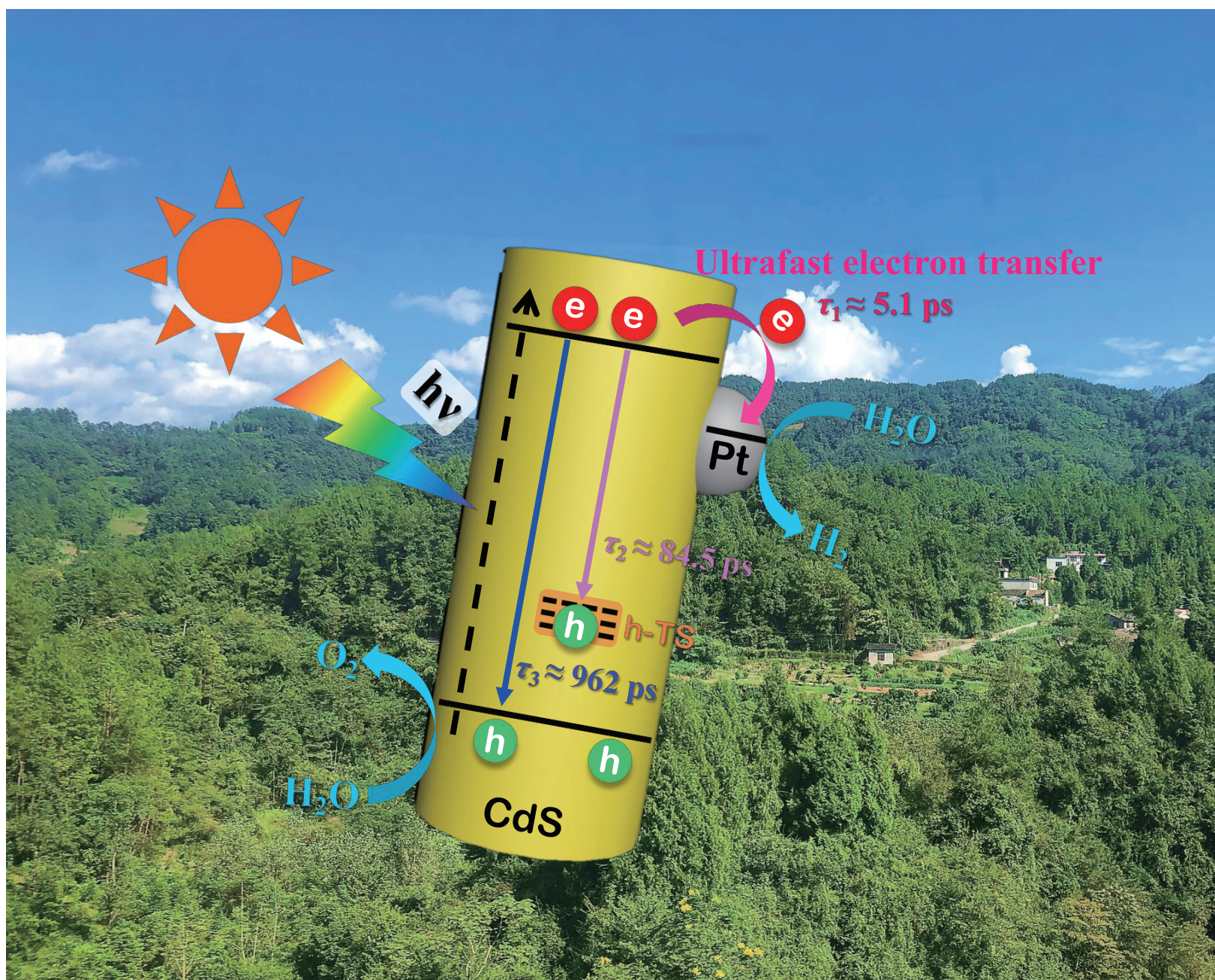




# Chinese Journal of Catalysis

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Volume 43 | Number 10 | 2022

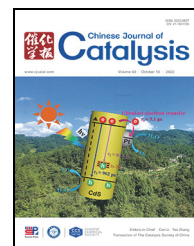




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## Chinese Journal of Catalysis

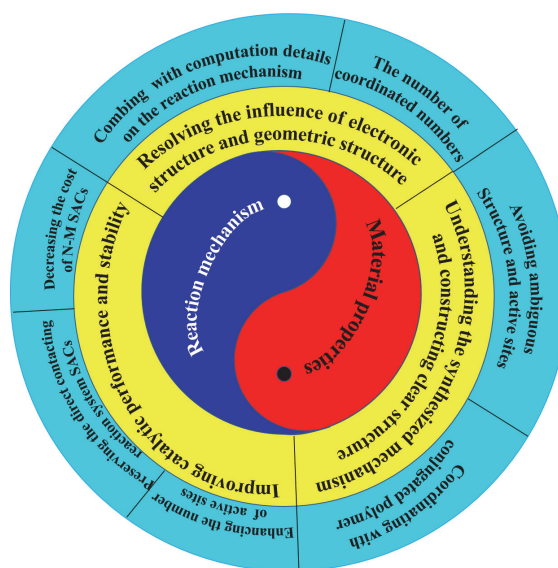
## Graphical Contents

## Reviews

*Chin. J. Catal.*, 2022, 43: 2453–2483 doi: 10.1016/S1872-2067(22)64104-4**Heterogeneous N-coordinated single-atom photocatalysts and electrocatalysts**

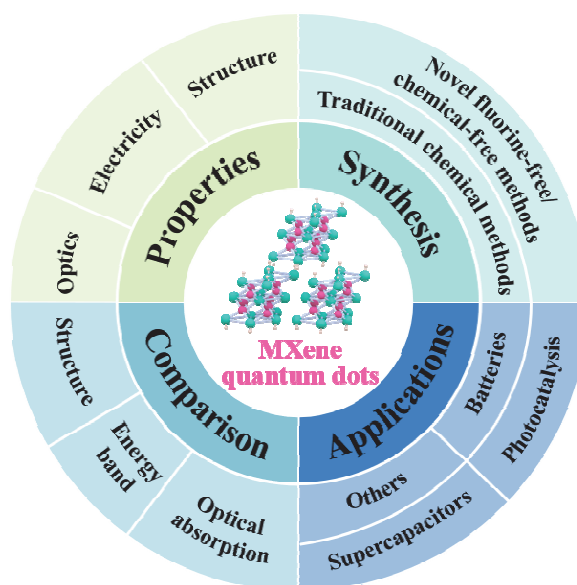
Rongchen Shen, Lei Hao, Yun Hau Ng \*, Peng Zhang, Arramel Arramel,  
Youji Li, Xin Li \*  
South China Agricultural University, China;  
City University of Hong Kong, China;  
Zhengzhou University, China;  
National University of Singapore, Singapore;  
Nano Center Indonesia, Indonesia;  
Jishou University, China

N-coordinated SMA catalysts exhibit unique catalytic performance in various reactions. This review explores the intimate correlation of intrinsic electronic structure, catalytic mechanism, and different electron states of SMA confinement.

*Chin. J. Catal.*, 2022, 43: 2484–2499 doi: 10.1016/S1872-2067(22)64102-0**MXene quantum dots of  $\text{Ti}_3\text{C}_2$ : Properties, synthesis, and energy-related applications**

Chen Guan, Xiaoyang Yue, Jiajie Fan, Qunjun Xiang \*  
University of Electronic Science and Technology of China;  
Zhengzhou University

This review presents the mechanism, characteristics, and comparisons of traditional chemical methods with novel fluorine-free/chemical-free methods and discusses the similarities and differences between MXene-derived quantum dots and 2D MXenes in terms of functional groups, light absorption capacity, energy band structure, and other properties.

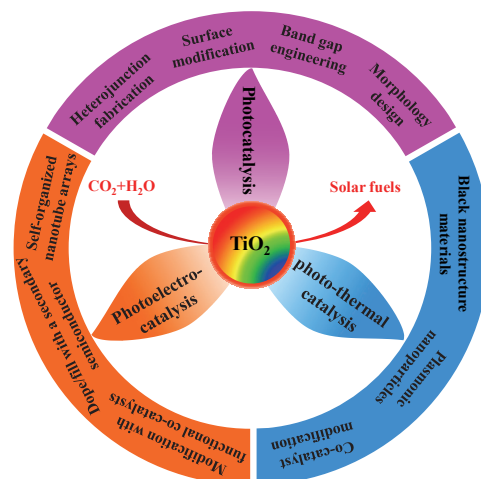




*Chin. J. Catal.*, 2022, 43: 2500–2529 doi: 10.1016/S1872-2067(21)64045-7

### TiO<sub>2</sub>-based photocatalysts for CO<sub>2</sub> reduction and solar fuel generation

Tao Zhang, Xiaochi Han, Nhat Truong Nguyen, Lei Yang, Xuemei Zhou\*  
Sichuan University, China;  
Concordia University, Canada



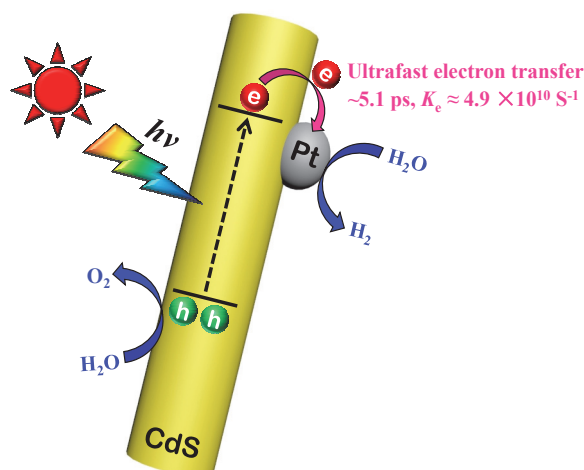
This review presents recent achievements in the solar-driven CO<sub>2</sub> reduction for solar fuel generation through TiO<sub>2</sub>-based photocatalysts. The approaches, mechanisms, and strategies to improve the photocatalytic activity and selectivity of TiO<sub>2</sub>-based photocatalysts have been systematically summarized.

## Articles

*Chin. J. Catal.*, 2022, 43: 2530–2538 doi: 10.1016/S1872-2067(22)64108-1

### Electron transfer kinetics in CdS/Pt heterojunction photocatalyst during water splitting

Jianjun Zhang, Gaoyuan Yang, Bowen He, Bei Cheng, Youji Li, Guijie Liang\*, Linxi Wang\*  
China University of Geosciences;  
Hubei University of Arts and Science;  
Wuhan University of Technology;  
Jishou University

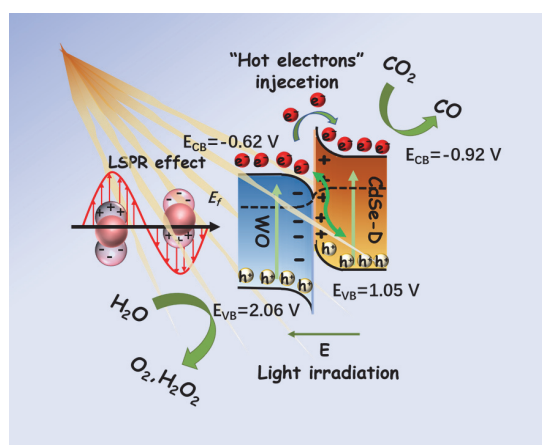


Electron transfer kinetics in CdS/Pt heterojunction photocatalysts during water splitting is studied by femtosecond transient absorption spectroscopy.

*Chin. J. Catal.*, 2022, 43: 2539–2547 doi: 10.1016/S1872-2067(21)64024-X

### Photocatalytic CO<sub>2</sub> conversion of W<sub>18</sub>O<sub>49</sub>/CdSe-Diethylenetriamine with high charge transfer efficiency: Synergistic effect of LSPR effect and S-scheme heterojunction

Yue Huang, Kai Dai\*, Jinfeng Zhang\*, Graham Dawson  
Huaibei Normal University;  
Xi'an Jiaotong-Liverpool University

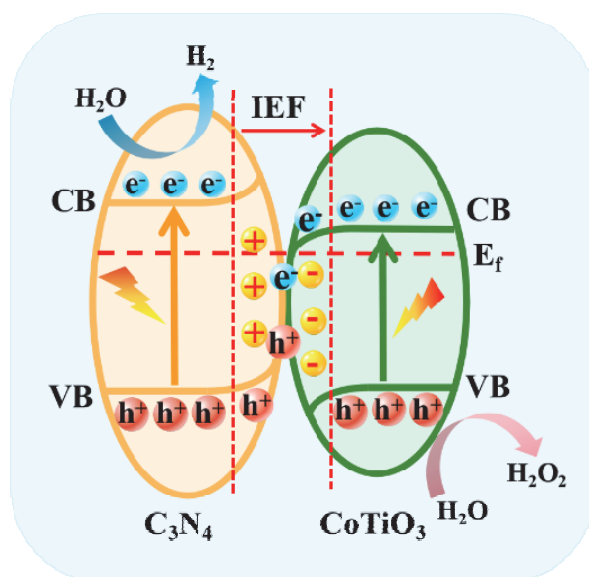


S-scheme W<sub>18</sub>O<sub>49</sub>/CdSe-diethylenetriamine heterojunction photocatalyst was successfully constructed. Compared with CdSe-D and W<sub>18</sub>O<sub>49</sub>, the increase in photocatalytic CO<sub>2</sub> production and stability of W<sub>18</sub>O<sub>49</sub>/CdSe-D composites is due to the synergy of LSPR effect caused by oxygen vacancy and the special separation of S-scheme heterojunction.

*Chin. J. Catal.*, 2022, 43: 2548–2557 doi: 10.1016/S1872-2067(22)64111-1

### g-C<sub>3</sub>N<sub>4</sub>/CoTiO<sub>3</sub> S-scheme heterojunction for enhanced visible light hydrogen production through photocatalytic pure water splitting

Aiyun Meng, Shuang Zhou, Da Wen, Peigang Han \*, Yaorong Su \*  
Shenzhen Technology University

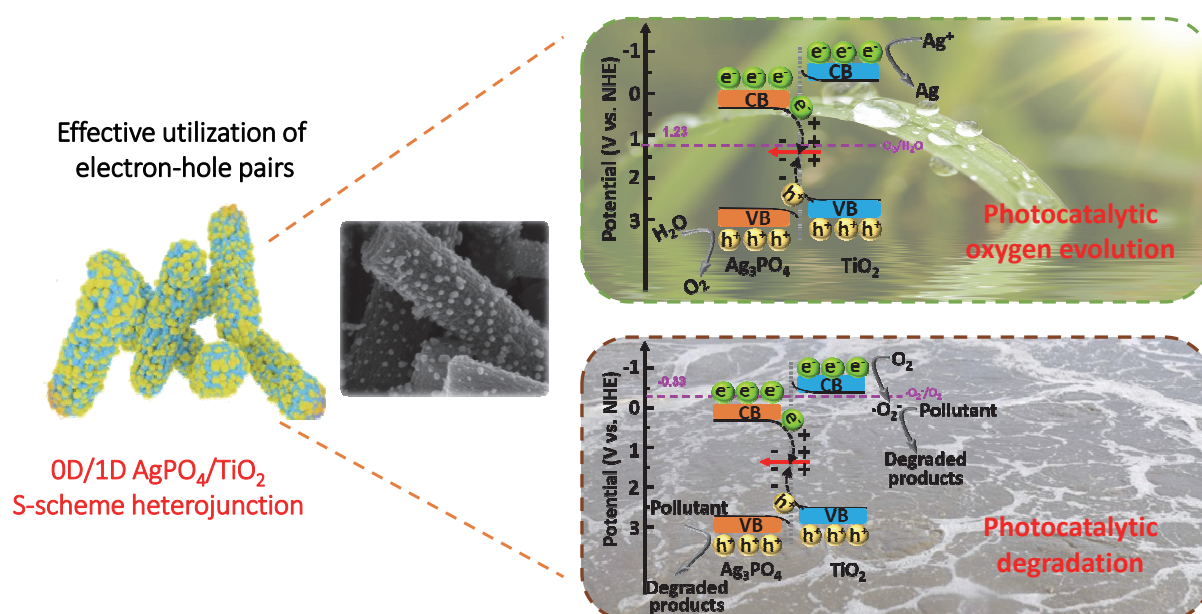


A novel g-C<sub>3</sub>N<sub>4</sub>/CoTiO<sub>3</sub> S-scheme heterojunction photocatalyst with extended visible light absorption, promoted charge separation, and strong redox capability was successfully constructed to achieve visible light photocatalytic H<sub>2</sub> production through pure water splitting.

*Chin. J. Catal.*, 2022, 43: 2558–2568 doi: 10.1016/S1872-2067(22)64099-3

### Constructing 0D/1D Ag<sub>3</sub>PO<sub>4</sub>/TiO<sub>2</sub> S-scheme heterojunction for efficient photodegradation and oxygen evolution

Yukun Zhu, Yan Zhuang, Lele Wang, Hua Tang \*, Xianfeng Meng, Xilin She \*  
Qingdao University; Jiangsu University



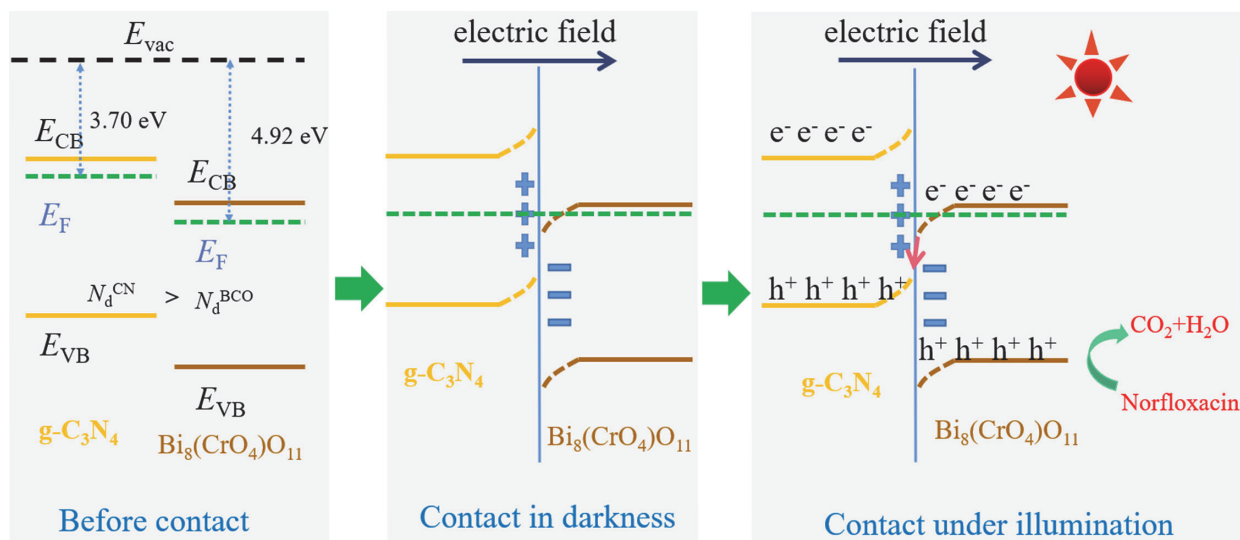
A 0D Ag<sub>3</sub>PO<sub>4</sub> nanoparticles/1D TiO<sub>2</sub> nanofibers S-scheme heterojunction with intimate interfacial contact was designed and exhibited excellent photocatalytic activity and stability in photocatalytic oxygen production and photocatalytic degradation of various organic contaminants, which can be attributed to the intimate interfacial contacts and rich active sites of 0D/1D geometry, fast charge carrier migration, and outstanding photoredox properties induced by the S-scheme charge-transfer route.



Chin. J. Catal., 2022, 43: 2569–2580 doi: 10.1016/S1872-2067(22)64142-1

### Self-assembly synthesis of S-scheme g-C<sub>3</sub>N<sub>4</sub>/Bi<sub>8</sub>(CrO<sub>4</sub>)O<sub>11</sub> for photocatalytic degradation of norfloxacin and bisphenol A

Xiaomeng Gu, Taijie Chen, Jian Lei, Yang Yang \*, Xiuzhen Zheng, Sujuan Zhang, Qiushi Zhu, Xianliang Fu, Sugang Meng \*, Shifu Chen \*  
Huaibei Normal University; Anqing Normal University

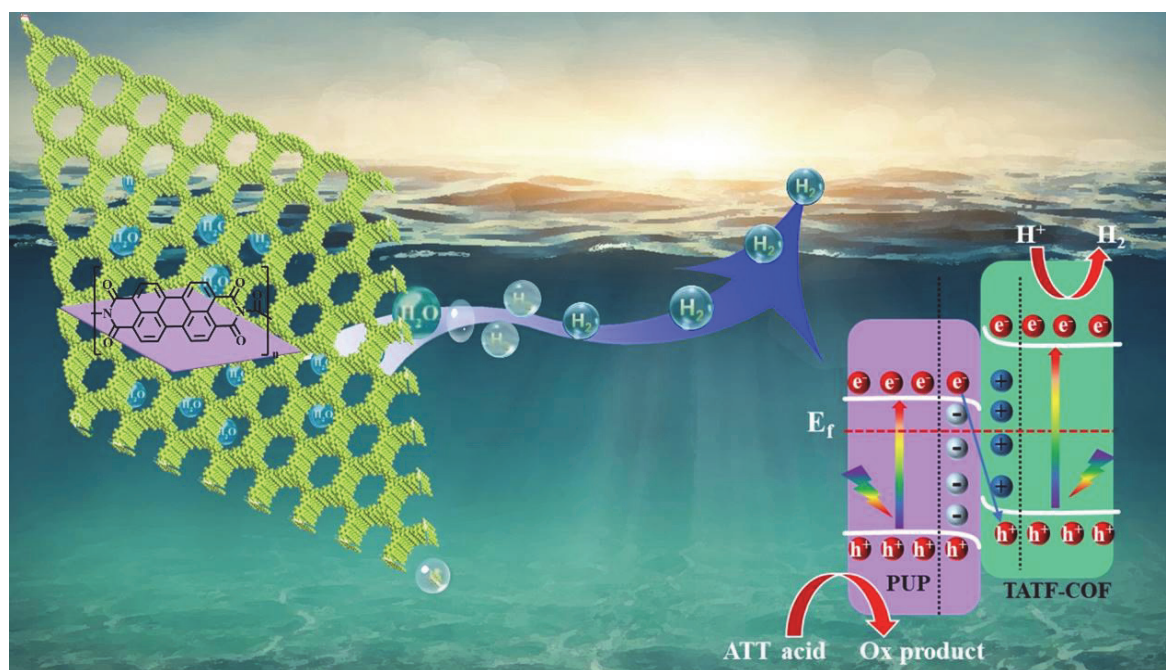


The S-scheme g-C<sub>3</sub>N<sub>4</sub>/Bi<sub>8</sub>(CrO<sub>4</sub>)O<sub>11</sub> heterojunctions were successfully synthesized and used for water purification, which exhibited remarkably improved charge transfer efficiency and photocatalytic antibiotic degradation activity under visible light illumination.

Chin. J. Catal., 2022, 43: 2581–2591 doi: 10.1016/S1872-2067(22)64130-5

### All-organic covalent organic frameworks/perylene diimide urea polymer S-scheme photocatalyst for boosted H<sub>2</sub> generation

Zizhan Liang, Rongchen Shen \*, Peng Zhang, Youji Li, Neng Li \*, Xin Li \*  
South China Agricultural University; Zhengzhou University; Jishou University; Wuhan University of Technology

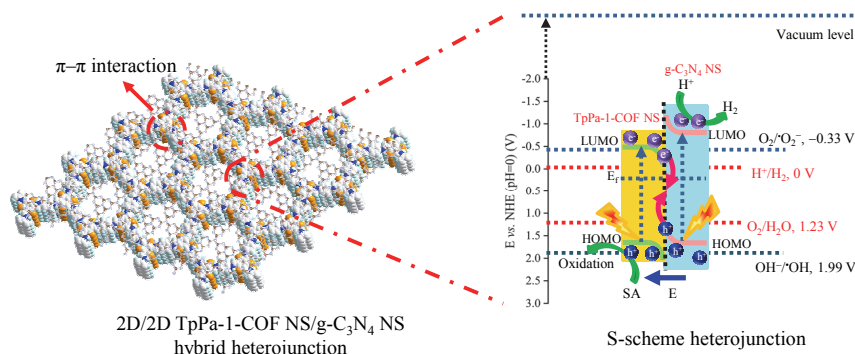


A conjugated COF/PUP all-organic heterostructure with S-Scheme interfacial charge-transfer channels was successfully developed and manufactured for the first time at ambient temperature *via* an *in situ* coupling of the 2D TATF-COF with PUP. The resulting S-scheme heterojunction exhibits an ultrahigh hydrogen-evolution rate (94.5 mmol h<sup>-1</sup> g<sup>-1</sup>) and an AQE of up to 19.7% at 420 nm.

*Chin. J. Catal.*, 2022, 43: 2592–2605 doi: 10.1016/S1872-2067(22)64094-4

## 2D/2D S-scheme heterojunction with a covalent organic framework and g-C<sub>3</sub>N<sub>4</sub> nanosheets for highly efficient photocatalytic H<sub>2</sub> evolution

Pengyu Dong, Aicaijun Zhang, Ting Cheng, Jinkang Pan, Jun Song, Lei Zhang, Rongfeng Guan, Xinguo Xi \*, Jinlong Zhang \*  
Yancheng Institute of Technology; East China University of Science and Technology



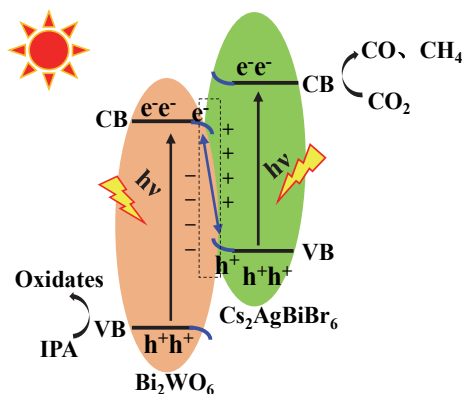
A 2D/2D S-scheme heterojunction containing TpPa-1-COF/g-C<sub>3</sub>N<sub>4</sub> NS was developed through intermolecular  $\pi$ - $\pi$  interactions, which improved the charge transfer owing to the built-in electric field and exhibited an outstanding photocatalytic H<sub>2</sub> evolution of 1153  $\mu\text{mol g}^{-1} \text{h}^{-1}$ .

*Chin. J. Catal.*, 2022, 43: 2606–2614 doi: 10.1016/S1872-2067(22)64091-9

## Ultrasonic-assisted fabrication of Cs<sub>2</sub>AgBiBr<sub>6</sub>/Bi<sub>2</sub>WO<sub>6</sub> S-scheme heterojunction for photocatalytic CO<sub>2</sub> reduction under visible light

Jiaqi Wang, Hao Cheng, Dingqiong Wei, Zhaohui Li \*  
Fuzhou University

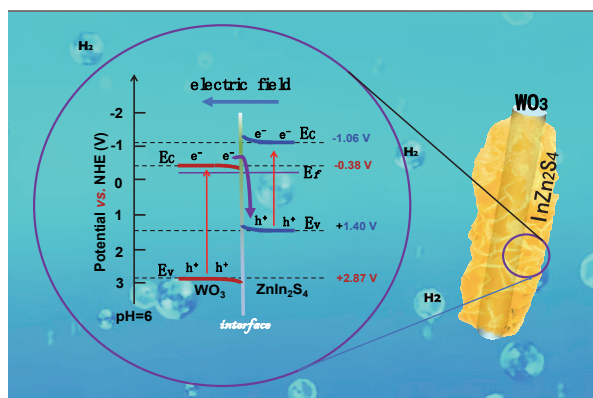
Cs<sub>2</sub>AgBiBr<sub>6</sub>/Bi<sub>2</sub>WO<sub>6</sub>, fabricated via an ultrasonic-assisted process, exhibited a superior photocatalytic activity for CO<sub>2</sub> reduction to produce CH<sub>4</sub> and CO under visible light, owing to the presence of an efficient S-scheme heterojunction.



*Chin. J. Catal.*, 2022, 43: 2615–2624 doi: 10.1016/S1872-2067(22)64134-2

## A novel S-scheme 3D ZnIn<sub>2</sub>S<sub>4</sub>/WO<sub>3</sub> heterostructure for improved hydrogen production under visible light irradiation

Mengyu Zhao, Sen Liu, Daimei Chen \*, Sushu Zhang, Sónia A. C. Carabineiro, Kangle Lv \*  
China University of Geosciences, China; South-Central Minzu University, China; Universidade NOVA de Lisboa, Portugal



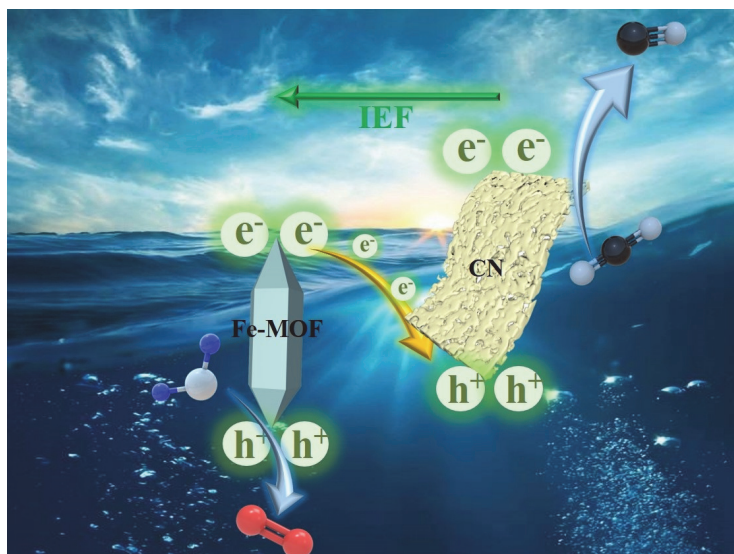
In-plane epitaxial growth of ZnIn<sub>2</sub>S<sub>4</sub> nanosheets on the surface of WO<sub>3</sub> nanorods was achieved by a facile solvothermal method, and this novel S-scheme 3D ZnIn<sub>2</sub>S<sub>4</sub>/WO<sub>3</sub> heterostructure exhibits high visible photocatalytic hydrogen production rate.



*Chin. J. Catal.*, 2022, 43: 2625–2636 doi: 10.1016/S1872-2067(22)64115-9

### 3D Fe-MOF embedded into 2D thin layer carbon nitride to construct 3D/2D S-scheme heterojunction for enhanced photoreduction of CO<sub>2</sub>

Xiaoxue Zhao, Mengyang Xu, Xianghai Song, Weiqiang Zhou, Xin Liu, Pengwei Huo \*  
Jiangsu University; Zhengzhou University

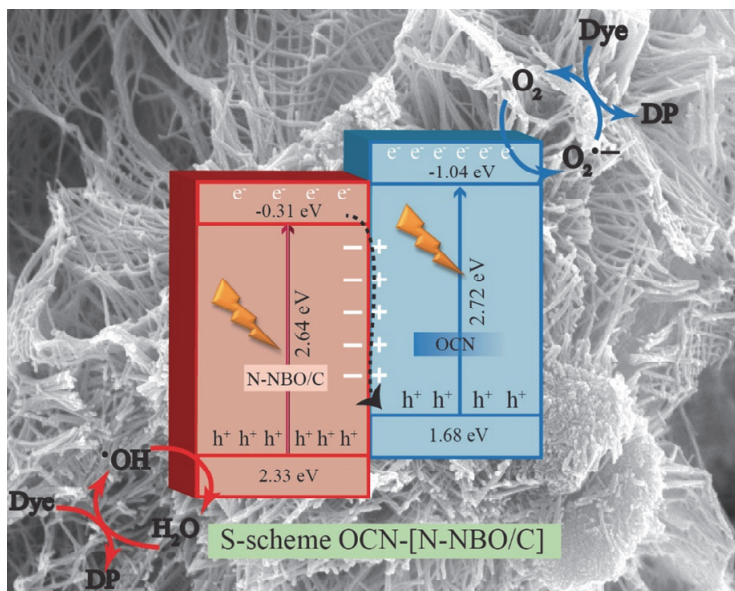


During the photocatalytic CO<sub>2</sub> reduction reaction, the 50CN/Fe-MOF follows the S-scheme electron transfer pathway, which not only improves the efficient separation of charge carriers, but also maintains a high redox capacity.

*Chin. J. Catal.*, 2022, 43: 2637–2651 doi: 10.1016/S1872-2067(21)64038-X

### Construction of 3D flowers-like O-doped g-C<sub>3</sub>N<sub>4</sub>-[N-doped Nb<sub>2</sub>O<sub>5</sub>/C] heterostructure with direct S-scheme charge transport and highly improved visible-light-driven photocatalytic efficiency

Fahim A. Qaraah, Samah A. Mahyoub, Abdo Hezam, Amjad Qaraah, Qasem A. Drmash, Guangli Xiu \*  
East China University of Science and Technology, China; University of Rostock, Germany; Tianjin University, China;  
King Fahd University of Petroleum & Minerals (KFUPM), Saudi Arabia



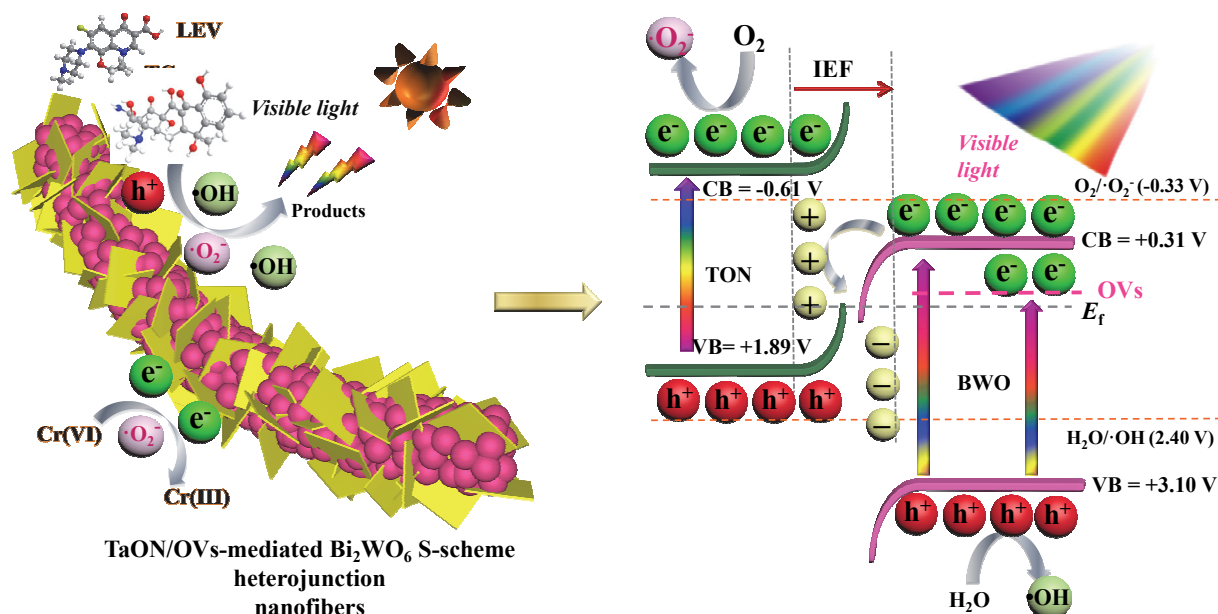
The hierarchical O-doped g-C<sub>3</sub>N<sub>4</sub>-[N-Nb<sub>2</sub>O<sub>5</sub>/C] step-scheme photocatalyst with a 3D flowers-like structure delivers superior RhB photodegradation performance compared to O-doped g-C<sub>3</sub>N<sub>4</sub> and N-Nb<sub>2</sub>O<sub>5</sub>/C due to the formation of an S-scheme heterojunction between O-doped g-C<sub>3</sub>N<sub>4</sub> and N-Nb<sub>2</sub>O<sub>5</sub>/C.

*Chin. J. Catal.*, 2022, 43: 2652–2664 doi: 10.1016/S1872-2067(22)64106-8

### S-scheme photocatalyst TaON/Bi<sub>2</sub>WO<sub>6</sub> nanofibers with oxygen vacancies for efficient abatement of antibiotics and Cr(VI): Intermediate eco-toxicity analysis and mechanistic insights

Shijie Li \*, Mingjie Cai, Yanping Liu, Chunchun Wang, Kangle Lv, Xiaobo Chen \*

Zhejiang Ocean University, China; South-Central Minzu University, China; University of Missouri-Kansas City, USA



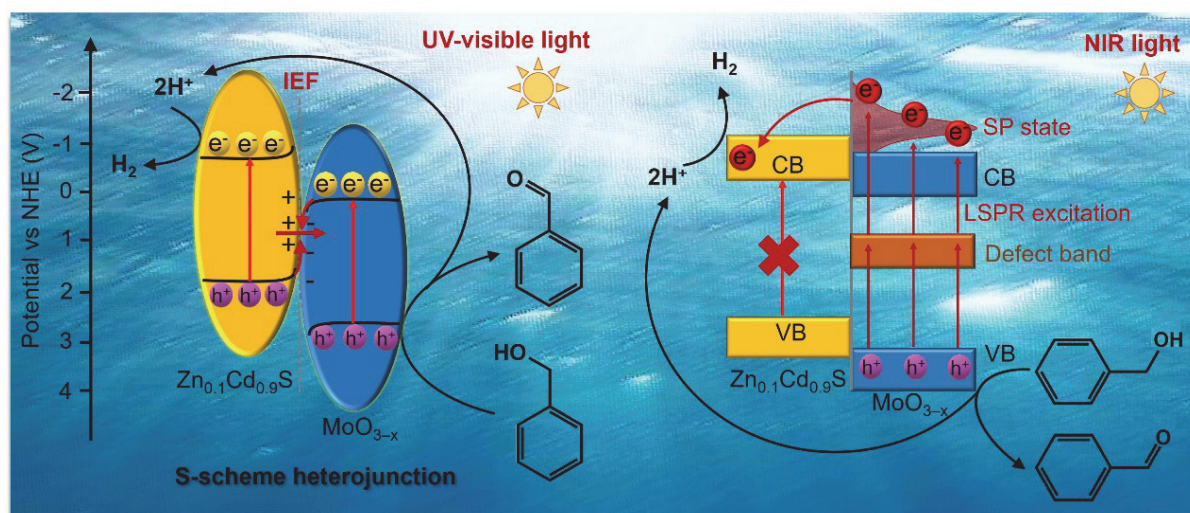
A novel TaON/Bi<sub>2</sub>WO<sub>6</sub> core-shell S-scheme heterojunction nanofibers with oxygen vacancies has been designed for highly efficient visible-light photocatalytic abatement of antibiotics and Cr(VI). The superior catalytic performance is benefiting from the efficient separation of high energetic charge carriers with optimal photo-redox power by S-scheme mechanism and rich oxygen vacancies, as well as the compact contact by the *in-situ* growth.

*Chin. J. Catal.*, 2022, 43: 2665–2677 doi: 10.1016/S1872-2067(22)64124-X

### Noble-metal-free plasmonic MoO<sub>3-x</sub>-based S-scheme heterojunction for photocatalytic dehydrogenation of benzyl alcohol to storable H<sub>2</sub> fuel and benzaldehyde

Yingcong Wei, Qiqi Zhang, Ying Zhou, Xiongfeng Ma, Lele Wang, Yanjie Wang, Rongjian Sa, Jinlin Long, Xianzhi Fu, Rusheng Yuan \*

Fuzhou University; Jiangsu University; Dongguan University of Technology; Minjiang University



Coproduction of H<sub>2</sub> and benzaldehyde from benzyl alcohol with simultaneous utilization of photogenerated electrons and holes over Zn<sub>0.1</sub>Cd<sub>0.9</sub>S/MoO<sub>3-x</sub> S-scheme heterojunction photocatalyst under UV-visible-NIR light excitation were achieved.

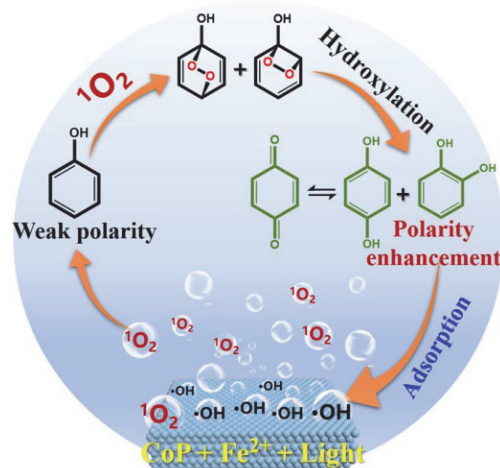


*Chin. J. Catal.*, 2022, 43: 2678–2689 doi: 10.1016/S1872-2067(22)64117-2

### Singlet oxygen synergistic surface-adsorbed hydroxyl radicals for phenol degradation in CoP catalytic photo-Fenton

Haoran Yu, Danxu Liu, Hengyi Wang, Haishuang Yu, Qingyun Yan,  
Jiahui Ji \*, Jinlong Zhang, Mingyang Xing \*  
*East China University of Science and Technology*

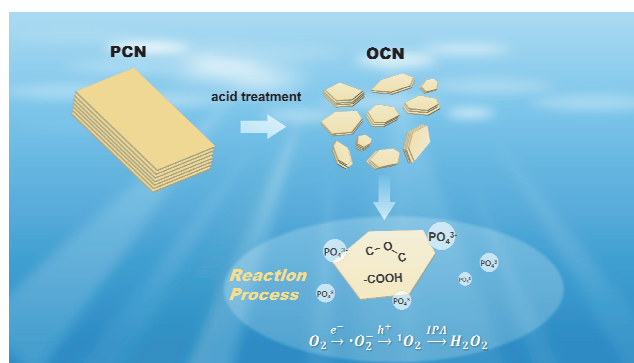
The synergistic effect of  $^1\text{O}_2$  and  $\bullet\text{OH}_{\text{ads}}$  in the CoP/Fe $^{2+}$ /AM1.5 system was confirmed.  $^1\text{O}_2$  promotes the hydroxylation of weakly polar phenol, which can then be adsorbed to the CoP surface and degraded by  $\bullet\text{OH}_{\text{ads}}$  on its surface.



*Chin. J. Catal.*, 2022, 43: 2690–2698 doi: 10.1016/S1872-2067(22)64114-7

### An efficient strategy for photocatalytic hydrogen peroxide production over oxygen-enriched graphitic carbon nitride with sodium phosphate

Yu Zhang, Ling Zhang, Di Zeng, Wenjing Wang, Juxue Wang, Weimin Wang, Wenzhong Wang \*  
*Shanghai Institute of Ceramics, Chinese Academy of Sciences; University of Chinese Academy of Sciences*



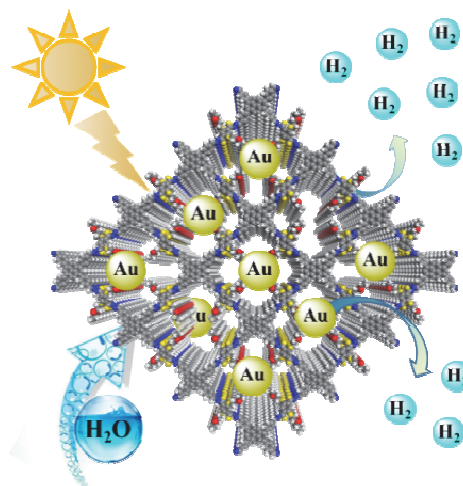
Oxygen-rich g-C $_3$ N $_4$  with abundant nitrogen vacancies was synthesized for efficient photocatalytic H $_2$ O $_2$  production. The reaction pathway was changed by introducing Na $_3$ PO $_4$ , and singlet oxygen played an important role in H $_2$ O $_2$  generation.

*Chin. J. Catal.*, 2022, 43: 2699–2707 doi: 10.1016/S1872-2067(22)64118-4

### A thioether-functionalized pyrene-based covalent organic framework anchoring ultrafine Au nanoparticles for efficient photocatalytic hydrogen generation

Zhiming Zhou, Chuanbiao Bie, Peize Li, Bien Tan, Yan Shen \*  
*Huazhong University of Science and Technology;  
China University of Geosciences*

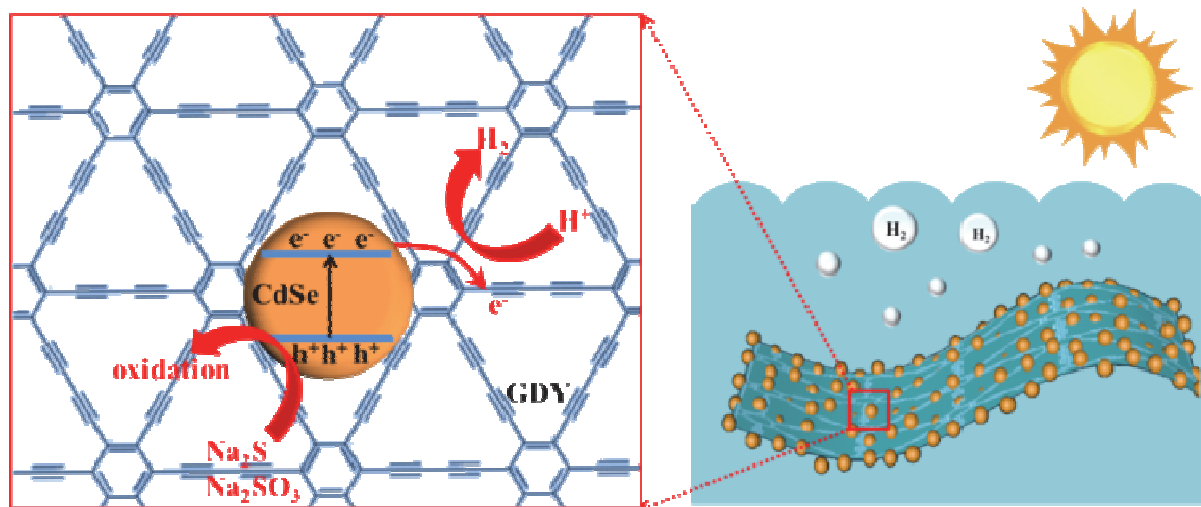
A thioether-functionalized pyrene-based COF was devised and built for efficient photocatalytic hydrogen generation. Its superior photocatalytic performance can be attributed to the peculiar pores of COF support and coordination contact between thioether groups and Au.



*Chin. J. Catal.*, 2022, 43: 2708–2719 doi: 10.1016/S1872-2067(21)64053-6

### Mechanochemical preparation and application of graphdiyne coupled with CdSe nanoparticles for efficient photocatalytic hydrogen production

Zhaobo Fan, Xin Guo \*, Mengxue Yang, Zhiliang Jin \*  
North Minzu University

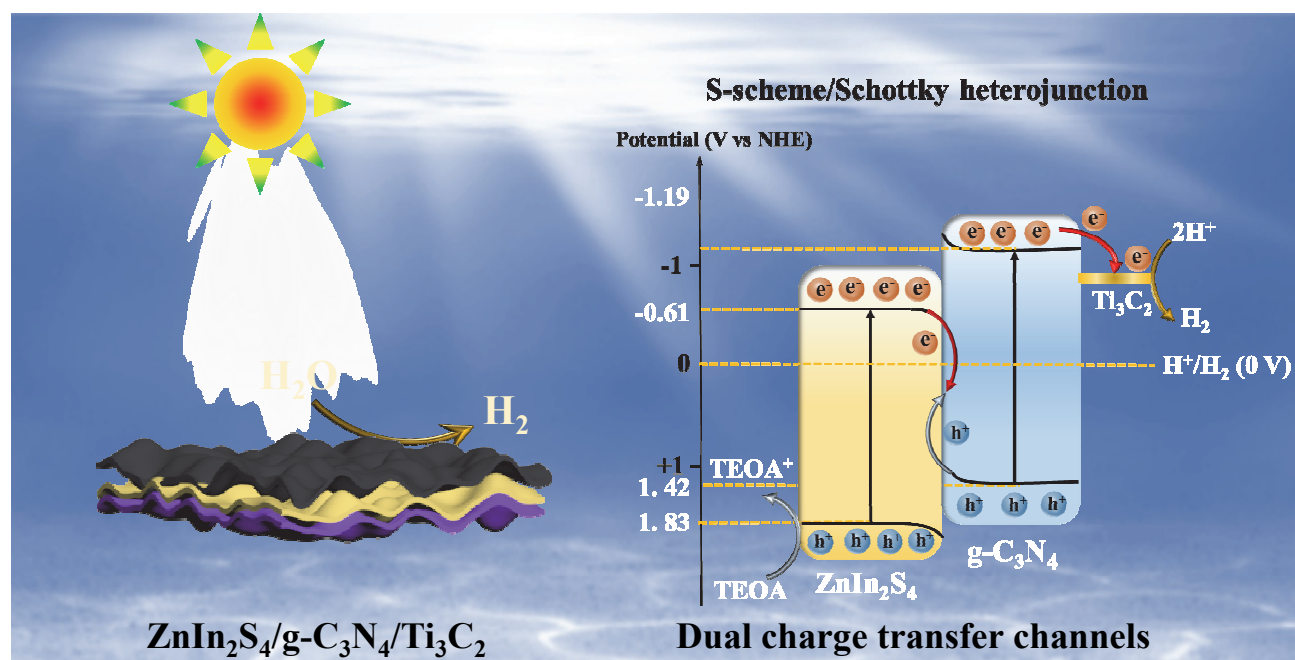


Graphdiyne was successfully prepared by the mechanochemical coupling of precursors  $C_6Br_6$  and  $CaC_2$  using a ball-milling approach. Graphdiyne coupled with CdSe exhibits high hydrogen evolution activity.

*Chin. J. Catal.*, 2022, 43: 2720–2731 doi: 10.1016/S1872-2067(22)64133-0

### Dual transfer channels of photo-carriers in 2D/2D/2D sandwich-like $ZnIn_2S_4/g-C_3N_4/Ti_3C_2$ MXene S-scheme/Schottky heterojunction for boosting photocatalytic $H_2$ evolution

Lele Wang, Tao Yang, Lijie Peng, Qiqi Zhang, Xilin She \*, Hua Tang, Qinqin Liu \*  
Jiangsu University; Qingdao University; Fuzhou University



A 2D/2D/2D sandwich-like ternary  $ZnIn_2S_4/g-C_3N_4/Ti_3C_2$  MXene heterojunction with dual carrier transfer channels was designed to boost the photogenerated carrier separation and migration.

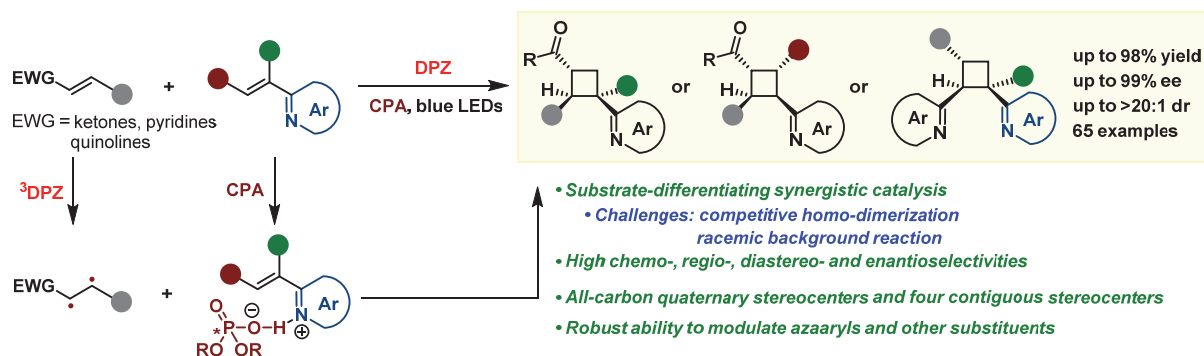


*Chin. J. Catal.*, 2022, 43: 2732–2742 doi: 10.1016/S1872-2067(22)64156-1

### Enantioselective intermolecular [2 + 2] photocycloadditions of vinylazaarenes with triplet-state electron-deficient olefins

Dong Tian, Xin Sun, Shanshan Cao, Er-Meng Wang, Yanli Yin, Xiaowei Zhao, Zhiyong Jiang \*

*Henan University; Henan Normal University; Henan University of Technology*



Asymmetric intermolecular [2 + 2] photocycloaddition reactions of electron-withdrawing olefins with vinylazaarenes have been developed by exploiting a substrate-differentiating synergistic catalysis platform.

## 目次

### 综 述

2453

非均相氮配位单原子光催化剂和电催化剂

沈荣晨, 郝磊, 吴永豪, 张鹏, Arramel Arramel, 李佑稷, 李鑫

2484

MXene量子点( $\text{Ti}_3\text{C}_2$ ): 性质、合成及其在能源领域的应用

关晨, 岳晓阳, 范佳杰, 向全军

2500

二氧化钛基光催化剂用于二氧化碳还原和太阳燃料的生产

张涛, 韩晓驰, Nhat Truong Nguyen, 杨磊, 周雪梅

### 论 文

2530

CdS/Pt异质结光催化剂光解水的电子转移动力学

张建军, 杨高元, 何博文, 程蓓, 李佑稷, 梁桂杰, 王临曦

2539

具有高效电荷转移的 $\text{W}_{18}\text{O}_{49}/\text{CdSe}$ -二乙烯三胺光催化 $\text{CO}_2$ 转化: LSPR效应和S型异质结协同效应

黄悦, 代凯, 张金锋, Graham Dawson

2548

$\text{g-C}_3\text{N}_4/\text{CoTiO}_3$ 梯型异质结及其增强的可见光催化分解纯水制氢性能

孟爱云, 周双, 温达, 韩培刚, 苏耀荣

2558

构建0D/1D  $\text{Ag}_3\text{PO}_4/\text{TiO}_2$  S型异质结以实现高效光降解和析氧

朱玉坤, 庄严, 王乐乐, 唐华, 孟献丰, 余希林

2569

$\text{g-C}_3\text{N}_4/\text{Bi}_8(\text{CrO}_4)\text{O}_{11}$  S型异质结的自组装制备及其光催化降解诺氟沙星和双酚A

顾晓蒙, 陈太杰, 雷健, 杨洋, 郑秀珍, 张素娟, 朱秋实, 付先亮, 孟苏刚, 陈士夫

2581

全有机COF/PUP S型光催化剂分解水制氢的性能研究

梁子展, 沈荣晨, 张鹏, 李佑稷, 李能, 李鑫

2592

采用共价有机骨架(COF)和 $\text{g-C}_3\text{N}_4$ 纳米片构筑2D/2D S型异质结并用于高效光催化析氢

董鹏玉, 张艾彩, 程婷, 潘劲康, 宋骏, 张磊, 关荣锋, 吴新国, 张金龙

2606

超声辅助制备 $\text{Cs}_2\text{AgBiBr}_6/\text{Bi}_2\text{WO}_6$  S型异质结用于可见光光催化 $\text{CO}_2$ 还原

王佳琦, 程浩, 魏丁琮, 李朝晖

2615

$\text{ZnIn}_2\text{S}_4$ 纳米片与 $\text{WO}_3$ 纳米棒构建3D结构的S型异质结用于可见光光催化分解水产氢

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2625

$\text{Fe-MOF/g-C}_3\text{N}_4$ 嵌入式3D/2D S型异质结的构建及其光还原 $\text{CO}_2$ 性能

赵小雪, 许梦阳, 宋相海, 周伟强, 刘鑫, 霍鹏伟

2637

通过直接S型电荷转移和高度改进的可见光驱动光催化效率构建3D花状O-掺杂 $\text{g-C}_3\text{N}_4$ -[N-掺杂 $\text{Nb}_2\text{O}_5/\text{C}$ ]异质结

Fahim A. Qaraah, Samah A. Mahyoub, Abdo Hezam, Amjad Qaraah, Qasem A. Drmash, 修光利

2652

新型氮氧化钼/氧空位钨酸铋S型异质结纤维用于高效光催化降解抗生素和还原六价铬: 产物毒性分析和光催化机理研究

李世杰, 蔡铭洁, 刘艳萍, 王春春, 吕康乐, 陈晓波

2665

非贵金属等离子共振增强 $\text{MoO}_3-x$ 基S型异质结光催化苯甲醇氧化同步产氢和苯甲醛

魏英聪, 张琪琪, 周颖, 马雄风, 王乐乐, 王严杰, 洒荣建, 龙金林, 付贤智, 员汝胜

2678

CoP助催化光芬顿中单线态氧协同表面吸附羟基自由基降解苯酚

俞浩然, 刘丹旭, 王恒屹, 于海爽, 闫青云, 嵇家辉, 张金龙, 邢明阳

2690

富氧石墨相氮化碳在磷酸钠溶液中高效光催化合成过氧化氢

张瑜, 张玲, 曾滴, 王文婧, 王举雪, 王伟民, 王文中

2699

一种锚定精细金纳米颗粒的硫醚功能化茈萸基共价有机框架用于高效光催化制氢

周志明, 别传彪, 李沛泽, 谭必恩, 申燕

2708

机械法制备石墨二炔并耦合CdSe纳米粒子高效光催化制氢  
范召博, 郭鑫, 杨梦雪, 靳治良

2720

2D/2D/2D三明治结构ZnIn<sub>2</sub>S<sub>4</sub>/g-C<sub>3</sub>N<sub>4</sub>/Ti<sub>3</sub>C<sub>2</sub> Mxene S型异质  
结-肖特基结双通道电荷转移路径促进的光催化析氢  
王乐乐, 杨涛, 彭李杰, 张琪琪, 余希林, 唐华, 刘芹芹

2732

乙烯基氮杂芳烃参与的不对称分子间[2 + 2]光环加成反应  
田栋, 孙鑫, 曹珊珊, 王二萌, 尹艳丽, 赵筱薇, 江智勇

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