我校青年拔尖人才董任峰副研究员在《Accounts of Chemical Research》刊发高水平学术论文

近日，我校化学与环境学院蔡跃鹏教授团队青年拔尖人才董任峰副研究员，以华南师范大学为第一单位在国际顶级期刊《Accounts of Chemical Research》（影响因子20.955）发表论文，题为《Photocatalytic Micro/Nanomotors: From Construction to Applications》(DOI:10.1021/acs.accounts.8b00249)。

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Photocatalytic Micro/Nanomotors: From Construction to Applications

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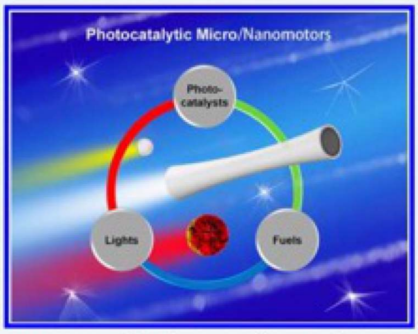
Supporting Information



CONSPECTUS: Synthetic micro/nanomotors (MNMs) are a particular class of micrometer or nanometer scale devices with controllable motion behavior in solutions by transferring various energies (chemical, optical, acoustic, magnetic, electric, etc.) into mechanical energy. These tiny devices can be functionalized either chemically or physically to accomplish complex tasks in a microcosm. Up to now, MNMs have exhibited great potential in various fields, ranging from environmental remediation, nanofabrication, to biomedical applications.

Recently, light-driven MNMs as classic artificial MNMs have attracted much attention. Under wireless remote control, they can perform reversible and repeatable motion behavior with immediate photoresponse. Photocatalytic micro/nanomotors (PMNMs) based on photocatalysts, one of the most important light-driven MNMs, can utilize energy from both the external light source and surrounding chemicals to achieve efficient propulsion. Unlike other kinds of MNMs, the PMNMs have a unique characteristic: photocatalytic property. On one hand, since photocatalysts can convert both optical and chemical energy inputs into mechanical propulsion of PMNMs via photocatalytic reactions, the propulsion generated can be modulated in many ways, such as through chemical concentration or light intensity. In addition, these PMNMs can be operated at low levels of optical and chemical energy input which is highly desired for more practical scenarios. Furthermore, PMNMs can be operated with custom features, including go/stop motion control through regulating an on/off switch, speed modulation through varying light intensities, direction control through adjusting light source position, and so forth. On the other hand, as superoxide radicals can be generated by photocatalytic reactions of activated photocatalysts, the PMNMs show great potential in environment remediation, especially in organic pollutant degradation.

In order to construct more practical PMNMs for future applications and further extend their application fields, the ideal PMNMs should be operated in a fully environmentally friendly system with strong propulsion. In the past decade, great progress in the construction, motion regulation, and application of PMNMs has been achieved, but there are still some challenges to realize the perfect system. In this Account, we will summarize our recent efforts and those of other groups in the development toward attractive PMNM systems. First, we will illustrate basic principles about the photocatalytic reactions of photocatalysts and demonstrate how the photocatalytic reactions affect the propulsion of PMNMs. Then, we will illustrate the construction strategies for highly efficient and biocompatible PMNMs from two key aspects: (1) Improvement of energy conversion efficiency to achieve strong propulsion of PMNMs. (2) Expansion of the usable wavelengths of light to operate PMNMs in environment-friendly conditions. Next, potential applications of PMNMs have been described. In particular, environment remediation has taken major attention for the applications of PMNMs due to their photocatalytic properties. Finally, in order to promote the development of PMNMs which can be operated in fully green environments for more practical applications, an outlook of key challenges and opportunities in construction of ideal PMNMs is presented.

INTRODUCTION

Utilizing micro/nanomachines to perform complicated tasks in a microcosmic world is an exciting challenge. Synthetic micro/nanomotors (MNMs) have attracted much attention in the

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Acc. Chem. Res. XXXX, XXX, XXX−XXX

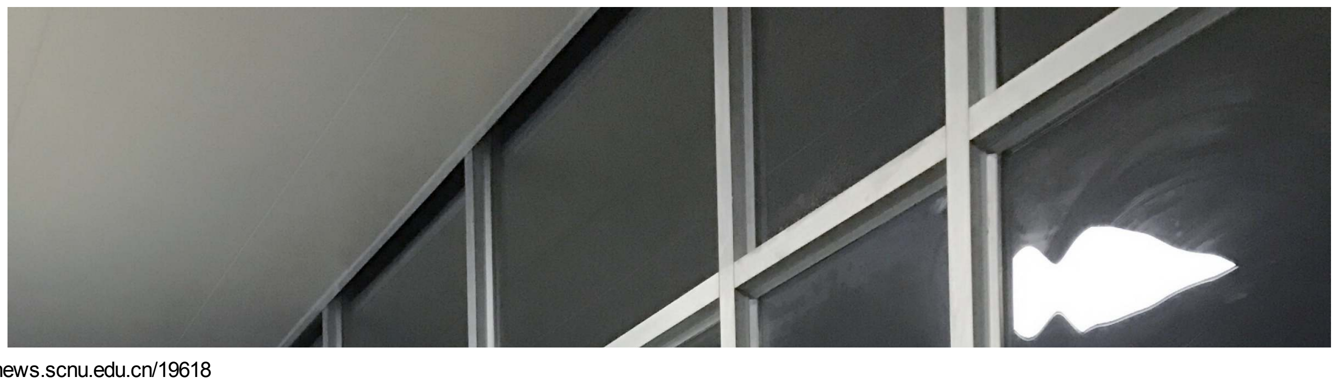
微纳马达(Micro/Nanomotors)是指在外界各种能量(光、电、磁、热、化学能等)的刺激下发生运动且尺寸为微米或纳米级的微观器件。它们如同一个个游走在微观世界的微纳米尺度的机器人，可精准的执行复杂的任务，如DNA识别、细胞运载、细菌隔离、污水净化等。因此，微纳马达的发展在应对未来生物医学、环境治理、微纳加工等领域的实际问题时体现出显著的优势。其中，光驱动微纳马达由于其运动行为可通过光远程控制这一独特性能而备受关注。光催化型微纳米马达是经典的光驱动微纳马达之一，一方面，其驱动所需能耗低，更为经济；另一方面，低能耗对环境的污染小，更为环保。因此，光催化型微纳马达的发展对未来使用微纳米技术解决微观世界的复杂问题具有重要的意义。董任峰副研究员对最近关于光催化型微纳马

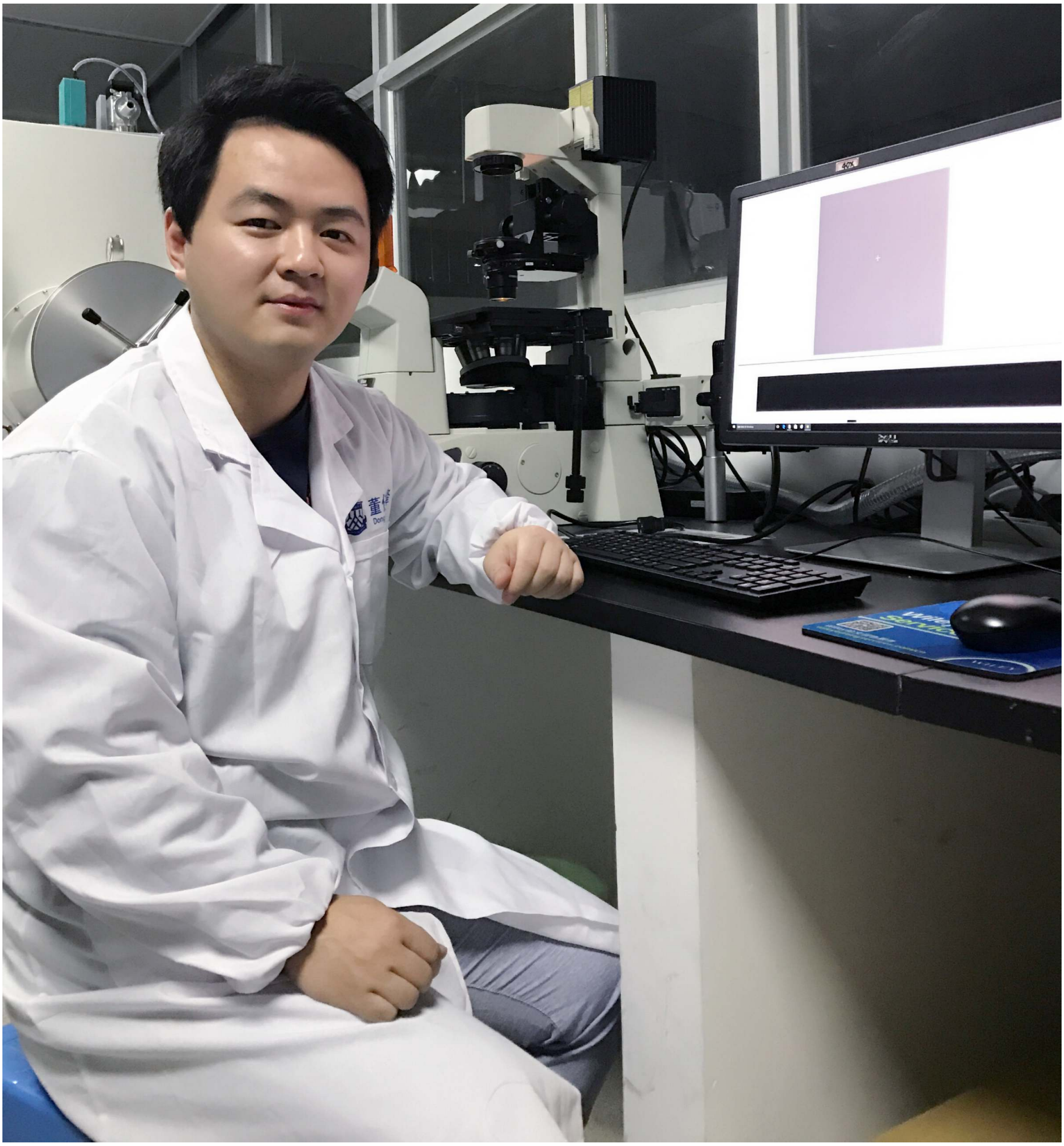
达的最新科研进展进行了系统的总结，成果以华南师范大学为第一单位发表在国际顶级期刊《Accounts of Chemical Research》上，此评述对开发动力强劲、能源环保、能耗经济且具备较好生物相容性的光驱动微纳马达具有非常好的指导作用。

蔡跃鹏教授课题组近年来一直致力于能源转换与存储材料设计制备与性能的研究。在能源存储材料方面，他们基于多孔金属-有机框架(MOF)材料为前驱体首次将制得的三元金属氧化物用作锂离子电池负极材料，表现出良好的电化学性能[Small, 2017,151020，IF = 9.598]。利用双功能金属有机框架(MOF)/作为前驱体可将多硫化锂固定在正极，能有效抑制锂硫电池的穿梭效应[ACS Appl. Mater. Interfaces, 2018, 10, 9435-9443, IF = 8.097；nanoscale, 2018, 10, 2774-2780, IF = 7.233]。利用多孔金属有机框架(MOFs)材料的可设计性，实现温室气体CO2的高选择性吸附以及二组分混合能源气体C2H2/C2H4的有效分离[ACS Appl. Mater. Interfaces, 2017, 9, 4701-4708; 2017, 9, 29374-29379, IF = 8.097]。

董任峰副研究员2012年-2014年国家公派赴美国University of California，San Diego博士联合培养，2016年以师资博士后身份加入蔡跃鹏教授课题组，2018年4月以青年拔尖人才身份入职华师，主要开展人造微纳米马达的结构与性能优化等能源转换方面的研究。目前共发表署名论文33篇，其中以第一或通讯作者身份发表SCI论文16篇。据谷歌学术统计，所发表论文总被引频次达1074篇次，其中3篇为ESI高被引论文，H因子为15。

自2016年5月入职华师以来，董任峰副研究员以第一作者、华师为第一单位，在Acc. Chem. Res. [2018, in press, IF = 20.955], J. Am. Chem. Soc.[2017, 139, 1722-1725,IF =14.357], Nanoscale[2017,9, 15027-15032,IF = 7.233] 等国际顶级期刊上发表多篇高水平学术论文。同时，以华南师范大学为依托单位申获了国家、省部级项目5项，包括国家自然科学基金青年项目，广东省自然科学基金自由申请项目，广东省自然科学基金博士启动项目，中国博士后基金特别资助项目和面上资助项目。





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影像

一夜春雨遍地金黄，最美华师惊艳了广州城！

“你的名字是？” “华师。”