 13, 2023, Prof. Xie Daiqian of NanjingUniversity was invited by the Photonic Nose and Molecular Materials Group to give a report to the group members in the Meeting Room 1568 of Zhi Zhi Building. The report was hosted by Prof. Wang Wenliang and attended by group teachers and graduate students.

Prof. Xie introduced his group's newly developed efficient new method of non-time-dependent energy transfer dynamic including nearest-neighbor coupling. They obtained the rate constants and state-state dynamic properties of the important H2-HF and HF-HF energy transfer processes in HF chemical lasers, and studied the KRb+KRb and other systems in the quantum dynamics of ultracold molecular reactions in combination with statistical quantum models, revealing a new microscopic dynamic mechanism.

After the report, Prof. Xie discussed related issues with the teachers and students present, and took a photo with them.

大连化物所袁开军研究员应邀作报告

DICP Researcher Yuan Kaijun invited to give report

2023 年 5 月 16 日下午，光子鼻与分子材料团队邀请中国科学院大连化学物理研究所袁开军研究员在新概念传感器与分子材料研究院报告厅为团队成员作报告。报告由边红涛教授主持，团队老师和博士、硕士研究生参加了本次报告会。

袁开军研究员的研究兴趣主要集中于星际和大气相关的小分子光化学动力学以及高压超快光谱和二维红外光谱研究，已建成基于大连相干光源的分子光化学实验站，实现了分子光化学产物全波段、全通道高分辨测量。本次报告主要介绍利用大连光源研究星际水分子和硫化氢分子等极紫外光化学动力学，以及这些结果在星际化学中的意义。此外，袁开军研究员还简要介绍了实验室最近发展的高压显微超快光谱表征系统和在先进材料超快动力学方面的工作进展。

报告结束后，袁开军研究员与在场师生就报告相关内容进行了讨论，并与参会师生合影留念。

On May 16, 2023, the Photonic Nose and Molecular Materials Group invited researcher Yuan Kaijun from Dalian Institute of Chemical Physics, Chinese Academy of Sciences, to give a presentation to group members in the lecture hall of the Institute of New Concept Sensors and Molecular Materials. The report was hosted by Prof. Bian Hongtao, and attended by teachers, doctoral and master's students of the group.

Yuan Kaijun's research interests focus on interstellar and atmospheric related small molecule photochemical dynamics, as well as high-pressure ultrafast spectroscopy and two-dimensional infrared spectroscopy. He has built an experimental station for molecular photochemistry based on Dalian Coherent Light Source and realized full-band and full-channel high-resolution measurements of molecular photochemical products. His report focused on the use of Dalian Light Source to study the extreme ultraviolet photochemical kinetics of interstellar water molecules and hydrogen sulfide molecules, etc., and the implications of these results in interstellar chemistry. In addition, he also introduced the high-pressure micro ultrafast spectroscopy characterization system recently developed by his laboratory and its work progress on ultrafast dynamics of advanced materials.

After the report, Yuan Kaijun discussed with the teachers and students present about his report content, and took a photo with them.

中国科技大学田善喜教授应邀作报告

USTC Prof. Tian Shanxi invited to give report

2023 年 5 月 15 日下午，光子鼻与分子材料团队邀请中国科技大学讲席教授田善喜在新概念传感器与分子材料研究院报告厅为团队成员作报告。报告由马佳妮教授主持，团队老师和博士、硕士研究生参加了本次报告会。

田善喜教授的研究兴趣主要集中于化学反应微观机制研究。本次报告介绍了田教授研究组新近建立的“时间延迟质谱”新方法，及利用该原创技术在醇类液体表面的分子取向和原位团簇、电子碰撞诱导的甲醇转化二甲基醚、溶剂化电子与电离辐射等方面取得了初步研究结果。

报告结束后，田善喜教授与在场师生就报告相关内容进行了讨论，并与参会师生合影留念。

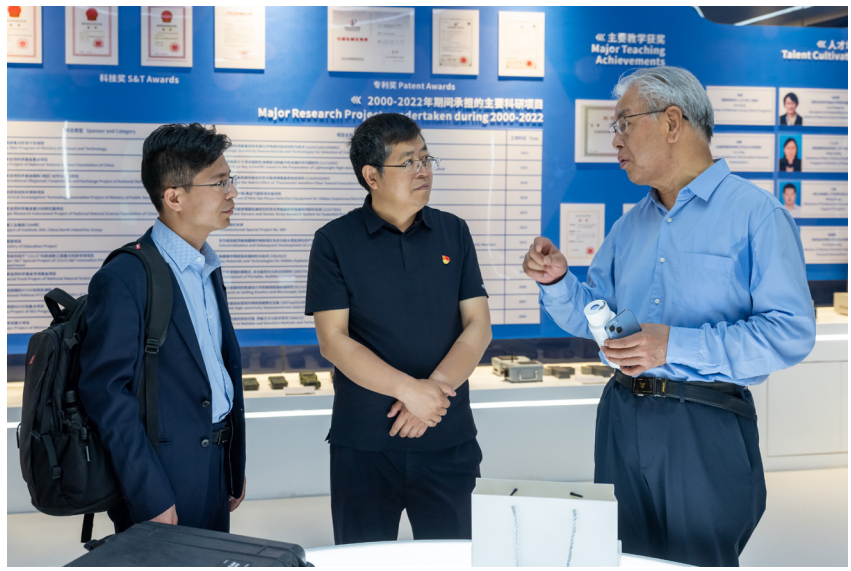
On May 15, 2023, Prof. Tian Shanxi of University of Science and Technology of China was invited by the Photonic Nose and Molecular Materials Group to give a report to the group members in the Lecture Hall of the Institute of New Concept Sensors and Molecular Materials building. The report was hosted by Prof. Ma Jiani and attended by group teachers and graduate students.

Prof. Tian’s research interests mainly include the microscopic mechanism of chemical reactions. In this report, he introduced the new method of Time-delayed Mass Spectrometry recently developed by his research group, and how they used this original technology to obtain preliminary research results on molecular orientation and in situ clusters on the surface of alcohol liquids, dimethyl ether conversed from electron collision-induced methanol, and solvated electrons and Ionizing radiation.

After the report, Prof. Tian discussed related issues with the teachers and students present, and took a photo with them.

西安光机所来访交流并介绍阿秒激光设施

XIOPM visitors brief on Attosecond Laser Facility



2023 年 5 月 18 日上午，中科院西安光学精密机械研究所马彩文所长一行前来新概念传感器与分子材料研究院进行交流，并介绍了其先进阿秒激光设施。

马彩文所长、付玉喜总工程师等

11 人先在房喻院士的带领下参观了装饰一新的新概念传感器与分子材料研究院大楼，参观了研究院成果展厅，然后在研究院会议室与研究院科研团队进行了座谈交流。

随后，西安光机所阿秒科学与技术研究中心在研究院报告厅为研究院师生作了题为“先进阿秒激光设施”的报告。

在报告中，光机所阿秒中心专家汇报了先进阿秒激光设施的规划及建设情况，指出先进阿秒激光设施的科学目标是建设国际最先进的，波段、性能以及应用终端覆盖最全的，以阿秒时间分辨为突出特点的、综合性超快的电子动力学研究设施。

报告会最后，阿秒中心专家与研究院师生展开交流，探讨用户的实际需求，并回答了师生提出的问题。

On May 18, 2023, director Ma Caiwen of the Xi’an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences and his colleagues came to visit the Institute of New Concept Sensors and Molecular Materials and gave an introduction of its advanced attosecond laser facility.

Accompanied by Prof. Fang Yu, director Ma Caiwen, chief engineer Fu Yuxi and other nine XIOPM visitors first visited the newly decorated building of the Institute of New Concept Sensors and Molecular Materials, toured the exhibition hall, and then had an exchange meeting with the INCSMM research team in the meeting room.

After the meeting, the XIOPM Attosecond Science and Technology Research Center gave a report titled “Advanced Attosecond Laser Facility” for the teachers and students of the institute in the lecture hall.

In the report, an expert from the Attosecond Center reported on the planning and construction of the Advanced Attosecond Laser Facility, saying that the scientific goal of the ASLF is to build the most advanced international, comprehensive ultrafast electron dynamics research facility with the most comprehensive coverage of wavelengths, performance and application terminals, and with the prominent feature of the Asecond time resolution.

After the report, the expert communicated with INCSMM students and faculty, discussing the practical user needs of and answering their questions.

大连化物所任泽峰研究员应邀作报告

DICP Researcher Ren Zefeng invited to give report

2023 年 5 月 30 日上午，光子鼻与分子材料团队邀请中国科学院大连化学物理研究所任泽峰研究员在新概念传感器与分子材料研究院报告厅为团队成员作报告。报告由边红涛教授主持，团队老师和博士、硕士研究生参加了本次报告会。

任泽峰研究员课题组最近发展的两个超快光谱技术：1. 利用时间分辨光发射电子显微镜（PEEM）研究单颗粒光催化剂的载流子动力学；2. 利用高灵敏瞬态吸收光谱研究光谱研究太阳光照下钙钛矿太阳能电池材料的载流子动力学，对了解半导体材料光生载流子的性质及其动力学，太阳能电池和光催化等是至关重要的。超快激光与 PEEM 的结合，能够从时间分辨、空间分辨、电子能量 / 动量分辨等多个维度研究半导体材料的性能，实现了单个 Cu2O 光催化颗粒的载流子动力学，促进理解光催化剂材料的光生电子 – 空穴在 Cu2O 不同晶面的动力学。此外，任泽峰研究员还简要介绍了由其发展的高灵敏瞬态吸收光谱技术，相关工作对太阳能电池材料的合成和器件的制备有重要的指导意义。

报告结束后，任泽峰研究员与在场师生就报告相关内容进行了讨论。

On May 30, 2023, the Photonic Nose and Molecular Materials Group invited researcher Ren Zefeng from Dalian Institute of Chemical Physics, Chinese Academy of Sciences, to give a report to group members in the Lecture Hall of the Institute of New Concept Sensors and Molecular Materials building. The report was hosted by Prof. Bian Hongtao, and attended by group teachers, doctoral and master's students.

Ren's research group has recently developed two ultrafast spectroscopic techniques: 1. Using time-resolved optical emission electron microscopy (PEEM) to study the carrier dynamics of single-particle photocatalysts; 2. Using highly sensitive transient absorption spectroscopy to study the carrier dynamics of perovskite solar cell materials under sunlight, which is crucial to understanding the properties and dynamics of photogenerated carriers of semiconductor materials, solar cells and photocatalysis. The combination of ultrafast laser and PEEM can study the performance of semiconductor materials from multiple dimensions such as time resolution, spatial resolution, and electron energy/momentum resolution, realize the carrier dynamics of a single Cu2O photocatalytic particle, and promote the understanding of the photoelectron-hole dynamics of photocatalyst materials in different crystal planes of Cu2O. In addition, Ren also briefly introduced the highly sensitive transient absorption spectroscopy technology developed by them, which has important guiding significance for the synthesis of solar cell materials and the preparation of devices.

After the report, Ren discussed with the teachers and students present about his report content, and took a photo with them.

大连化物所吴凯丰研究员应邀作报告

DICP Researcher Wu Kaifeng invited to give report

2023 年 5 月 31 日下午，光子鼻与分子材料团队邀请中国科学院大连化学物理研究所吴凯丰研究员在新概念传感器与分子材料研究院报告厅作报告，报告题目为量子点超快自旋光物理与光化学，本次报告由边红涛教授主持，团队教师和博士、硕士研究生参加了本次报告会。

吴凯丰老师的主要研究领域是量子点等低维光电材料的激子、载流子和自旋超快动力学及其在新型能源和量子技术中的应用。吴老师在报告中讲述了其团队近年来的一些研究工作：基于先进的时间分辨谱学方法，系统研究了量子点的超快光物理与光化学机制；发展了飞秒瞬态磁光技术用于研究自旋动力学；在杂质和电子掺杂量子点中观测到长寿命的热电子布居以及新奇的量子裁剪效应；系统研究了量子点–有机分子三线态传能机制，基于此开发了高效率的光子上转换体系，并与有机光催化融合，实现了快速高效的太阳光合成。

报告结束后，吴凯丰研究员与在场学生和老师就报告相关内容进行了讨论，解答了他们疑惑，并与参会教师合影留念。

On May 31, 2023, the Photonic Nose and Molecular Materials Group invited researcher Wu Kaifeng from Dalian Institute of Chemical Physics, Chinese Academy of Sciences, to give a report titled Quantum Dot Ultrafast Spin Optophysics and Photochemistry to group members in the Lecture Hall of the Institute of New Concept Sensors and Molecular Materials building. The report was hosted by Prof. Bian Hongtao, and attended by group teachers, doctoral and master's students.

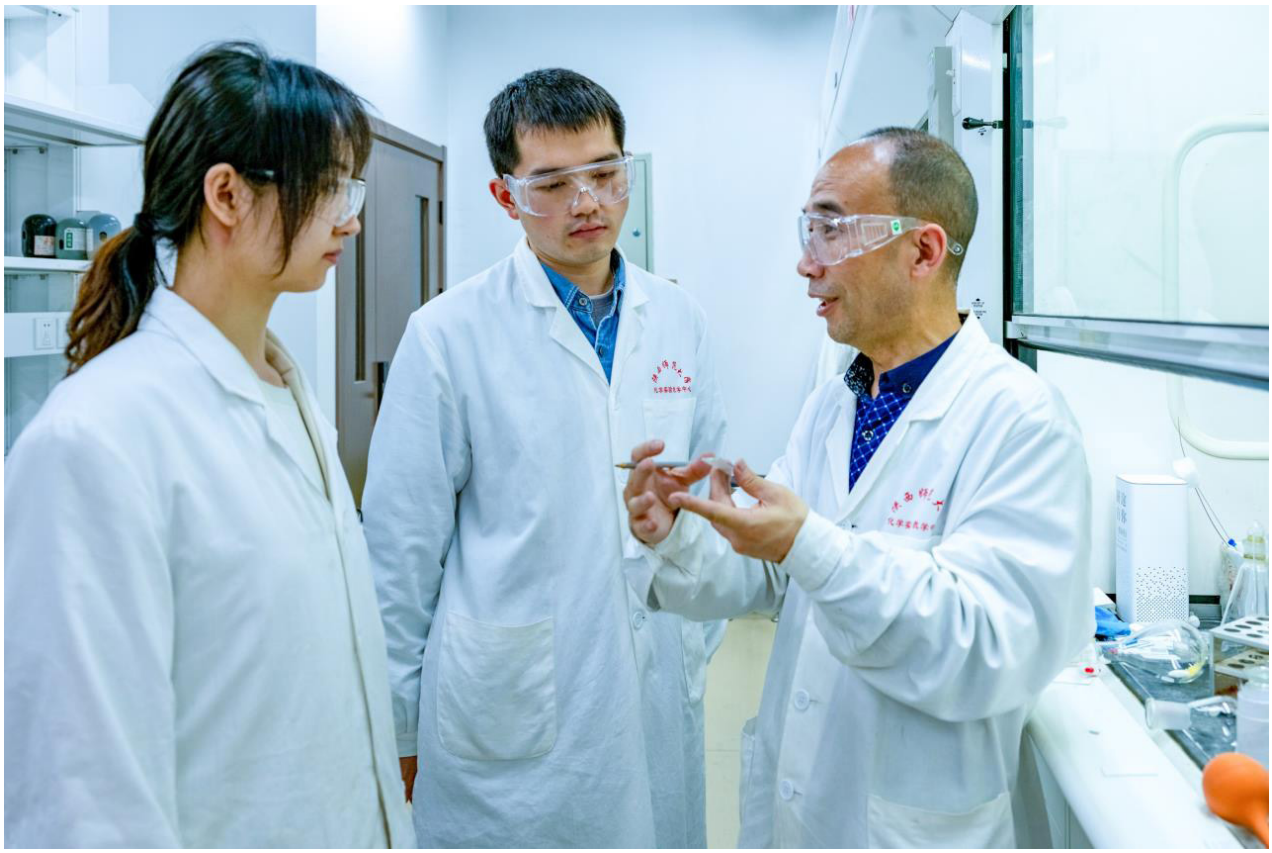
The main research area of Wu is the excitons, charge carriers, and spin ultrafast dynamics of low-dimensional optoelectronic materials such as quantum dots, as well as their applications in new energy and quantum technology. In the presentation, Wu discussed some of the recent research work conducted by his team. They employed advanced time-resolved spectroscopy methods to systematically investigate the ultrafast photophysics and photochemical mechanisms of quantum dots. They developed femtosecond transient magneto-optical techniques to study spin dynamics. Long-lived hot electron populations and novel quantum confinement effects were observed in impurity and electron-doped quantum dots. They also studied the triplet energy transfer mechanism between quantum dots and organic molecules, and based on this, developed highly efficient photon upconversion systems. By combining it with organic photocatalysis, they achieved rapid and efficient solar fuel synthesis.

After the report, Wu discussed the relevant content of the report with the students and teachers present, cleared their doubts, and took a photo with the participating teachers.

心怀感恩，不倦求索——我的毕业随想

Be grateful and tireless in the quest ——my reflection upon graduation

文 / 关 望　Text / Guan Wang



三年研究生生活，犹如白驹过隙，转瞬即逝。弹指一挥间，时光让我从懵懂无知的新生，成长为略有收获的毕业生。三年中的凡事种种犹如沙滩上踩下的脚印，悠远而清晰。当时间像潮水一样掩埋了曾经深刻的脚印的时候，只有我自己知道，无痕的沙滩上曾经发生过许多，也给过我许多。

当第一次聆听导师刘凯强教授的教诲时，我知道我的硕士研究生生涯开始了。而在课题组学习生活的近三年时光里，我处处感受得到房喻老师为大家营造良好的学习、工作环境与氛围而所作出的努力，深切体味到学术平台对一个人的学术生涯的重要性。团队常常邀请知名学者前来交流讲学，给我们广大学生创造了许多学术思想碰撞的机会，为科研实验的顺利进行提供了新的互动平台。课题组老师们的辛勤努力，特别是房喻老师，他那种数十年如一日的勤勉与坚持时刻感染着我们，激励与鞭策着我与我的导师力求严谨、努力勤奋，立志以房老师为榜样，不懈努力。

回首三年的点点滴滴，心中感慨颇多。有对自己导师三年培育之恩的感激，有对师兄师姐师弟师妹们的真心不舍。在答辩之后，我谨就研究生学术生涯的一些经历与感受分享给大家，希望能对师弟师妹们有一点帮助。

在论文选题上，立足导师确定的研究方向，我通过相关搜索引擎查阅了近十年内国内外中英文参考文献，精读摘要、前言等文章关键部分，明确了每一篇论文的研究目的、必要性与重要性，把握相关研究的前沿进展，

总结本领域的学术挑战与困境；在实验开始阶段，我通常采用假设验证法，即先提出一个假设，定一个或多个初步方案，与导师深入讨论后，再进行实验验证，最后确定研究方案；在实验过程中，我详细记录实验结果与细节，按照国际标准范式（主流刊物风格）画图做表，以月报、组会 PPT 等方式汇报实验进展，并与导师、同学们积极互动，找出实验过程中存在的不足及问题，及时制定下一阶段的探索目标与实验方案；在文章投稿准备方面，首先与导师讨论评估研究结果的学术层次，在确定目标刊物之后，严格按照刊物的版面特色确定正文中的图表，完善图表的可读性、新颖性、代表性以及逻辑性。在此基础上，草拟研究论文初稿，根据导师的修改意见，再次提高稿件质量直至最后投稿。

在毕业论文准备阶段，本着事情提前想、及时做的原则，先与导师确定论文的章节布局，分类参考文献，完成综述部分，并根据研究的逻辑性与连续性，分章节表述实验结果。再次修改时，加深研究结果的分析与讨论。需要指出的是，无论是研究论文还是毕业论文，图表及原始数据均做到了一一对应，以便追本溯源，提升或修正。

正如导师所言，“科研与生命过程一样，绝不可能一帆风顺，生活给我们一份无奈与困惑，我们应还它以十倍的勇气与坚持！”，所以每当我在实验上遇到无法解决的难题时，总会毫不掩饰地表露出来，并积极寻求导师、师兄师姐们的援助，经历了讨论、查资料、再讨论、试验、讨论、再试验等过程，直到问题最终解决；每当获得重要结果时，满心欢喜与激动，每每如此，也不敢掉以轻心，再次通过实验验证结果是否可以重复。每当与导师学术观点不一致的时候，我也有坚持己见的情况，但最终还是先沉下心来，通过资料查阅与知识再学习等途径，明确其中的道理所在，进一步理解导师的学术占位及师生认知上的差异，再次与导师互动，表达自己已经更新的观点。每当试图睡个懒觉或开小差的时候，总会觉得自己离优秀还差的太远，所以常常咬咬牙尽力克服年轻人惯有的惰性，争取更多的学习与实验的时间。当文章投稿过程中遭受编辑拒不送审的时候，我也十分沮丧，但当受到导师谈笑风生、语重心长的鼓励时，便有了十足的信心，于是进一步按照导师要求，积极修改文章存在的瑕疵与不足。

我马上就要毕业了，也打算继续沿着科研这条路走下去。过去经历的近 3 年科研训练，使我终于明白了一个道理：学术就是另外一种马拉松，我们学生们应多一份自信，多一份坚持，少一分懒惰与藉口，心怀感恩，不倦求索，向先贤与现世科研达人学习而努力奋斗。

我深深地祝福房喻老师、导师等全体师生们身体健康，工作学习顺利，也祝光子鼻与分子材料研究团队、新概念传感器与分子材料研究院蒸蒸日上，再创辉煌！我也将不倦努力，争取做出新的更大成绩！

Three years of graduate life is transient like a white horse passing through the crevice. At the snap of my fingers, time has allowed me to grow from an ignorant freshman to a graduate student who has made some progress. Everything in the past three years is like footprints on the beach, distant and clear. When time buried the once deep footprints like a tide, only I knew that many had happened and given me a lot on the traceless beach.

When I listened to my mentor, Prof. Liu Kaiqiang, for the first time, I knew that my master’s career had begun. In the past three years of studying and living in the research group, I have felt the efforts made by Prof. Fang Yu to create a good learning and working environment and atmosphere for everyone, and deeply appreciated the importance of academic platforms to one’s academic career. The group often invites well-known scholars to give lectures, creating many opportunities for our students to stimulate academic ideas and providing a new interactive platform for the smooth progress of research experiments. The hard work of the teachers in the research group, especially Prof. Fang Yu’s decades of diligence and persistence have always infected us, inspiring and motivating me and my mentor to work rigorously and diligently, and we are determined to follow his example in make our unremitting efforts.

Looking back on the three years, I feel a lot of emotions in my heart. I am grateful to my supervisor’s kindness in nurturing me for three years, and I am reluctant to bid farewell to my fellow students. After the thesis defense, I would like to share some of my experiences and feelings about my academic career as a graduate student, hoping to be of some help to younger students.

Based on the research direction determined by my supervisor, I selected the topic for my thesis, after checking the relevant literature in English and Chinese in the past ten years through search engines, reading the abstract, preface and other key parts of the articles, clarifying the research purpose, necessity and importance of each article, grasping the frontier progress of relevant research, and summarizing the academic challenges and difficulties in the field. When I begin to experiment, I usually adopt the hypothesis verification method, i.e., I first put forward a hypothesis, set one or more preliminary plans, and then conduct experimental verification after in-depth discussion with my supervisor, and finally determine the research plan. In the process of experimentation, I record the experimental results and details, draw diagrams and make tables according to the international standard paradigm (mainstream publication style), report the experimental progress by means of monthly group meeting presentations, and actively interact with my supervisor and fellow students to find out the shortcomings and problems in

the experimental process, and promptly develop the next phase of exploration goals and experimental plans. In terms of article submission, I first discuss with my supervisor to assess the academic level of the research results, and after determining the target journals, we determine the figures and tables of the article in strict accordance with the layout characteristics of the journals, and improved the readability, novelty, representativeness and logic of the figures and tables. On this basis, I make the first draft of the paper, and revise the manuscript again according to Prof. Liu's opinions and suggestions until the final submission.

In preparation of the graduation thesis, I followed the principle of thinking ahead and doing things in time, discussed and determined the layout of the chapters of the thesis with Prof. Liu first, then I classified the references, completed the review section, and presented the experimental results in chapters according to the logic and continuity of the research. When I revised the thesis, I expanded the analysis and discussion of the research results. It should be noted that no matter the research paper or the graduation thesis, the diagrams, tables and raw data are strictly corresponding, so that they can be traced back to the source and enhanced or corrected.

As Prof. Liu said, "Scientific research and the process of life can never be smooth sailing. Life gives us helplessness and confusion, we should return it with ten times the courage and persistence." Therefore, whenever I encounter unsolvable problems in experiments, I will always expose them without any hesitation, and seek help from Prof. Liu and other students, and go through the process of discussion, checking information, re-discussion, experimentation, discussion, re-experimentation, until the problem is finally solved. Whenever important results are obtained, I am full of joy and excitement, but in the meantime, I dare not take it lightly, and would verify whether the results can be repeated in another experiment. When I disagree with Prof. Liu in academic views, I would insist on my own opinion, but in the end, I would calm down first, clarify the truth through data review and knowledge learning, further understand the academic position of the supervisor and the cognitive differences between teachers and students, interact with him again, and express my updated views. When I ever slack off, I would always feel that I am too far from excellent, so I often grit my teeth and try my best to overcome the inertia of young people and strive for more time for learning and experimentation. I was also very frustrated when the editor refused to submit the article for review during the submission process, but when I was encouraged by Prof. Liu with his lively and sincere words, I regained my confidence and further corrected the flaws and shortcomings of the article according to the his requirements.

I am about to graduate, and I plan to continue on the path of scientific research. The past three years of research training has taught me a truth: Academia is another kind of marathon, and we students should have more confidence, more persistence, less laziness and excuses, be grateful and tireless in the quest, learn from the ancestors and the current research experts and strive hard.

I sincerely wish Prof. Fang Yu, Prof. Liu, all teachers and students good health, successful work and study, and also wish the Photonic Nose and Molecular Materials Group, the Institute of New Concept Sensors and Molecular Materials prosperous and brilliant! I will also work tirelessly toward new and greater achievements!

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