



# Chinese Journal of Catalysis

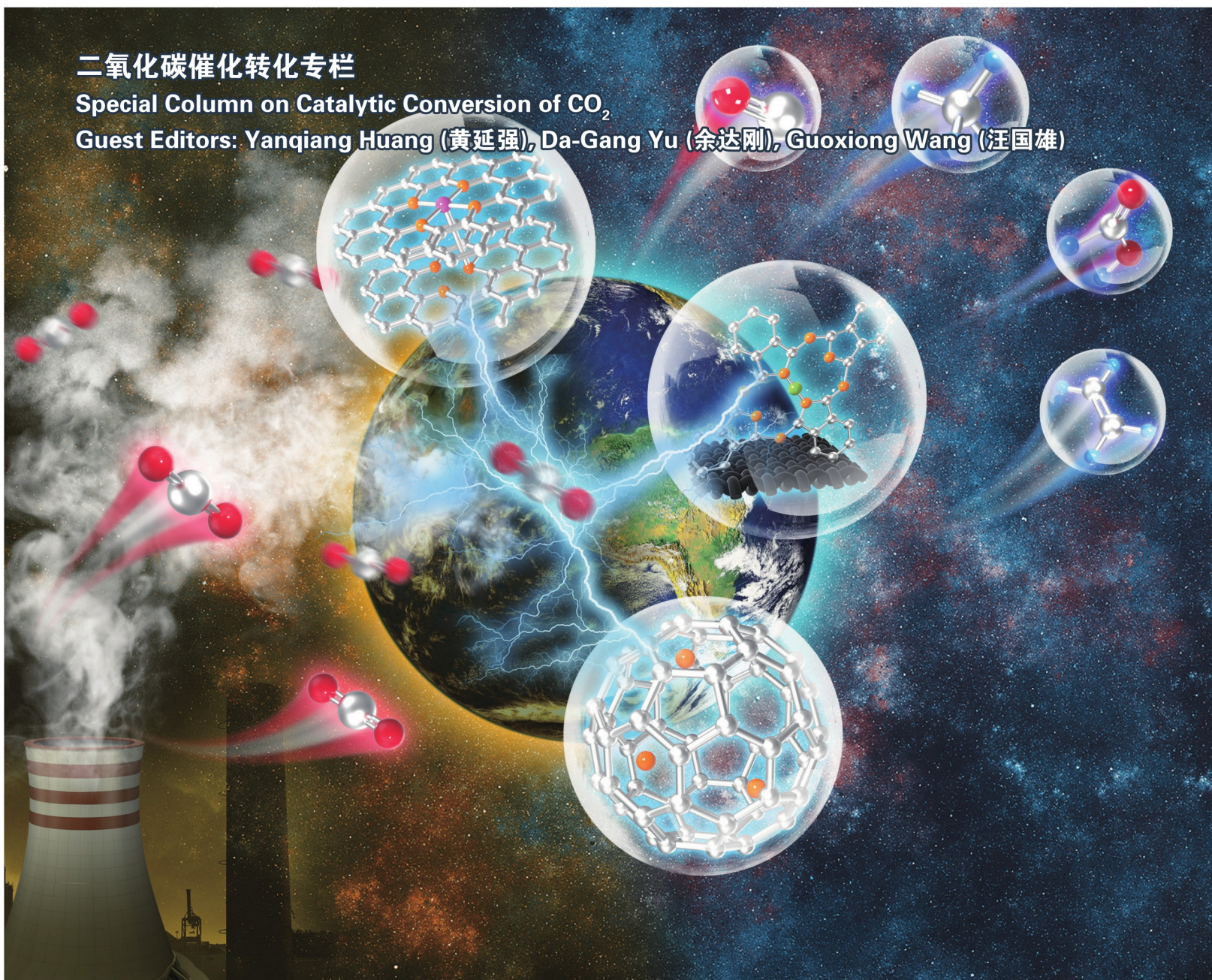
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二氧化碳催化转化专栏

Special Column on Catalytic Conversion of CO<sub>2</sub>

Guest Editors: Yanqiang Huang (黄延强), Da-Gang Yu (余达刚), Guoxiong Wang (汪国雄)



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**Special column on catalytic conversion of CO<sub>2</sub>**  
 Guest Editors: Yanqiang Huang, Da-Gang Yu, Guoxiong Wang

Chinese Journal of Catalysis  
**Graphical Contents**

**Special column on catalytic conversion of CO<sub>2</sub>**

*Chin. J. Catal.*, 2022, 43: 1545–1546 doi: 10.1016/S1872-2067(22)64112-3 **[Editorial]**

**Preface to special column on catalytic conversion of CO<sub>2</sub>**

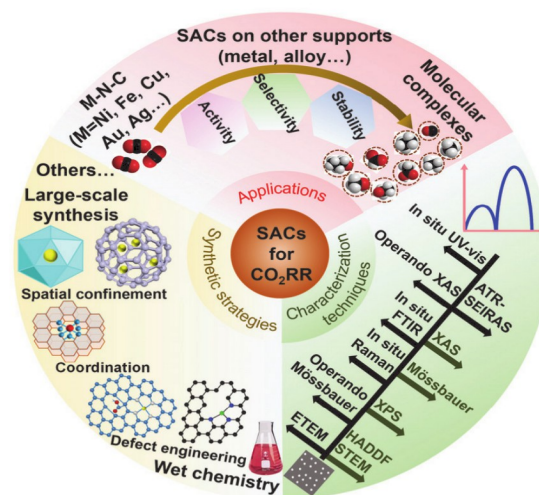
Yanqiang Huang, Da-Gang Yu, Guoxiong Wang (Guest Editors)  
*Dalian Institute of Chemical Physics, Chinese Academy of Sciences; Sichuan University*



*Chin. J. Catal.*, 2022, 43: 1547–1597 doi: 10.1016/S1872-2067(21)64000-7 **[Review]**

**Single atom-based catalysts for electrochemical CO<sub>2</sub> reduction**

Qian Sun, Chen Jia, Yong Zhao, Chuan Zhao \*  
*The University of New South Wales, Australia*



This review introduces the synthesis of SACs, summarizes their CO<sub>2</sub>RR applications, discusses the characterization techniques such as *in situ/operando* skills to reveal the in-depth catalytic mechanism and provides future directions of SACs and molecular catalysts.

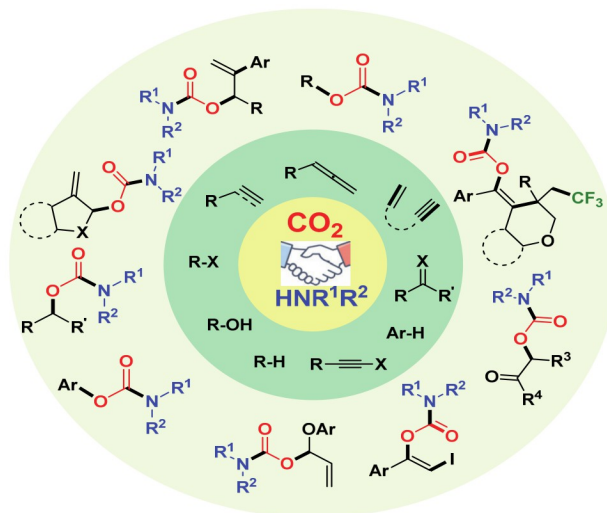


*Chin. J. Catal.*, 2022, 43: 1598–1617 doi: 10.1016/S1872-2067(21)64029-9 [Review]

### Recent advances in fixation of CO<sub>2</sub> into organic carbamates through multicomponent reaction strategies

Lu Wang, Chaorong Qi \*, Wenfang Xiong, Huanfeng Jiang \*  
South China University of Technology

This review summarizes the recent advances in the synthesis of organic carbamates from CO<sub>2</sub> through multicomponent reaction strategies. Future perspectives and challenges in incorporating CO<sub>2</sub> into carbamates are also presented.

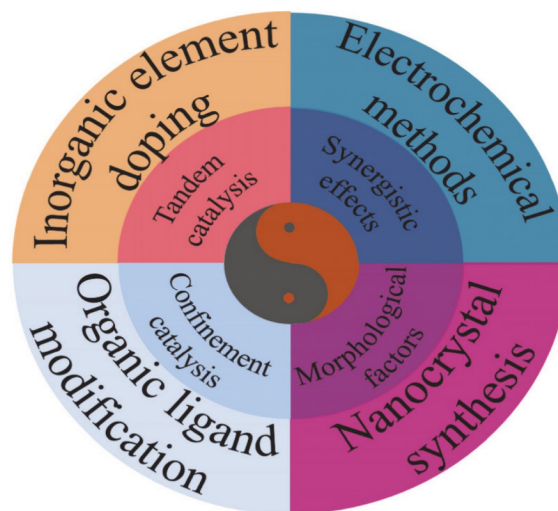


*Chin. J. Catal.*, 2022, 43: 1618–1633 doi: 10.1016/S1872-2067(21)63965-7 [Review]

### Tuning strategies and structure effects of electrocatalysts for carbon dioxide reduction reaction

Cong Liu, Xuanhao Mei, Ce Han, Xue Gong, Ping Song \*, Weilin Xu \*  
Changchun Institute of Applied Chemistry, Chinese Academy of Sciences;  
University of Science and Technology of China

An overview of catalysts tuning strategies has been provided, including electrochemical methods, nanocrystal synthesis, and a series of structure effects such as tandem catalysis, synergistic effects, and confinement catalysis.



*Chin. J. Catal.*, 2022, 43: 1634–1641 doi: 10.1016/S1872-2067(21)63967-0 [Review]

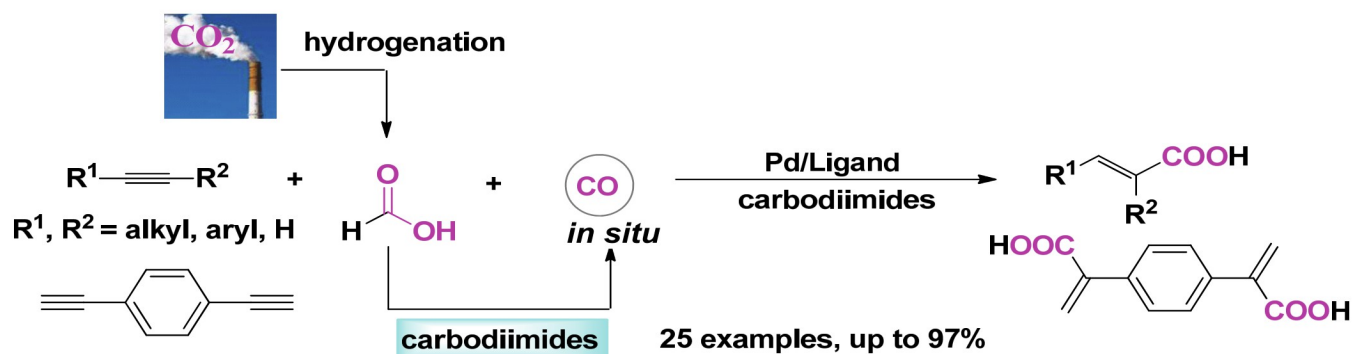
### Progresses on carbon dioxide electroreduction into methane

Han Zheng, Zhengwu Yang, Xiangdong Kong, Zhigang Geng \*, Jie Zeng \*  
University of Science and Technology of China

We summarized the recent progresses on CO<sub>2</sub> electroreduction into CH<sub>4</sub> from the perspective of catalyst design strategies including construction of sub-nanometer catalytic sites, modulation of interfaces, *in-situ* structural evolution, and engineering of tandem catalysts.



Chin. J. Catal., 2022, 43: 1642–1651 doi: 10.1016/S1872-2067(21)63848-2 [Article]

**Efficient hydrocarboxylation of alkynes based on carbodiimide-regulated *in situ* CO generation from HCOOH: An alternative indirect utilization of CO<sub>2</sub>**Shu-Mei Xia, Zhi-Wen Yang, Kai-Hong Chen, Ning Wang, Liang-Nian He \*  
Nankai University

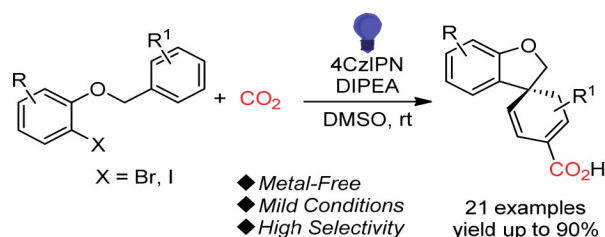
- use carbodiimide as activator for hydrocarboxylation of alkynes
- high TON value up to 900
- no toxic CO and the indirect use of CO<sub>2</sub>
- first synthesis of 2,2'-(1,4-phenylene)diacrylic acid
- high chem-, regio- and stereoselectively
- good results in gram scale experiment

We provide a new strategy for using carbodiimide as dehydrant to realize highly chem-, regio- and stereoselective Pd-catalyzed hydrocarboxylation of alkynes with HCOOH as both CO source and hydrogen donor, as a protocol for indirect utilization of CO<sub>2</sub>.

Chin. J. Catal., 2022, 43: 1652–1656 doi: 10.1016/S1872-2067(21)63956-6 [Communication]

**Photo-catalyzed sequential dearomatization/carboxylation of benzyl *o*-halogenated aryl ether with CO<sub>2</sub> leading to spirocyclic carboxylic acids**Yaping Yi, Chanjuan Xi \*  
Tsinghua University; Nankai University

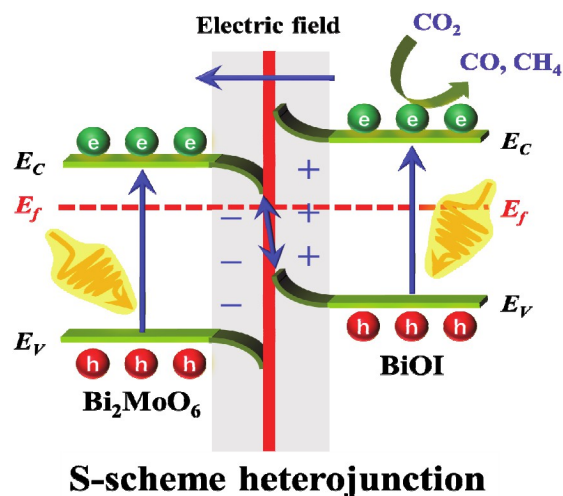
An effective method to synthesize spirocyclic carboxylic acids from benzyl *o*-halogenated aryl ether and CO<sub>2</sub> is developed with mild conditions, high selectivity, ideal yields and good functional group tolerance.



Chin. J. Catal., 2022, 43: 1657–1666 doi: 10.1016/S1872-2067(21)64010-X [Article]

**S-Scheme 2D/2D Bi<sub>2</sub>MoO<sub>6</sub>/BiOI van der Waals heterojunction for CO<sub>2</sub> photoreduction**Zhongliao Wang, Bei Cheng, Liuyang Zhang \*, Jiaguo Yu \*, Youji Li, S. Wageh, Ahmed A. Al-Ghamdi  
Wuhan University of Technology, China;  
China University of Geosciences, China;  
Jishou University, China;  
King Abdulaziz University, Saudi Arabia

The S-scheme 2D/2D Bi<sub>2</sub>MoO<sub>6</sub>/BiOI van der Waals heterojunction accelerates charge separation, enhances the redox capability of photoexcited electron-hole pairs, and decreases the energy barrier of the CO<sub>2</sub> photoreduction reaction, contributing to a high CO and CH<sub>4</sub> yield rate.

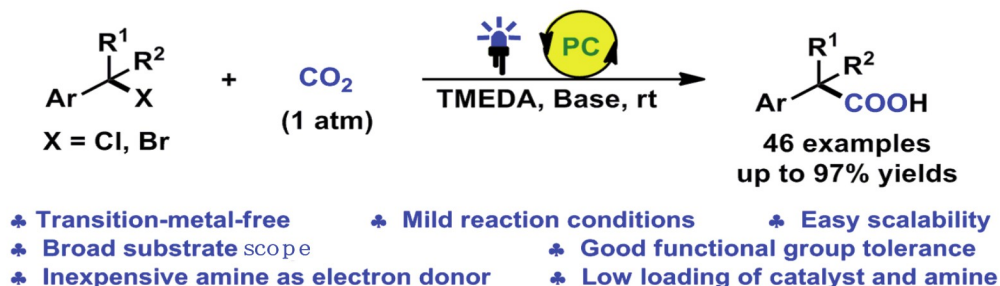




*Chin. J. Catal.*, 2022, 43: 1667–1673 doi: 10.1016/S1872-2067(21)63859-7 [Communication]

### Visible-light photoredox-catalyzed carboxylation of benzyl halides with CO<sub>2</sub>: Mild and transition-metal-free

Ke Jing, Ming-Kai Wei, Si-Shun Yan, Li-Li Liao, Ya-Nan Niu, Shu-Ping Luo, Bo Yu \*, Da-Gang Yu \*  
Sichuan University; Zhejiang University of Technology



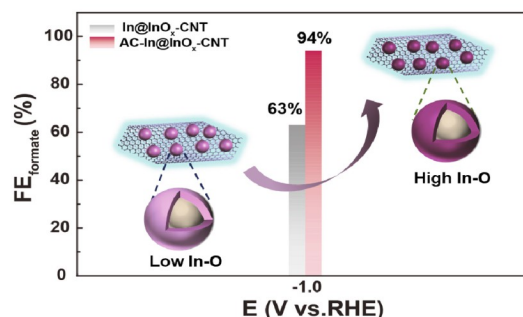
Visible-light photoredox-catalyzed carboxylation of benzyl halides with CO<sub>2</sub> was developed using organic dyes as photocatalysts under mild and transition-metal-free conditions, providing an efficient approach for assembling valuable aryl acetic acids.

*Chin. J. Catal.*, 2022, 43: 1674–1679 doi: 10.1016/S1872-2067(21)63943-8 [Communication]

### Regulating surface In–O in In@InO<sub>x</sub> core-shell nanoparticles for boosting electrocatalytic CO<sub>2</sub> reduction to formate

Yan Yang, Jiaju Fu, Tang Tang, Shuai Niu, Li-Bing Zhang, Jianan Zhang, Jin-Song Hu \*  
Institute of Chemistry, Chinese Academy of Sciences; Zhengzhou University; University of Chinese Academy of Sciences

A facile air calcination and *in situ* reconstruction strategy is developed to regulate the surface In–O sites in core-shell In@InO<sub>x</sub> catalysts for revealing its effects on electrocatalytic CO<sub>2</sub>RR.

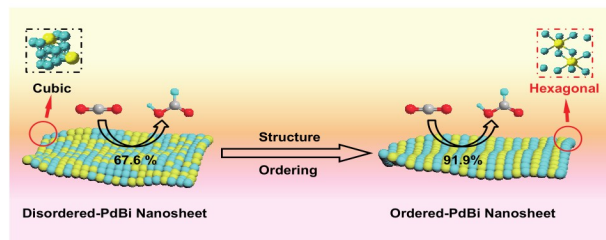


*Chin. J. Catal.*, 2022, 43: 1680–1686 doi: 10.1016/S1872-2067(21)63999-2 [Communication]

### Regulating Pd-catalysis for the electrocatalytic CO<sub>2</sub> reduction to formate via intermetallic PdBi nanosheets

Linfeng Xie, Xuan Liu, Fanyang Huang, Jiashun Liang, Jianyun Liu, Tanyuan Wang, Liming Yang, Ruiguo Cao, Qing Li \*  
Huazhong University of Science and Technology; University of Science and Technology of China

Intermetallic PdBi nanosheet with ordered hexagonal phase is developed as electrocatalyst for selective reduction of CO<sub>2</sub> to formate. The ordered-PdBi has a lower free energy barrier of \*OCHO and higher energy barrier of \*H than disordered-PdBi, enhancing the activity of formate production.

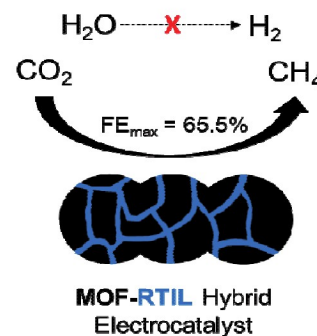


*Chin. J. Catal.*, 2022, 43: 1687–1696 doi: 10.1016/S1872-2067(21)63970-0 [Article]

### Metal organic framework-Ionic liquid hybrid catalysts for the selective electrochemical reduction of CO<sub>2</sub> to CH<sub>4</sub>

Ernest Pahuyo Delmo, Yian Wang, Jing Wang, Shangqian Zhu, Tiehuai Li, Xueping Qin, Yibo Tian, Qinglan Zhao, Juhee Jang, Yinu Wang, Meng Gu, Lili Zhang \*, Minhua Shao \*  
The Hong Kong University of Science and Technology; Southern University of Science and Technology; Huaiyin Normal University

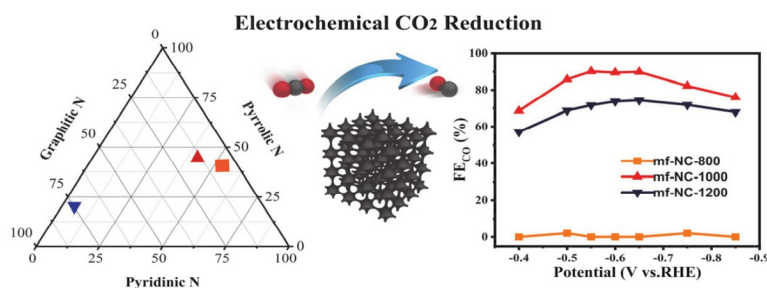
MOF-RTIL hybrid electrocatalysts are shown to selectively reduce CO<sub>2</sub> to CH<sub>4</sub> with a maximum FE of 65%. This study illustrates a novel approach of embedding co-catalysts within porous frameworks to improve CO<sub>2</sub>RR electrocatalysis.



*Chin. J. Catal.*, 2022, 43: 1697–1702 doi: 10.1016/S1872-2067(21)64006-8 [Article]

### Synergetic effect of nitrogen-doped carbon catalysts for high-efficiency electrochemical CO<sub>2</sub> reduction

Chuhao Liu, Yue Wu, Jinjie Fang, Ke Yu, Hui Li, Wenjun He, Weng-Chon Cheong, Shoujie Liu, Zheng Chen, Jing Dong\*, Chen Chen\*  
*Tsinghua University; Nanjing Tech University; Beijing University of Chemical Technology; University of Macau; Anhui Normal University*

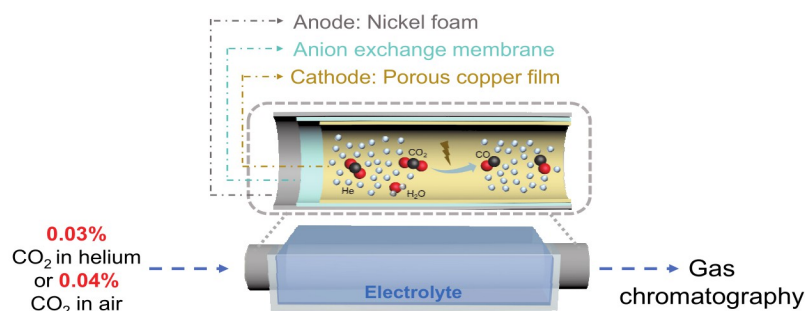


Metal-free nitrogen-doped carbon catalysts (mf-NCs) with well-defined active N-species sites were synthesized as robust catalysts for CO<sub>2</sub>RR. Graphitic N and pyridinic N can synergistically improve CO<sub>2</sub>-to-CO selectivity.

*Chin. J. Catal.*, 2022, 43: 1703–1709 doi: 10.1016/S1872-2067(21)63988-8 [Article]

### Electroreduction of air-level CO<sub>2</sub> with high conversion efficiency

Yangshen Chen, Miao Kan, Shuai Yan, Junbo Zhang, Kunhao Liu, Yaqin Yan, Anxiang Guan, Ximeng Lv, Linping Qian, Gengfeng Zheng\*  
*Fudan University*

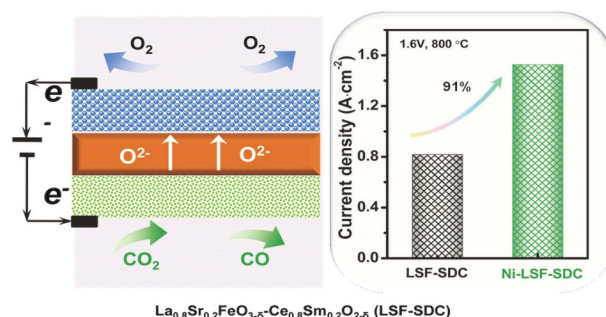


This paper realizes the direct electroreduction of 0.03% or 0.04% CO<sub>2</sub> in a homemade gas-phase electrochemical reactor using a low-cost copper (Cu) or nanoscale copper (nano-Cu) catalyst with high CO<sub>2</sub> conversion efficiency.

*Chin. J. Catal.*, 2022, 43: 1710–1718 doi: 10.1016/S1872-2067(21)63960-8 [Article]

### Highly dispersed nickel species on iron-based perovskite for CO<sub>2</sub> electrolysis in solid oxide electrolysis cell

Yingjie Zhou, Tianfu Liu, Yuefeng Song, Houfu Lv, Qingxue Liu, Na Ta, Xiaomin Zhang\*, Guoxiong Wang\*  
*Donghua University; Dalian Institute of Chemical Physics, Chinese Academy of Sciences; University of Chinese Academy of Sciences*



Highly dispersed nickel species with low loading on perovskite can alter its electronic structure and facilitate the oxygen vacancy formation, thus greatly promote the CO<sub>2</sub> electrolysis.



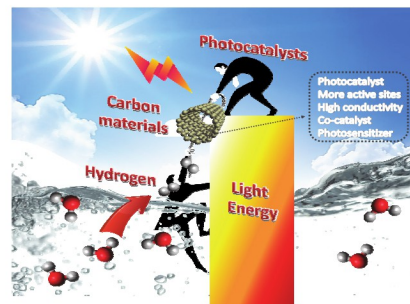
## Reviews

*Chin. J. Catal.*, 2022, 43: 1719–1748 doi: 10.1016/S1872-2067(21)63994-3

### Environmentally-friendly carbon nanomaterials for photocatalytic hydrogen production

Sheng Xiong, Rongdi Tang, Daoxin Gong, Yaocheng Deng \*, Jiangfu Zheng, Ling Li, Zhanpeng Zhou, Lihua Yang, Long Su  
Hunan Agricultural University

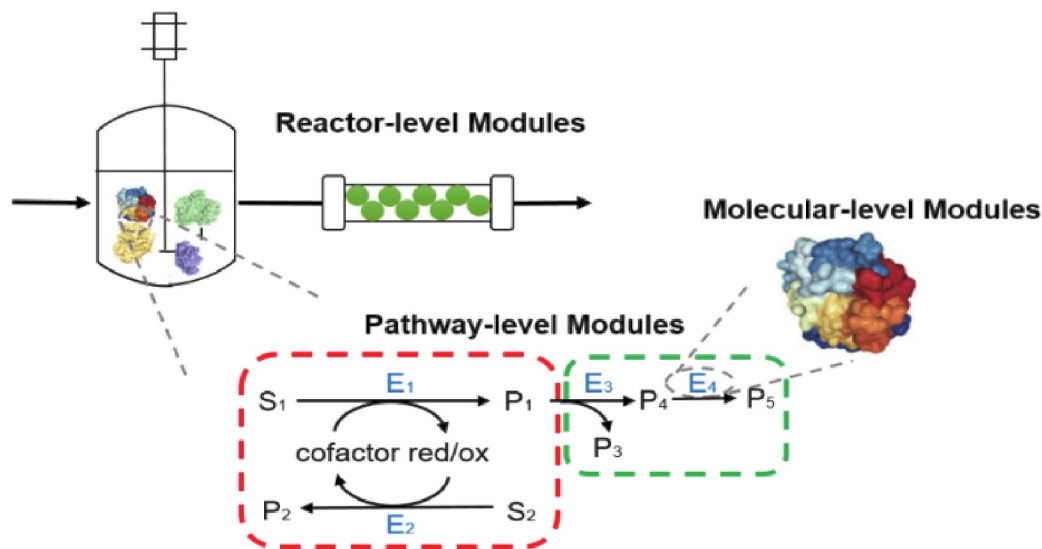
This review introduced the CNMs, including carbon dots, fullerenes, carbon nanotubes, carbon nanofibers, graphene, and graphdiyne. CNMs can provide abundant adsorption and active sites, charge separation, transport channels, and can be used as photocatalysts, co-catalysts and photosensitizers.



*Chin. J. Catal.*, 2022, 43: 1749–1760 doi: 10.1016/S1872-2067(21)64002-0

### Toward modular construction of cell-free multienzyme systems

Yinchen Zhang, Ning Nie, Yifei Zhang \*  
Beijing University of Chemical Technology



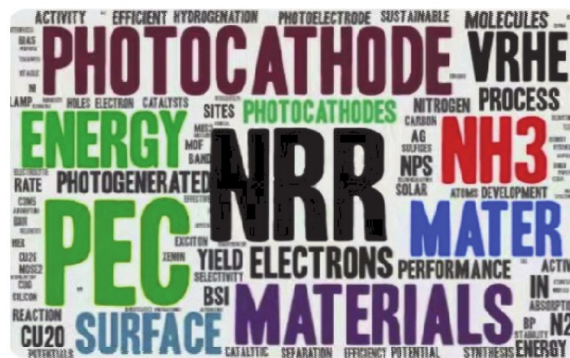
Modulization has shown advantages in the construction and optimization of cell-free multienzyme systems. Here we introduce typical natural and synthetic multienzyme modules at and across multiple levels.

*Chin. J. Catal.*, 2022, 43: 1761–1773 doi: 10.1016/S1872-2067(21)64001-9

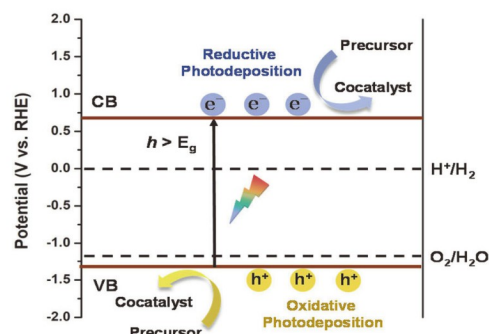
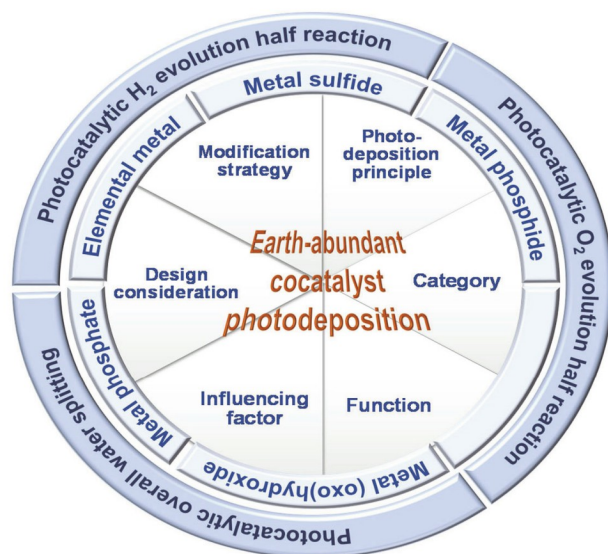
### Photoelectrochemical nitrogen reduction: A step toward achieving sustainable ammonia synthesis

Liqun Wang, Xiao Yan, Wenping Si, Daolan Liu, Xinggong Hou, Dejun Li \*, Feng Hou \*, Shi Xue Dou, Ji Liang \*  
Tianjin Normal University, China;  
Shenzhen Institute of Information Technology, China;  
Tianjin University, China;  
University of Wollongong, Australia

The photoelectrochemical NRR is an energy-efficient and environmentally friendly route for sustainable ammonia synthesis. In this review, the fundamental principles and the latest progress in research into photocathode materials of PEC-NRR are described.



Chin. J. Catal., 2022, 43: 1774–1804 doi: 10.1016/S1872-2067(22)64105-6

**Photodeposition of earth-abundant cocatalysts in photocatalytic water splitting: Methods, functions, and mechanisms**Hui Zhao, Qinyi Mao, Liang Jian, Yuming Dong\*, Yongfa Zhu\*  
Jiangnan University; Tsinghua University

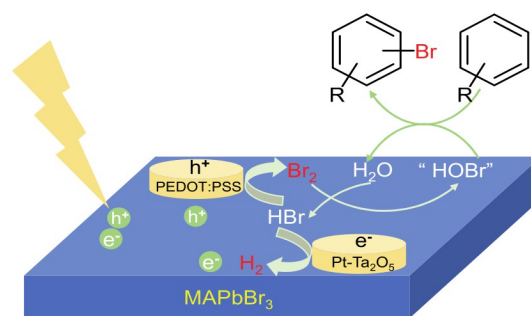
This review provides a detailed insight into the photodeposition of earth-abundant cocatalysts onto semiconductors for photocatalytic water splitting, including the deposition methods, catalytic performance, and functional mechanisms.

**Communications**

Chin. J. Catal., 2022, 43: 1805–1811 doi: 10.1016/S1872-2067(22)64101-9

**Aromatic bromination with hydrogen production on organic-inorganic hybrid perovskite-based photocatalysts under visible light irradiation**Yanfei Zhang, Hong Wang, Yan Liu, Can Li\*  
Dalian Institute of Chemical Physics, Chinese Academy of Sciences;  
University of Chinese Academy of Sciences

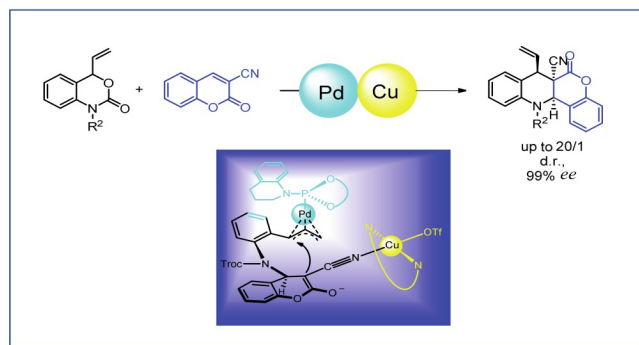
Organic-inorganic hybrid perovskite MAPbBr<sub>3</sub>, hybridizing with Pt-Ta<sub>2</sub>O<sub>5</sub> and PEDOT:PSS, can achieve aromatic bromination along hydrogen production with high yield and selectivity using HBr as the bromine source under visible light irradiation.



Chin. J. Catal., 2022, 43: 1812–1817 doi: 10.1016/S1872-2067(21)64051-2

**The synthesis of tetracyclic coumarins via decarboxylative asymmetric [4+2] cycloadditions enabled by Pd(0)/Cu(I) synergistic catalysis**Kai Wang, Xiangfeng Lin, Qian Li, Yan Liu\*, Can Li\*  
Dalian Institute of Chemical Physics, Chinese Academy of Sciences;  
University of Chinese Academy of Sciences

A highly efficient asymmetric decarboxylative [4+2] cycloaddition of 3-cyanocoumarins with vinyl benzoxazinones was developed, affording the coumarin-derived condensed rings bearing three continuous stereocenters in high yields with excellent diastereoselectivities (>20/1 d.r.) and enantioselectivities (up to 99% ee).





## Articles

*Chin. J. Catal.*, 2022, 43: 1818–1829 doi: 10.1016/S1872-2067(21)64009-3

### Energy funneling and charge separation in CdS modified with dual cocatalysts for enhanced H<sub>2</sub> generation

Meiyu Zhang, Chaochao Qin, Wanjun Sun, Congzhao Dong, Jun Zhong, Kaifeng Wu, Yong Ding \*

Lanzhou University;

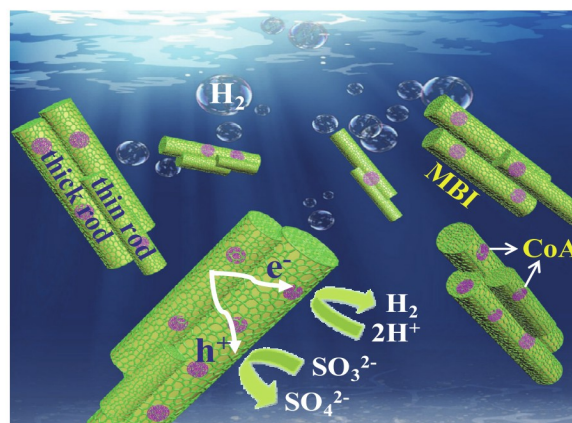
Dalian Institute of Chemical Physics, Chinese Academy of Sciences;

Henan Normal University;

Soochow University;

Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences

For CdS/MBI/MCoA, the MBI and MCoA molecules selectively extracted photogenerated holes and electrons from CdS nanorods rapidly. Additionally, the MBI molecules facilitated energy funneling from thin to thick rods, endowing CdS/MBI/MCoA elevated photocatalytic H<sub>2</sub> evolution.



*Chin. J. Catal.*, 2022, 43: 1830–1841 doi: 10.1016/S1872-2067(21)64027-5

### Non-noble metal single-atom catalyst with MXene support: Fe<sub>1</sub>/Ti<sub>2</sub>CO<sub>2</sub> for CO oxidation

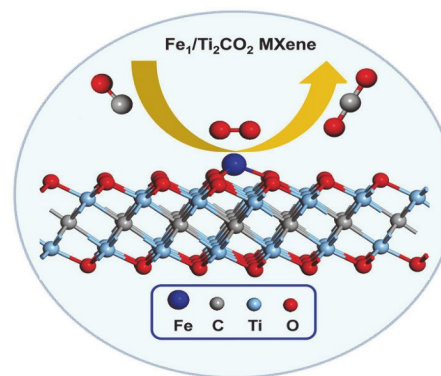
Chun Zhu, Jin-Xia Liang\*, Yang-Gang Wang, Jun Li \*

Guizhou University;

Southern University of Science and Technology;

Tsinghua University

MXene supported non-noble metal single-atom catalyst Fe<sub>1</sub>/Ti<sub>2</sub>CO<sub>2</sub> is found to exhibit excellent activity for low-temperature CO oxidation through first-principles computational modelling.

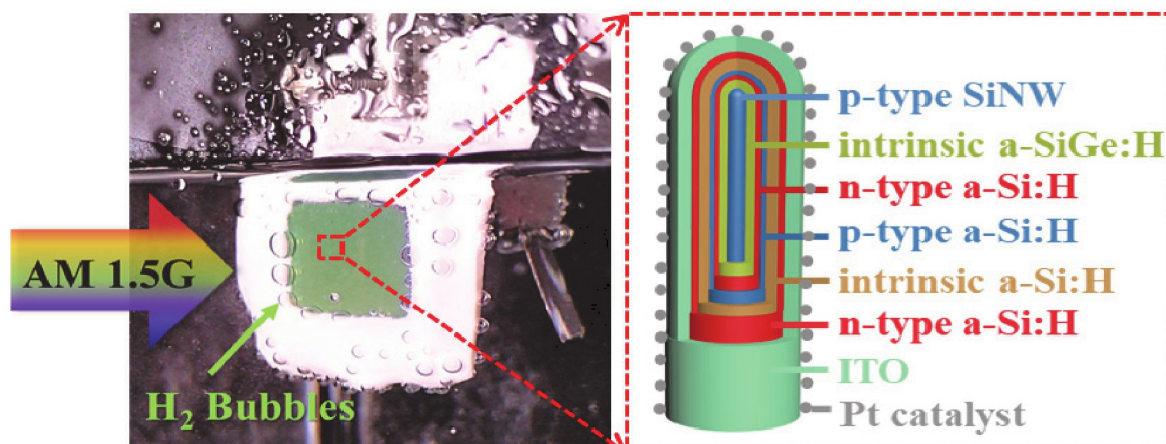


*Chin. J. Catal.*, 2022, 43: 1842–1850 doi: 10.1016/S1872-2067(21)64046-9

### Ultrathin 3D radial tandem-junction photocathode with a high onset potential of 1.15 V for solar hydrogen production

Shaobo Zhang, Huiting Huang, Zhijie Zhang, Jianyong Feng, Zongguang Liu, Junzhuan Wang, Jun Xu, Zhaosheng Li \*, Linwei Yu \*, Kunji Chen, Zhigang Zou

Nanjing University

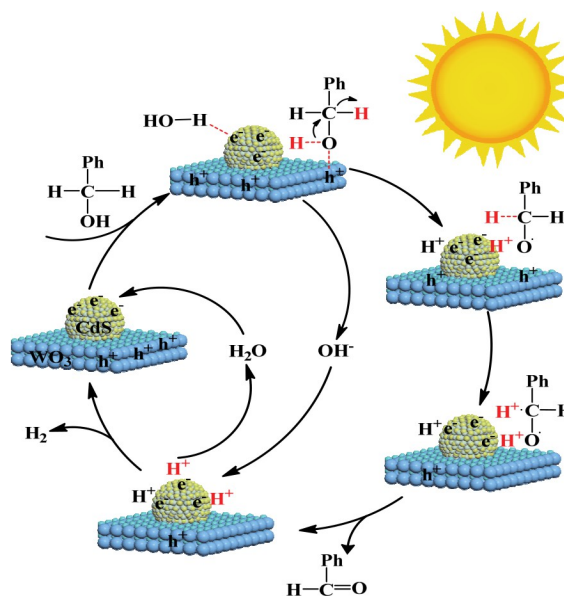


A radial tandem junction thin-film photocathode with a  $V_{\text{onset}}$  of 1.15 V vs. RHE has been demonstrated directly on VLS-grown SiNWs for the first time, using a-Si:H (~50 nm) as the outer absorber layer and a-SiGe:H (~40 nm) as the inner layer.

*Chin. J. Catal.*, 2022, 43: 1851–1859 doi: 10.1016/S1872-2067(21)63989-X

### Photocatalytic selective oxidation of aromatic alcohols coupled with hydrogen evolution over CdS/WO<sub>3</sub> composites

Yu-Lan Wu, Ming-Yu Qi, Chang-Long Tan, Zi-Rong Tang\*, Yi-Jun Xu\*  
Fuzhou University

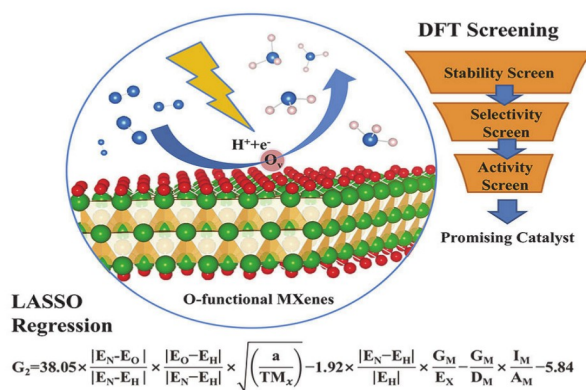


The photoexcited charge carriers can be effectively separated by the construction of a direct Z-scheme system. Under light irradiation, photocatalytic selective oxidation of aromatic alcohols to aromatic aldehydes coupled with hydrogen evolution are simultaneously realized on the Z-scheme CdS/WO<sub>3</sub> photocatalyst, making full use of the synergistic potential of the combined photoredox system.

*Chin. J. Catal.*, 2022, 43: 1860–1869 doi: 10.1016/S1872-2067(21)64011-1

### Computational screening of O-functional MXenes for electrocatalytic ammonia synthesis

Yijing Gao, Shijie Zhang, Xiang Sun, Wei Zhao, Han Zhuo, Guilin Zhuang, Shibin Wang, Zihao Yao, Shengwei Deng, Xing Zhong, Zhongzhe Wei, Jian-guo Wang\*  
Zhejiang Normal University; Zhejiang University of Technology

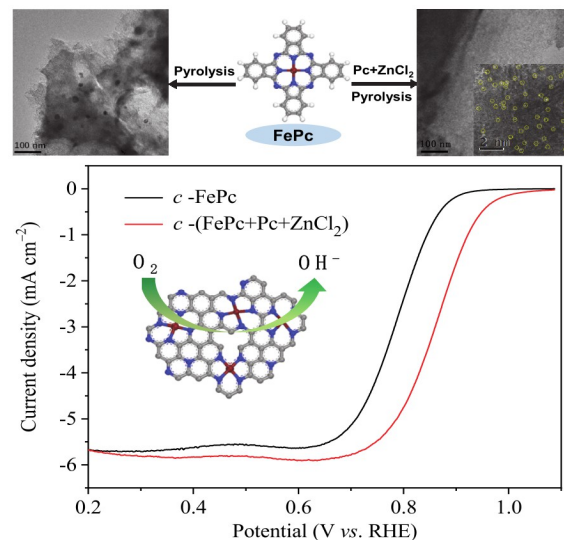


A three-step screening method (including stability, activity, and selectivity screening) was applied to develop NRR catalysts from O-functional MXenes, and LASSO regression was applied to describe the original NRR performance.

*Chin. J. Catal.*, 2022, 43: 1870–1878 doi: 10.1016/S1872-2067(21)63992-X

### Synergy of staggered stacking confinement and microporous defect fixation for high-density atomic Fe<sup>II</sup>-N<sub>4</sub> oxygen reduction active sites

Menghui Chen, Yongting Chen, Zhili Yang, Jin Luo, Jialin Cai, Joey Chung-Yen Jung, Jiujun Zhang, Shengli Chen\*, Shiming Zhang\*  
Shanghai University; Wuhan University



A synergistic modulation strategy of phthalocyanine (Pc) for spatial-locations confinement and Zn-salts for active-sites fixation has been proposed to overwhelmingly grow atomic Fe<sup>II</sup>-N<sub>4</sub> for the high ORR performance Fe-N<sub>x</sub>-C catalyst.



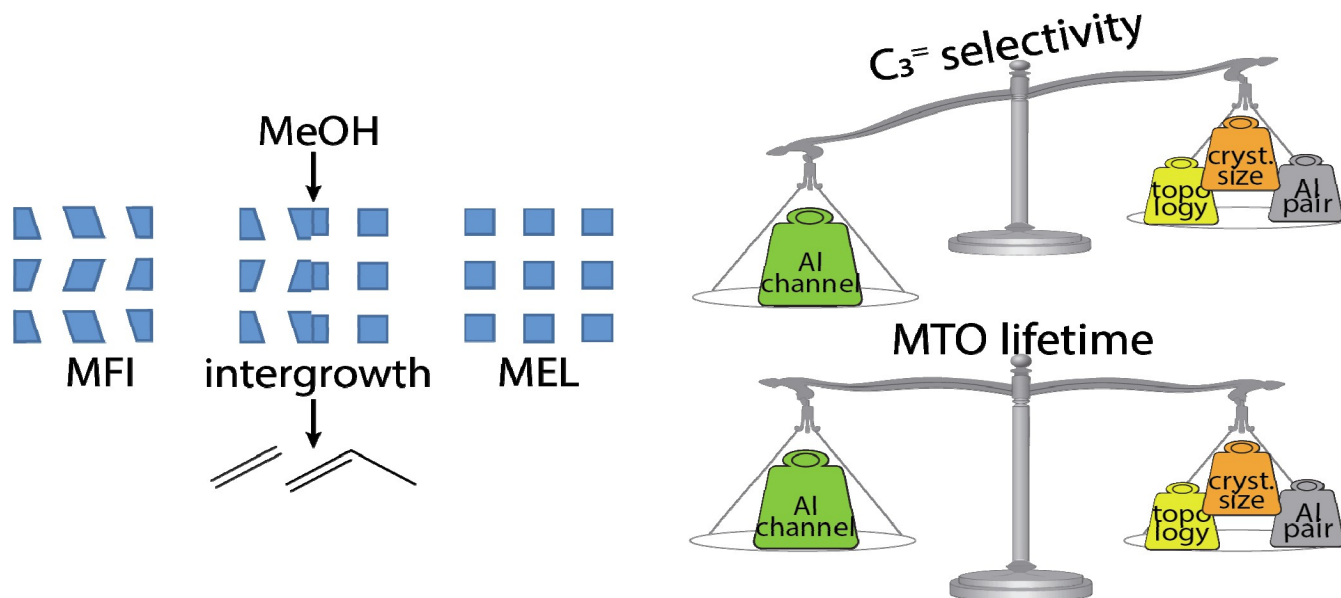
*Chin. J. Catal.*, 2022, 43: 1879–1893 doi: 10.1016/S1872-2067(21)63990-6

### An integrated approach to the key parameters in methanol-to-olefins reaction catalyzed by MFI/MEL zeolite materials

Chuncheng Liu, Evgeny A. Uslamin, Sophie H. van Vreeswijk, Irina Yarulina, Swapna Ganapathy, Bert M. Weckhuysen, Freek Kapteijn\*, Evgeny A. Pidko\*

*Delft University of Technology, the Netherlands;*

*Process Research and Chemical Engineering, Germany; Utrecht University, the Netherlands*



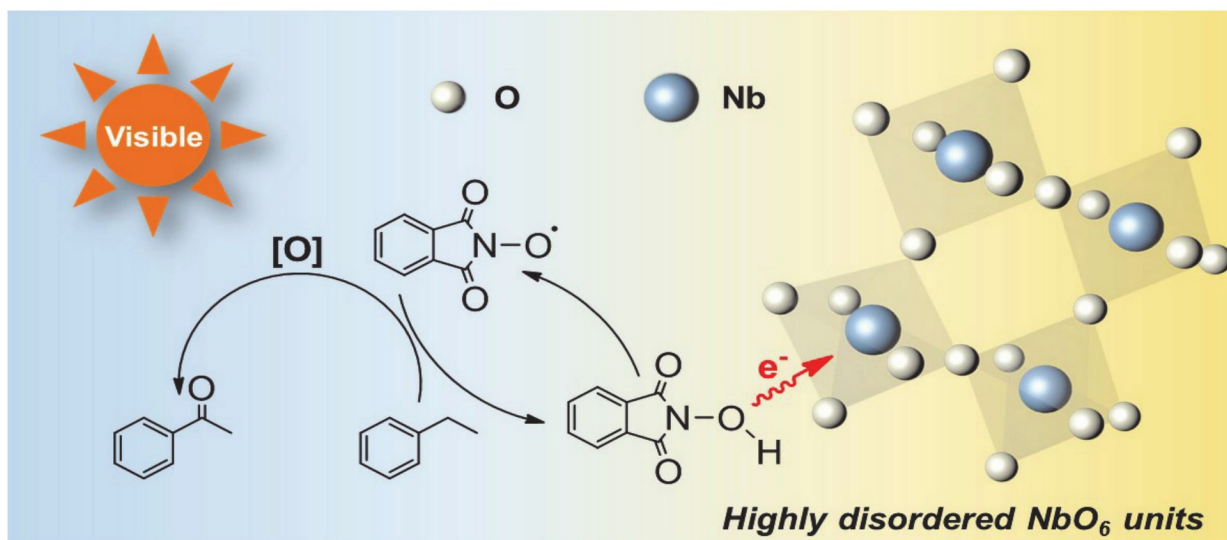
Al enrichment in the channels is of primary importance to determine propylene production in MTO. Catalyst deactivation is rather complex, which is controlled by Al distribution, crystal size, topology and Al<sub>pair</sub>.

*Chin. J. Catal.*, 2022, 43: 1894–1905 doi: 10.1016/S1872-2067(21)64026-3

### Unveiling the highly disordered NbO<sub>6</sub> units as electron-transfer sites in Nb<sub>2</sub>O<sub>5</sub> photocatalysis with *N*-hydroxyphthalimide under visible light irradiation

Kaiyi Su, Chaofeng Zhang\*, Yehong Wang, Jian Zhang, Qiang Guo, Zhuyan Gao, Feng Wang\*

*Dalian Institute of Chemical Physics, Chinese Academy of Sciences; University of Chinese Academy of Sciences*



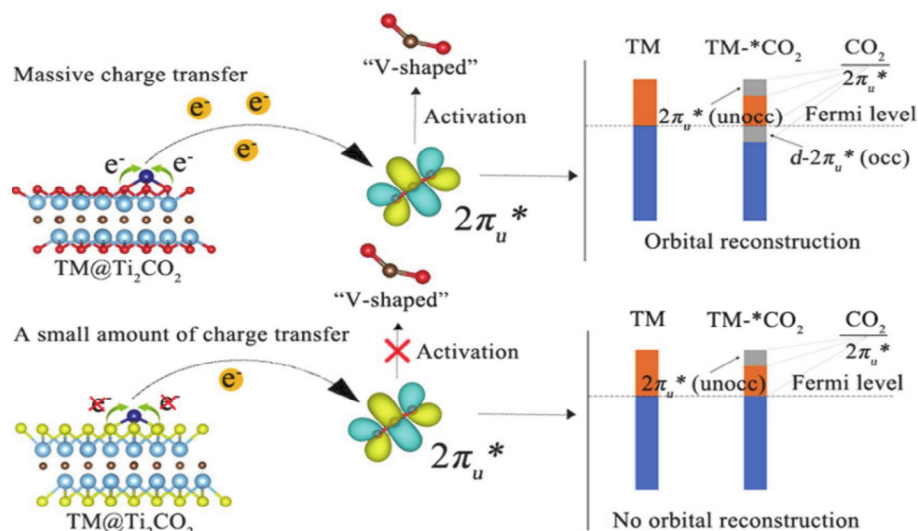
Using *N*-hydroxyphthalimide as probe molecule, highly disordered NbO<sub>6</sub> units act as the electron-transfer sites on Nb<sub>2</sub>O<sub>5</sub> under visible light irradiation, which can be conducive to a deep understanding of NbO<sub>x</sub> units in photocatalysis.

Chin. J. Catal., 2022, 43: 1906–1917 doi: 10.1016/S1872-2067(21)64018-4

**Charge transfer and orbital reconstruction of non-noble transition metal single-atoms anchored on Ti<sub>2</sub>CT<sub>x</sub>-MXenes for highly selective CO<sub>2</sub> electrochemical reduction**

Neng Li \*, Jiahe Peng, Zuhao Shi, Peng Zhang, Xin Li \*

Wuhan University of Technology; Zhengzhou University; South China Agricultural University

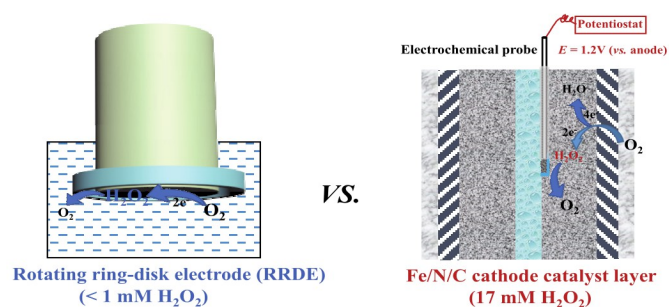


Oxygen surface group can provide adequate electrons in CO<sub>2</sub> activation. The charge transfer and orbital reconstruction between CO<sub>2</sub> and TM@Ti<sub>2</sub>CO<sub>2</sub> leads to the activation of CO<sub>2</sub>, which does not happen at -S surface group.

Chin. J. Catal., 2022, 43: 1918–1926 doi: 10.1016/S1872-2067(21)63993-1

**Revealing the concentration of hydrogen peroxide in fuel cell catalyst layers by an *in-operando* approach**Chun-Yu Qiu, Li-yang Wan, Yu-Cheng Wang \*, Muhammad Rauf, Yu-Hao Hong, Jia-yin Yuan, Zhi-You Zhou \*, Shi-Gang Sun  
Xiamen University, China; Shenzhen University, China; Stockholm University, Sweden

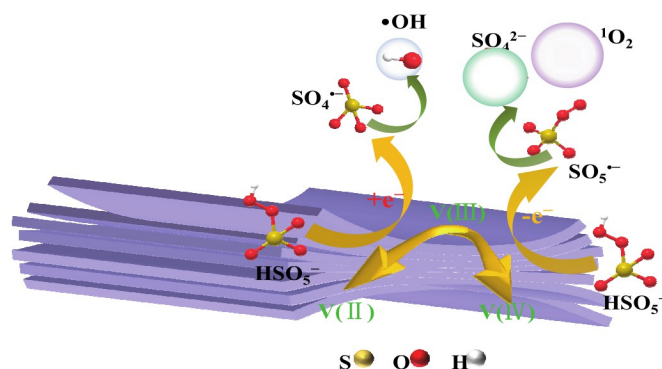
The *in-operando* concentration of H<sub>2</sub>O<sub>2</sub> in Fe/N/C cathode catalyst layer is one order of magnitude higher than that under aqueous electrodes test conditions.



Chin. J. Catal., 2022, 43: 1927–1936 doi: 10.1016/S1872-2067(21)64050-0

**Ultradurable fluorinated V<sub>2</sub>AlC for peroxydisulfate activation in organic pollutant degradation processes**Chao Li, Chenjie Song, Hui Li, Liqun Ye \*, Yixue Xu, Yingping Huang, Gongzhe Nie, Rumeng Zhang, Wei Liu, Niu Huang, Po Keung Wong, Tianyi Ma \*  
China Three Gorges University, China; Hubei Three Gorges Laboratory, China; Swinburne University of Technology, Australia; The Chinese University of Hong Kong, China

F-V<sub>2</sub>AlC showed higher activity and better reusability than V<sub>2</sub>O<sub>3</sub> for PMS activation with extremely low ion leakage. And mechanism investigation showed that the main reactive oxygen specie was <sup>1</sup>O<sub>2</sub>, which induced by the two-dimensional confinement effect. In addition, the introduction of F changed the adsorption mode of TC over catalyst, thereby changing the degradation path.





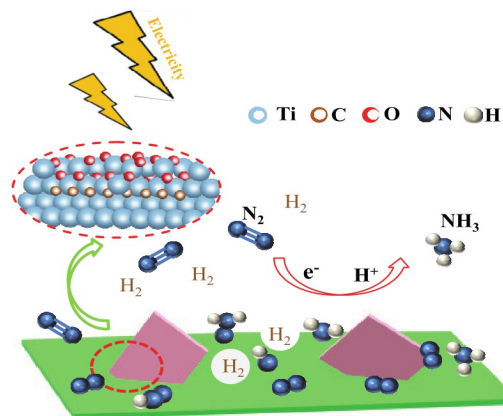
*Chin. J. Catal.*, 2022, 43: 1937–1944 doi: 10.1016/S1872-2067(21)64020-2

### Heterostructuring 2D TiO<sub>2</sub> nanosheets *in situ* grown on Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene to improve the electrocatalytic nitrogen reduction

Xiu Qian, Yanjiao Wei, Mengjie Sun, Ye Han \*, Xiaoli Zhang, Jian Tian \*, Minhua Shao \*

*Shandong University of Science and Technology;*  
*The Hong Kong University of Science and Technology;*  
*Zhengzhou University*

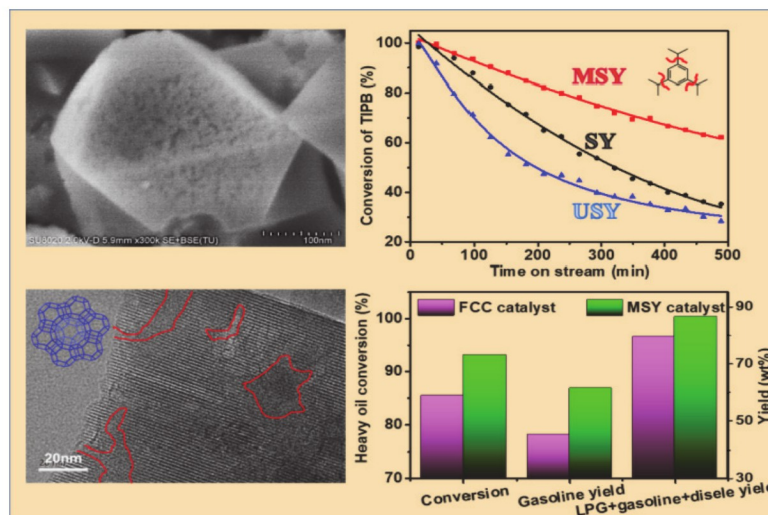
TiO<sub>2</sub>/Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene was prepared through the *in situ* growth of TiO<sub>2</sub> nanosheets (NSs) on extremely conductive Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene, which exhibited an excellent electrochemical activity for NRR (NH<sub>3</sub> yield of 44.17 μg h<sup>-1</sup> mg<sup>-1</sup><sub>cat.</sub>).



*Chin. J. Catal.*, 2022, 43: 1945–1954 doi: 10.1016/S1872-2067(21)64043-3

### Synthesis of mesoporous high-silica zeolite Y and their catalytic cracking performance

Wenhao Cui, Dali Zhu, Juan Tan, Nan Chen, Dong Fan, Juan Wang, Jingfeng Han, Linying Wang \*, Peng Tian \*, Zhongmin Liu  
*Dalian Institute of Chemical Physics, Chinese Academy of Sciences; University of Chinese Academy of Sciences; Dalian University of Technology*



Mesoporous high-silica zeolite Y with high (hydro)thermal stability has been successfully synthesized, which possesses larger acid concentration and stronger acid strength than USY, and exhibits superior catalytic performance in the cracking of hydrocarbons and industrial heavy oil.

*Chin. J. Catal.*, 2022, 43: 1955–1962 doi: 10.1016/S1872-2067(21)64035-4

### Ammonium cobalt phosphate with asymmetric coordination sites for enhanced electrocatalytic water oxidation

Jing Qi, Mingxing Chen, Wei Zhang \*, Rui Cao \*  
*Henan Normal University; Shaanxi Normal University*

Two cobalt phosphates with distinct Co symmetry were obtained to explore the effect of coordination structure on the electrocatalytic oxygen evolution reaction. Asymmetric Co geometry can accelerate surface reconstruction to enhance OER activity.

