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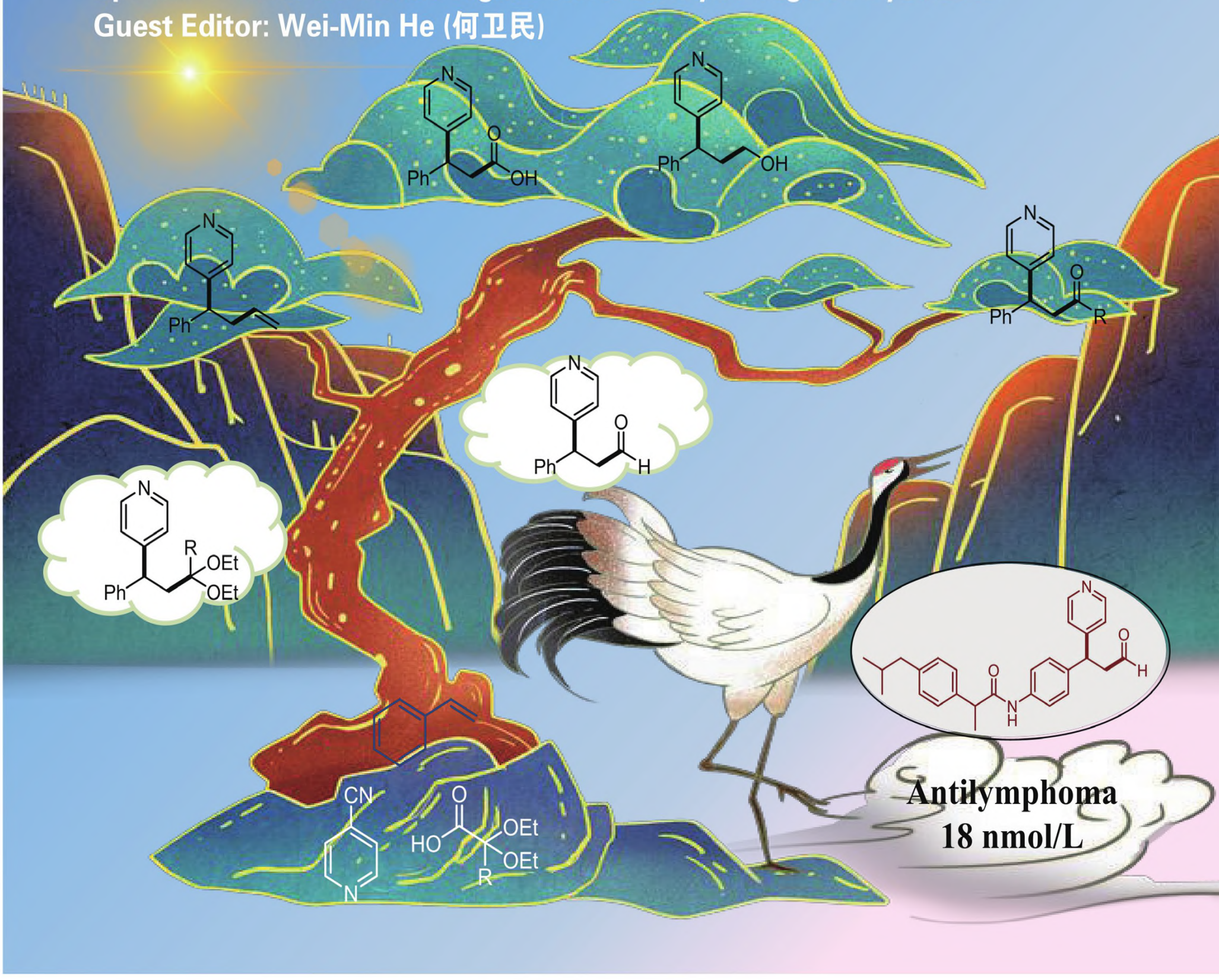
可见光催化有机合成专栏
Special Column on Visible-Light-Driven Catalytic Organic Synthesis
Guest Editor: Wei-Min He (何卫民)



催化学报 CHINESE JOURNAL OF CATALYSIS March 2022 Vol. 43 No. 3 Pages 547–894

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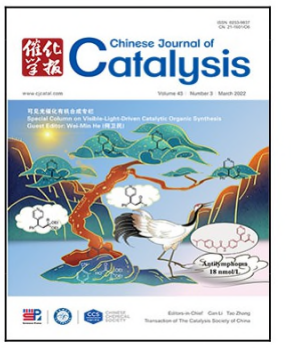

Chinese Journal of Catalysis

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Special column on visible-light-driven catalytic organic synthesis

Chin. J. Catal., 2022, 43: 547 doi: 10.1016/S1872-2067(21)63996-7

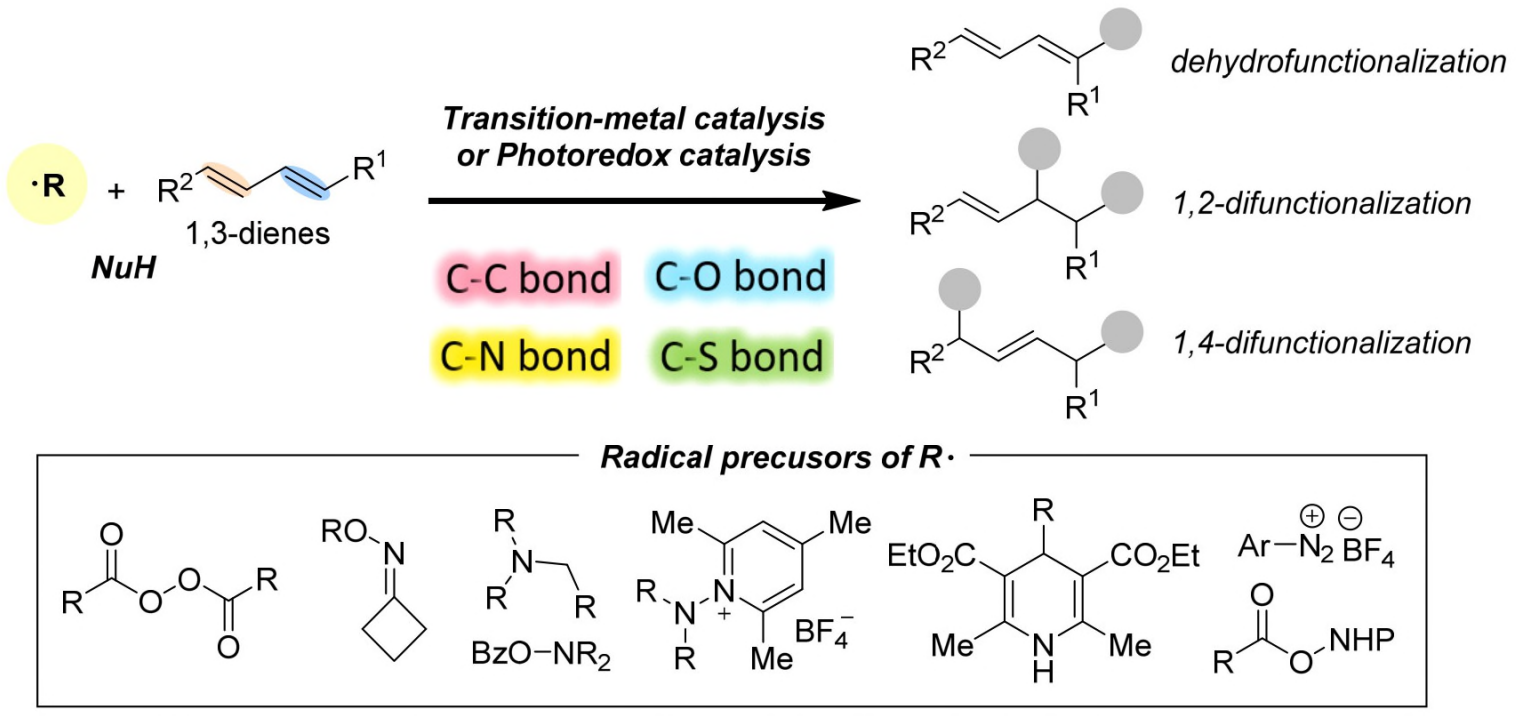
Preface to special column on visible-light-driven catalytic organic synthesis [Editorial]

Wei-Min He (Guest Editor)
University of South China

Chin. J. Catal., 2022, 43: 548–557 doi: 10.1016/S1872-2067(21)63919-0 [Review]

Recent advances in radical-mediated transformations of 1,3-dienes

Peng-Zi Wang, Wen-Jing Xiao, Jia-Rong Chen *
Central China Normal University; Henan Normal University

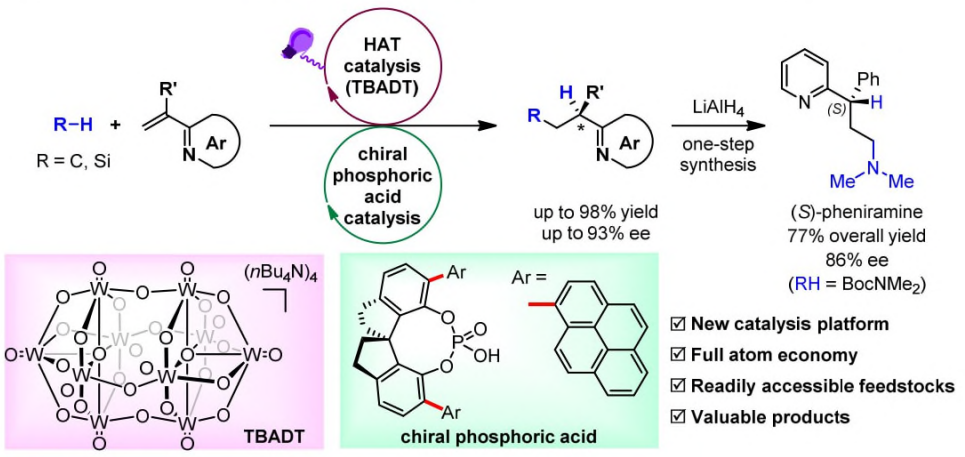


A brief summary about the recent advances in the field of radical-mediated transformations of 1,3-dienes as well as related mechanistic studies and synthetic applications is presented, which is organized according to the different radical precursors and related working modes.

Chin. J. Catal., 2022, 43: 558–563 doi: 10.1016/S1872-2067(21)63887-1 **[Communication]**

Conjugate addition-enantioselective protonation to forge tertiary stereocentres α to azaarenes *via* cooperative hydrogen atom transfer and chiral hydrogen-bonding catalysis

Yaqi Tan, Yanli Yin *, Shanshan Cao, Xiaowei Zhao, Guirong Qu, Zhiyong Jiang *
Henan Normal University; Henan University; Henan University of Technology; Xinxiang Tuoxin Pharmaceutical Co., Ltd.

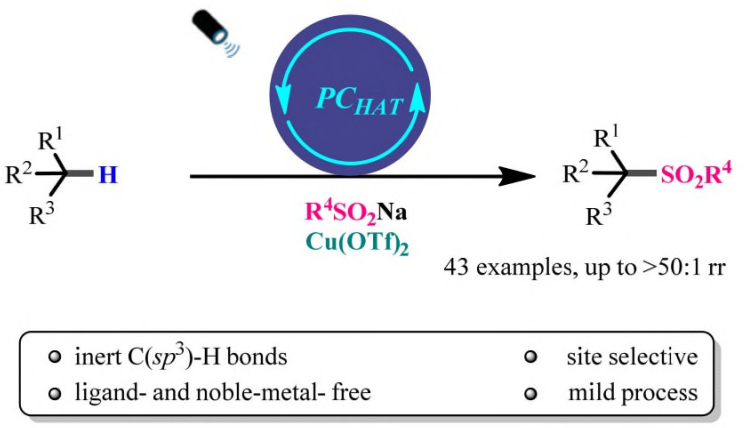


Cooperative hydrogen atom transfer and chiral hydrogen-bonding catalysis is explored to establish a new platform for accessing enantioenriched azaarene derivatives.

Chin. J. Catal., 2022, 43: 564–570 doi: 10.1016/S1872-2067(21)63953-0 **[Communication]**

Photocatalyzed site-selective C(sp^3)–H sulfonylation of toluene derivatives and cycloalkanes with inorganic sulfinates

Shaonan Zhang, Shi Cao, Yu-Mei Lin, Liyuan Sha, Cheng Lu, Lei Gong *
Xiamen University



A practical and economic approach to site-selective C(sp^3)–H sulfonylation of toluene derivatives and cycloalkanes with inorganic sulfonate salts by photo-induced direct hydrogen atom transfer catalysis has been developed. Accordingly, a variety of biologically and synthetically attractive sulfone products have been synthesized in good yields and with high site-selectivity.

Chin. J. Catal., 2022, 43: 571–583 doi: 10.1016/S1872-2067(21)63917-7 **[Article]**

Transition-metal-free three-component acetalation-pyridylation of alkenes *via* photoredox catalysis

Chun-Hua Ma, Yu Ji, Jie Zhao, Xing He, Shu-Ting Zhang *, Yu-Qin Jiang *, Bing Yu *
Henan Normal University; Zhengzhou University

The acetalation-pyridylation of alkenes was achieved in the visible-light promoted protocol, and diverse group transformations were achieved in simple operation. It could provide hit compounds for antitumor drug development.

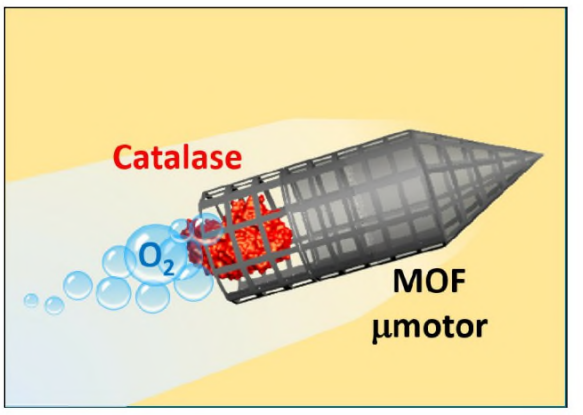
Highlights

Chin. J. Catal., 2022, 43: 584–585 doi: 10.1016/S1872-2067(21)63929-3

Enzyme-powered micromotors based on hierarchical porous MOFs

Lei Gan, Christian Doonan *, Paolo Falcaro *
Graz University of Technology, Austria;
The University of Adelaide, Australia

Enzyme-powered MOFtors with hierarchical porosity self-propelled by oxygen bubbles from catalase immobilized in mesopores enhance uptake of dye molecules in micropores during propulsion.

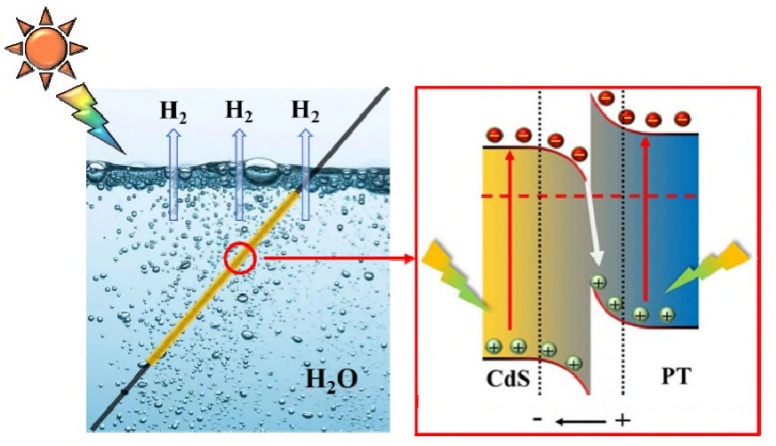


Chin. J. Catal., 2022, 43: 586–588 doi: 10.1016/S1872-2067(21)63925-6

CdS/polymer S-scheme H_2-production photocatalyst and its *in-situ* irradiated electron transfer mechanism

S. Wageh *, Ahmed A. Al-Ghamdi, Omar A. Al-Hartomy, Maged F. Alotaibi, Linxi Wang *
King Abdulaziz University, Saudi Arabia;
China University of Geosciences, China

The highlight summarizes Cheng *et al.*'s work on fabricating CdS/polymer S-scheme photocatalyst for efficient H_2 production. The intimate CdS-polymer binding forms a sturdy S-scheme heterojunction and the photocatalytic mechanisms are profoundly investigated by *in-situ* characterization.



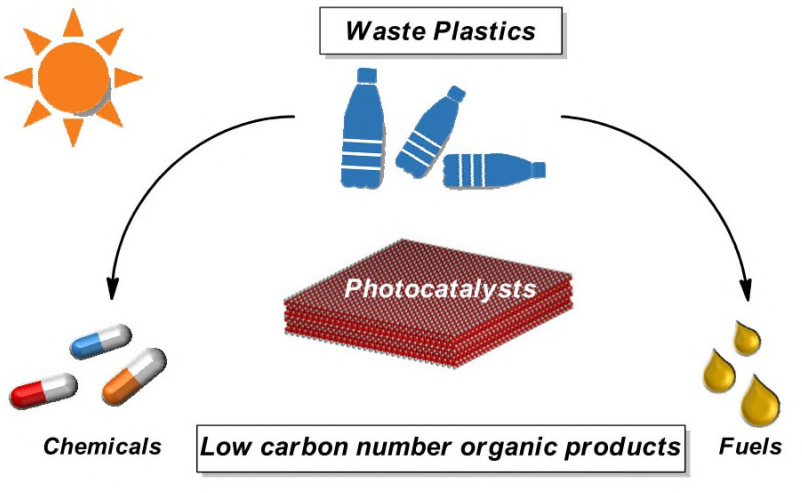
Perspective

Chin. J. Catal., 2022, 43: 589–594 doi: 10.1016/S1872-2067(21)63885-8

Photocatalytic conversion of waste plastics to low carbon number organic products

Kaiyi Su, Huifang Liu, Chaofeng Zhang, Feng Wang *
Dalian Institute of Chemical Physics, Chinese Academy of Sciences;
University of Chinese Academy of Sciences

This perspective highlights the routes in the photocatalytic conversion of waste plastics and gives insight into the challenge and potential avenues to enhance the yield of low carbon number organic products from waste plastics.



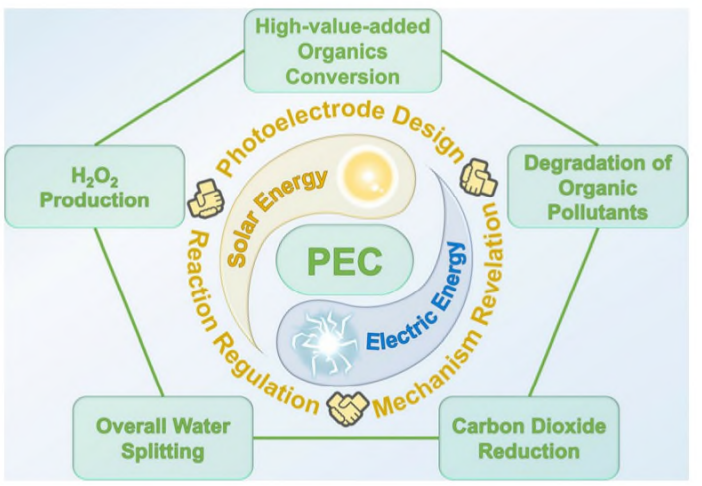
Account

Chin. J. Catal., 2022, 43: 595–610 doi: 10.1016/S1872-2067(21)63923-2

Photoelectrocatalysis for high-value-added chemicals production

Yucong Miao, Mingfei Shao *
Beijing University of Chemical Technology

The utilization of PEC technology in the production of high-value-added chemicals has promising prospects. In this Account, the photoelectrode design, reaction regulation and mechanism revelation are discussed in detail.

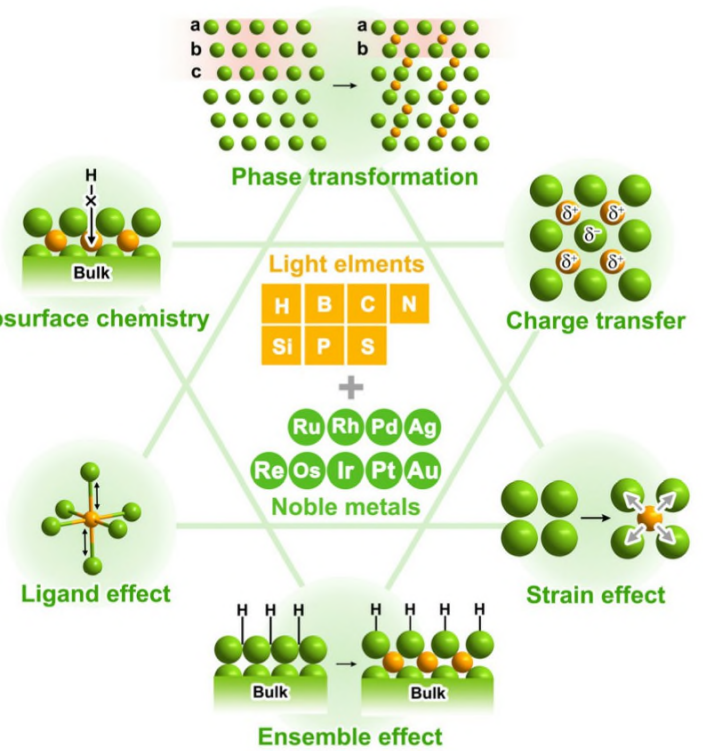


Reviews

Chin. J. Catal., 2022, 43: 611–635 doi: 10.1016/S1872-2067(21)63899-8

Light alloying element-regulated noble metal catalysts for energy-related applications

Hui Chen, Bo Zhang, Xiao Liang, Xiaoxin Zou *
Jilin University

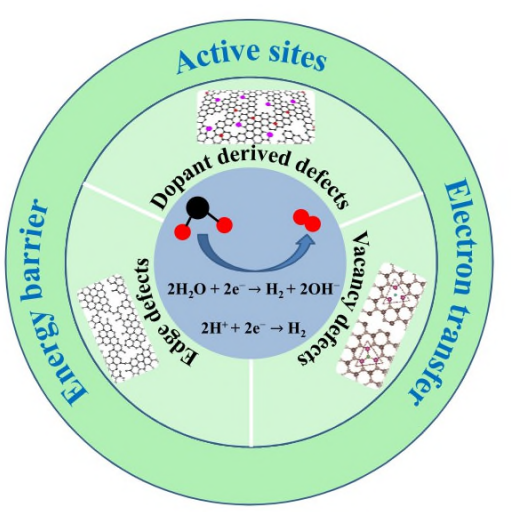


Recent research progress and existing challenges of light element-modified noble metals for various catalytic applications are reviewed. The positive role of light elements in the optimization of noble metals to achieve excellent catalytic activity, stability, and selectivity is highlighted.

Chin. J. Catal., 2022, 43: 636–678 doi: 10.1016/S1872-2067(21)63945-1

A review of defect engineering in two-dimensional materials for electrocatalytic hydrogen evolution reaction

Tianmi Tang, Zhenlu Wang *, Jingqi Guan *
Jilin University

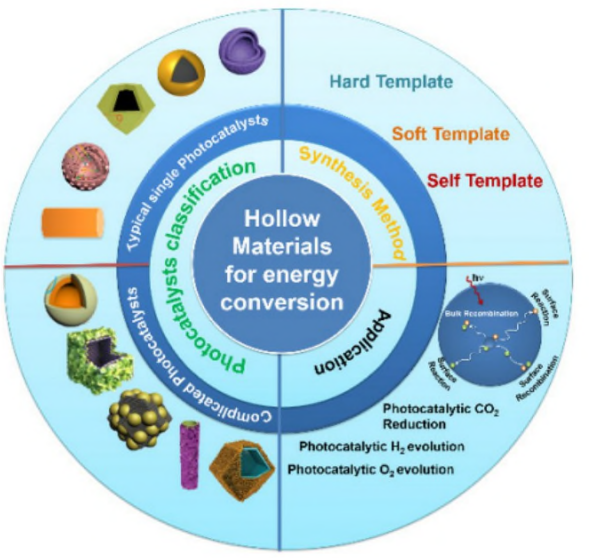


In this review, we introduce systematically classic fabrication strategies of different defect sites (including edge defects, vacancy defects and dopant derived defects) in 2D materials and discuss detailedly the structure-function relationship for HER.

Chin. J. Catal., 2022, 43: 679–707 doi: 10.1016/S1872-2067(21)63863-9

Design and applications of hollow-structured nanomaterials for photocatalytic H_2 evolution and CO_2 reduction

Xuli Li, Ning Li, Yangqin Gao, Lei Ge*
China University of Petroleum Beijing

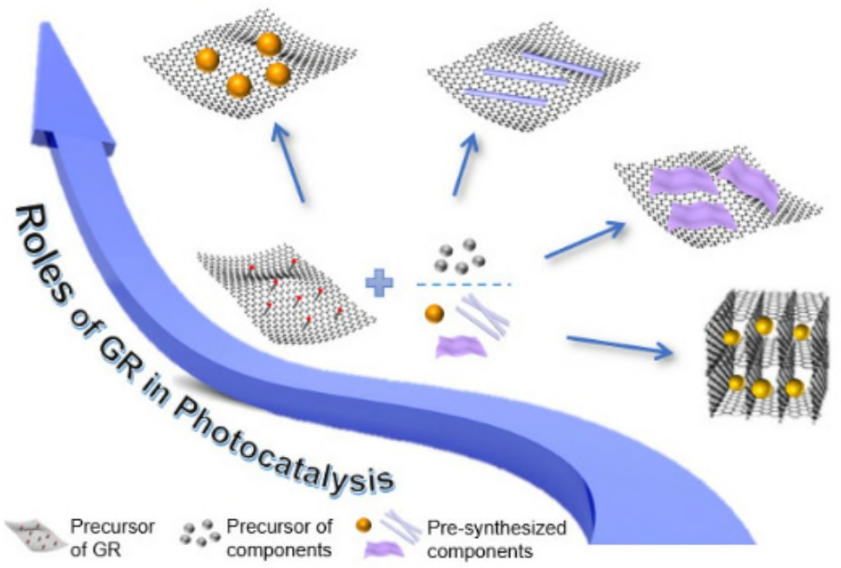


The synthesis approaches and design principles of hollow-structured hierarchical photocatalysts are summarized. The photocatalytic mechanism analysis of photocatalytic H_2 evolution and CO_2 reduction is also presented to provide a reference for the rational design and investigation of highly efficient photocatalysts.

Chin. J. Catal., 2022, 43: 708–730 doi: 10.1016/S1872-2067(21)63871-8

Multifunctional graphene-based composite photocatalysts oriented by multifaced roles of graphene in photocatalysis

Yue-Hua Li, Zi-Rong Tang *, Yi-Jun Xu *
Fuzhou Uiversity

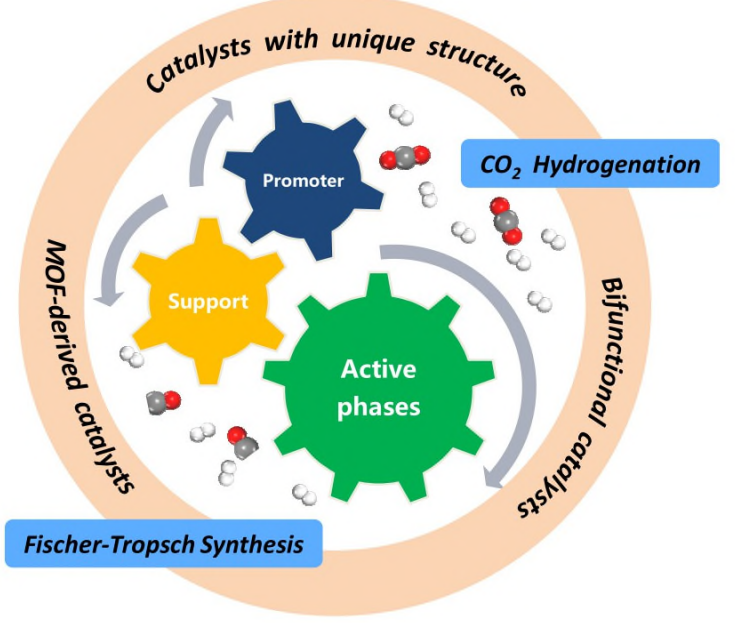


This review overviews optimizing strategies and synthesis of graphene-based composite photocatalysts oriented by the fundamental manifold roles of graphene in photocatalysis and proposes the key challenges and future perspectives for further investigations of graphene-based photocatalysts.

Chin. J. Catal., 2022, 43: 731–754 doi: 10.1016/S1872-2067(21)63802-0

Recent advances in application of iron-based catalysts for CO_x hydrogenation to value-added hydrocarbons

Junhui Liu *, Yakun Song, Xuming Guo, Chunshan Song *, Xinwen Guo *
Henan University of Science and Technology;
The Chinese University of Hong Kong;
Dalian University of Technology



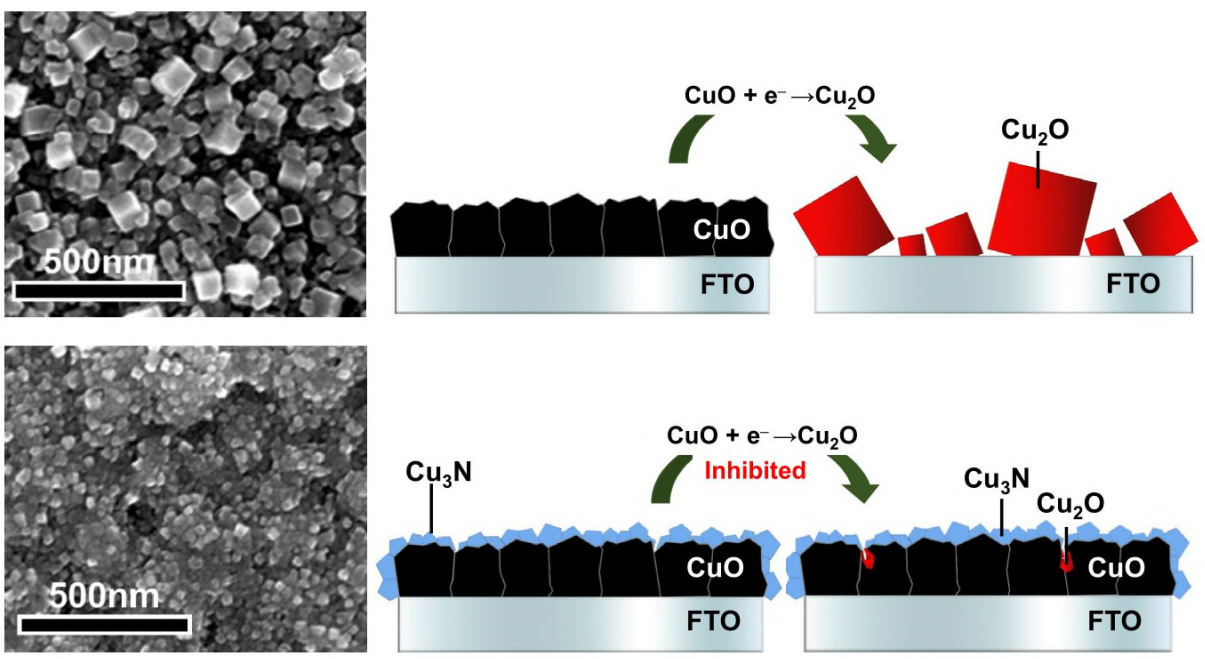
Based on an intensive understanding of promoter effect, support, and active phases, novel iron-based catalysts have been designed and prepared for the efficient conversion of CO or CO_2 into value-added hydrocarbons.

Communication

Chin. J. Catal., 2022, 43: 755–760 doi: 10.1016/S1872-2067(21)63894-9

Stabilizing CuO photocathode with a Cu_3N protection shell

Xiang-dong Meng, Chao Zhen *, Gang Liu *, Hui-Ming Cheng
Institute of Metal Research, Chinese Academy of Sciences; ShanghaiTech University; University of Science and Technology of China; Tsinghua-Berkeley Shenzhen Institute, Tsinghua University



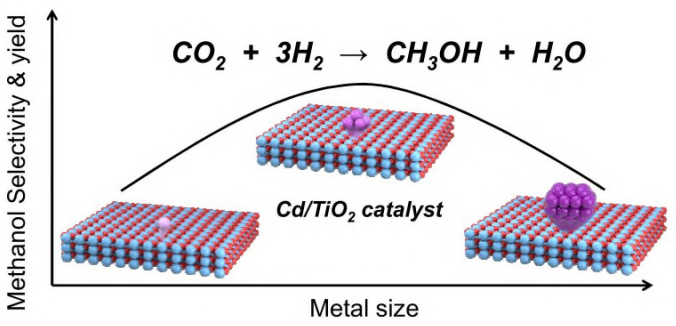
A Cu_3N protection shell was used to protect the CuO photocathode to effectively suppress the photocorrosion of CuO.

Articles

Chin. J. Catal., 2022, 43: 761–770 doi: 10.1016/S1872-2067(21)63907-4

Highly dispersed Cd cluster supported on TiO_2 as an efficient catalyst for CO_2 hydrogenation to methanol

Jijie Wang, Jittima Meeprasert, Zhe Han, Huan Wang, Zhendong Feng, Chizhou Tang, Feng Sha, Shan Tang, Guanna Li, Evgeny A. Pidko *, Can Li *
Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China; Delft University of Technology, the Netherlands; Nankai University, China; University of Chinese Academy of Sciences, China; Wageningen University & Research, the Netherlands

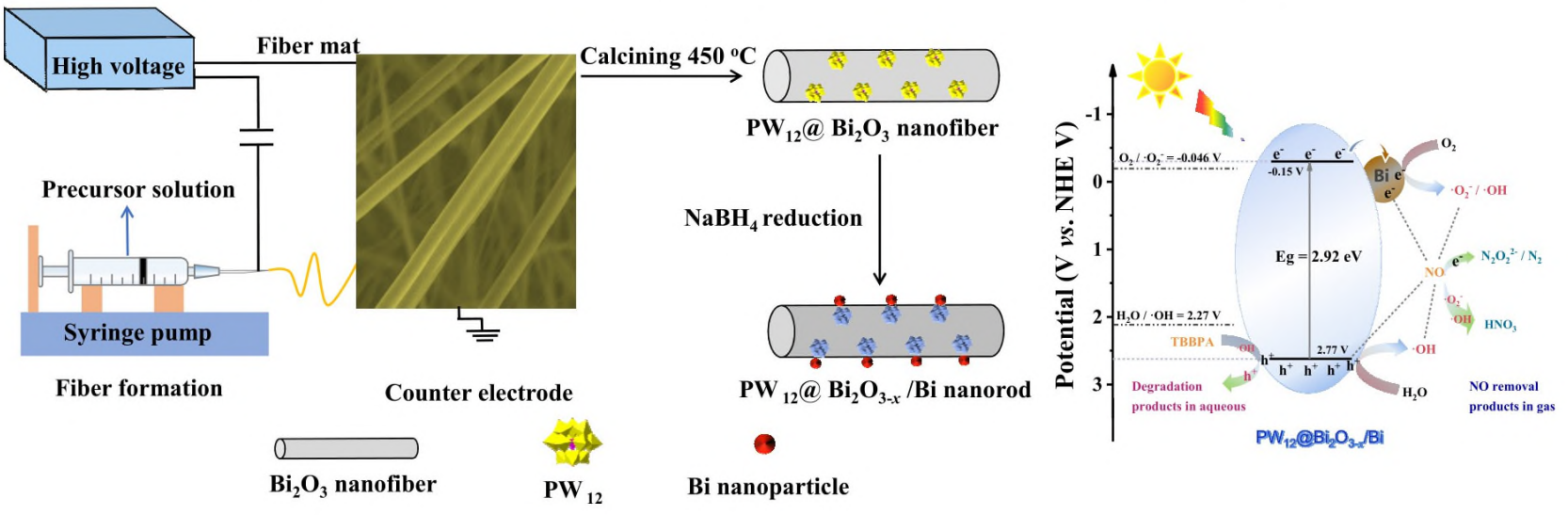


A novel Cd/TiO_2 catalyst exhibiting a menthol selectivity of 81% and a CO_2 conversion of 15.8% was obtained. It was found that the unique electronic properties exhibited by the Cd clusters supported by the TiO_2 matrix were responsible for the high selectivity of CO_2 hydrogenation to methanol.

Chin. J. Catal., 2022, 43: 771–781 doi: 10.1016/S1872-2067(21)63843-3

Polyoxometalates-doped Bi_2O_{3-x}/Bi photocatalyst for highly efficient visible-light photodegradation of tetrabromobisphenol A and removal of NO

Yingnan Zhao, Xing Qin, Xinyu Zhao, Xin Wang, Huaqiao Tan *, Huiying Sun, Gang Yan *, Haiwei Li, Wingkei Ho *, Shun-cheng Lee
The Education University of Hong Kong; Northeast Normal University; Jilin Jianzhu University; The Hong Kong Polytechnic University

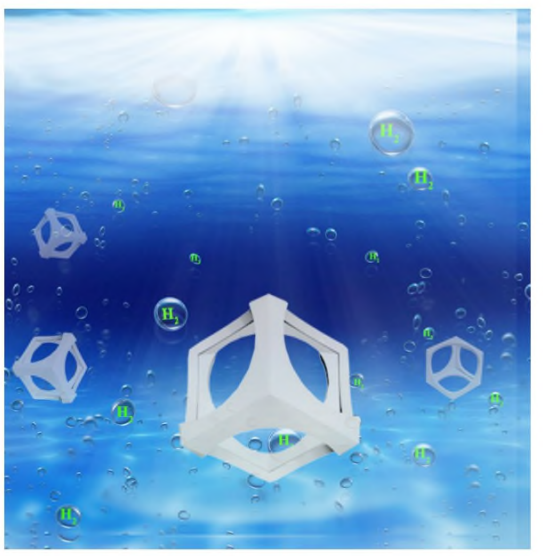


$PW_{12}O_{40}$@Bi_2O_{3-x}/Bi-*n* Schottky photocatalysts were prepared by a simple electrospinning/calcination/*in-situ* $NaBH_4$ reduction method. The synergistic effect of PW_{12}-doping and the interface Schottky junction endows $PW_{12}O_{40}$@Bi_2O_{3-x}/Bi-18 with ultrahigh photocatalytic activity for tetrabromobisphenol A photodegradation and NO removal.

Chin. J. Catal., 2022, 43: 782–792 doi: 10.1016/S1872-2067(21)63864-0

Copper-doped zinc sulfide nanoframes with three-dimensional photocatalytic surfaces for enhanced solar driven H_2 production

Junmin Huang, Jianmin Chen, Wangxi Liu, Jingwen Zhang,
Junying Chen *, Yingwei Li *
South China University of Technology

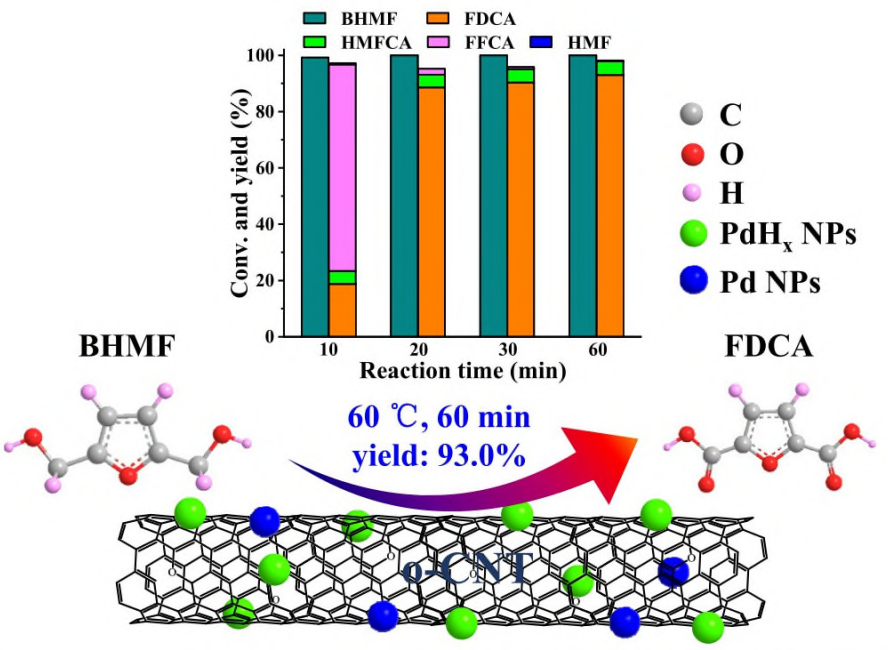


Novel Cu-doped ZnS nanoframes with three-dimensional photocatalytic surfaces are fabricated by employing ZIF-8 as the precursor for enhanced solar-driven hydrogen evolution.

Chin. J. Catal., 2022, 43: 793–801 doi: 10.1016/S1872-2067(21)63878-0

Oxidation of 2,5-bis(hydroxymethyl)furan to 2,5-furandicarboxylic acid catalyzed by carbon nanotube-supported Pd catalysts

Zhenyu Li, Liyuan Huai, Panpan Hao *, Xi Zhao, Yongzhao Wang, Bingsen Zhang, Chunlin Chen, Jian Zhang *
Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences; Institute of Metal Research, Chinese Academy of Sciences

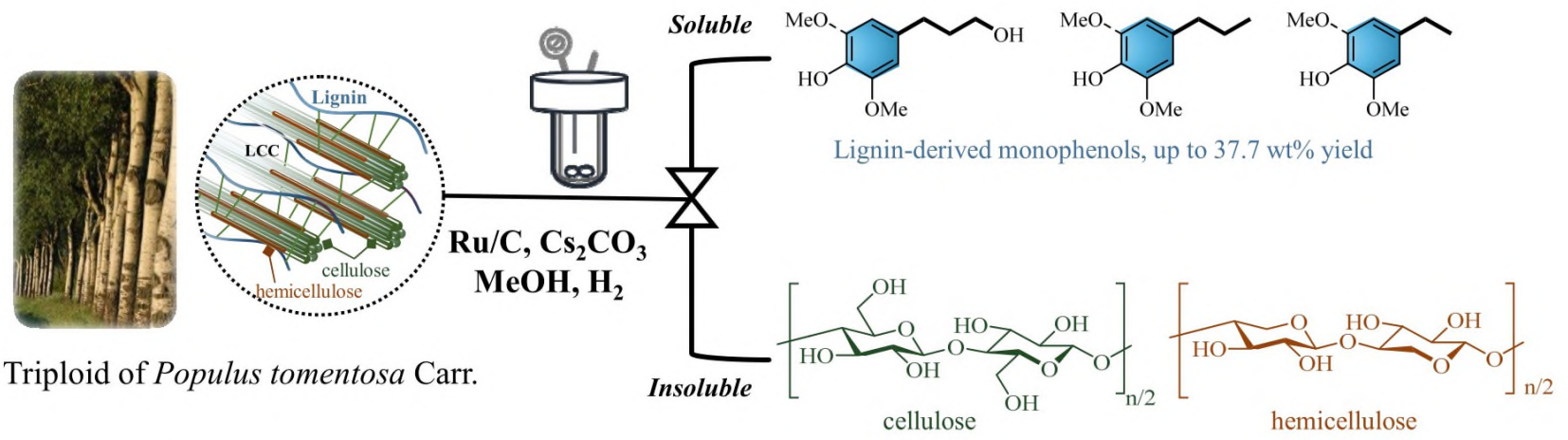


Oxidation of 2,5-bis(hydroxymethyl)furan to 2,5-furandicarboxylic acid as a promising route affords a high FDCA yield of 93.0% under a mild condition when catalyzed by modified carbon nanotube-supported Pd catalysts.

Chin. J. Catal., 2022, 43: 802–810 doi: 10.1016/S1872-2067(21)63881-0

Integration of Ru/C and base for reductive catalytic fractionation of triploid poplar

Yiwei Fan, Helong Li, Shihao Su, Jinlei Chen Chunquan Liu, Shuizhong Wang, Xiangya Xu, Guoyong Song *
Beijing Forestry University; Chongqing University of Arts and Sciences; SINOPEC Beijing Research Institute of Chemical Industry

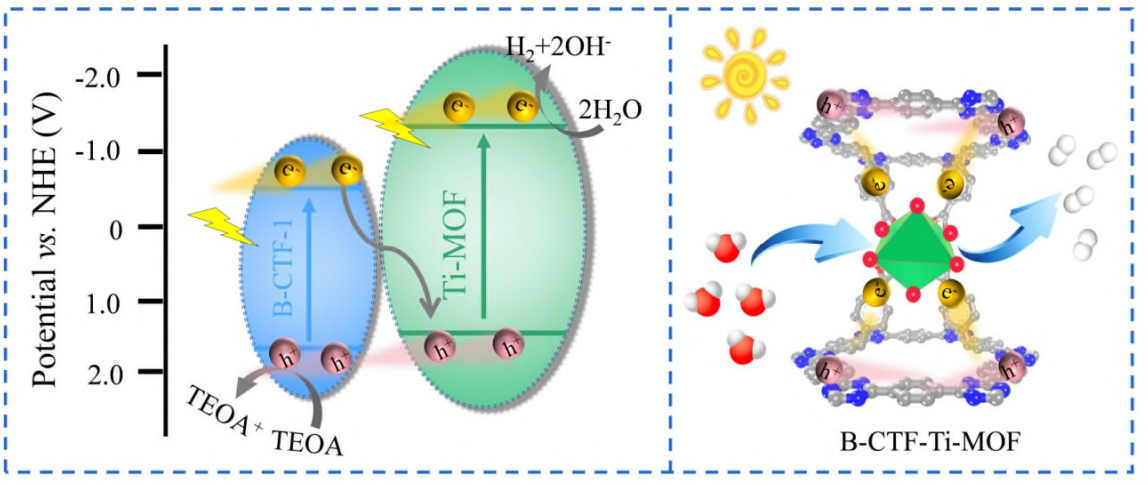


The introduction of a base into the Ru/C-catalyzed RCF of triploid poplar led to significant variations in the monophenolic product distribution and promoted the enzymolysis of cellulose.

Chin. J. Catal., 2022, 43: 811–819 doi: 10.1016/S1872-2067(21)63892-5

A new strategy for the fabrication of covalent organic framework-metal-organic framework hybrids *via in-situ* functionalization of ligands for improved hydrogen evolution reaction activity

Ling-Ling Zheng, Long-Shuai Zhang *, Ying Chen, Lei Tian, Xun-Heng Jiang, Li-Sha Chen, Qiu-Ju Xing, Xiao-Zhen Liu, Dai-She Wu, Jian-Ping Zou *
Nanchang Hangkong University; Nanchang University

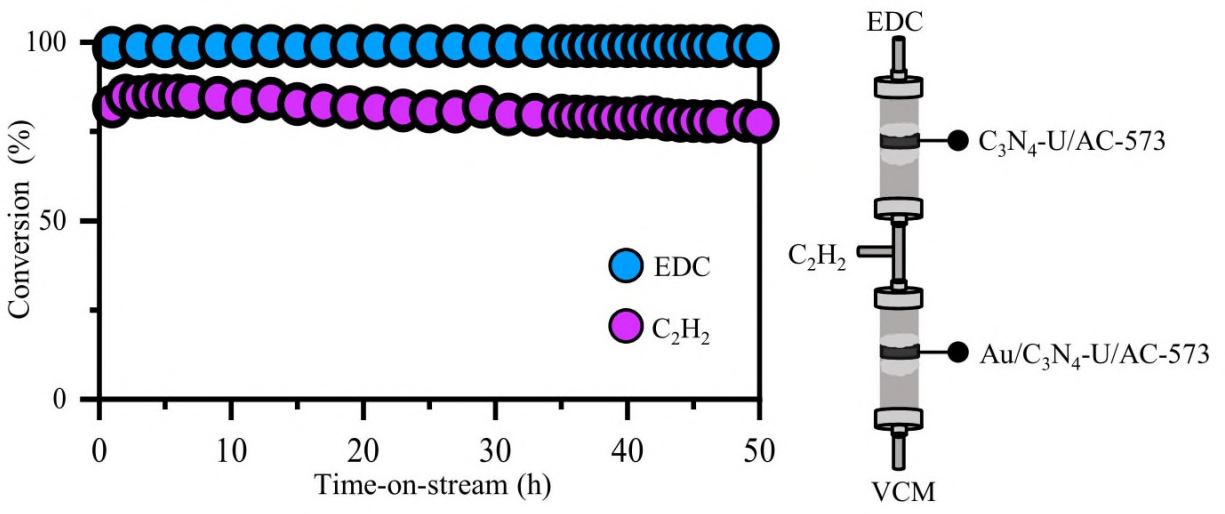


Well-designed unique covalent organic framework-metal-organic framework hybrids (B-CTF-Ti-MOF) were constructed by using *in-situ* functionalized ligands as nucleation sites and electronic transmission channels to boost the photocatalytic performance of the material.

Chin. J. Catal., 2022, 43: 820–831 doi: 10.1016/S1872-2067(21)63913-X

M/C_3N_4/AC (M = Au, Pt, Ru)-catalyzed acetylene coupling with ethylene dichloride: How effective are the bifunctionalities?

Qing Yu, Shiyi Wang, Mengru Wang, Xiaoling Mou *, Ronghe Lin *, Yunjie Ding *
Zhejiang Normal University; Dalian Institute of Chemical Physics, Chinese Academy of Sciences

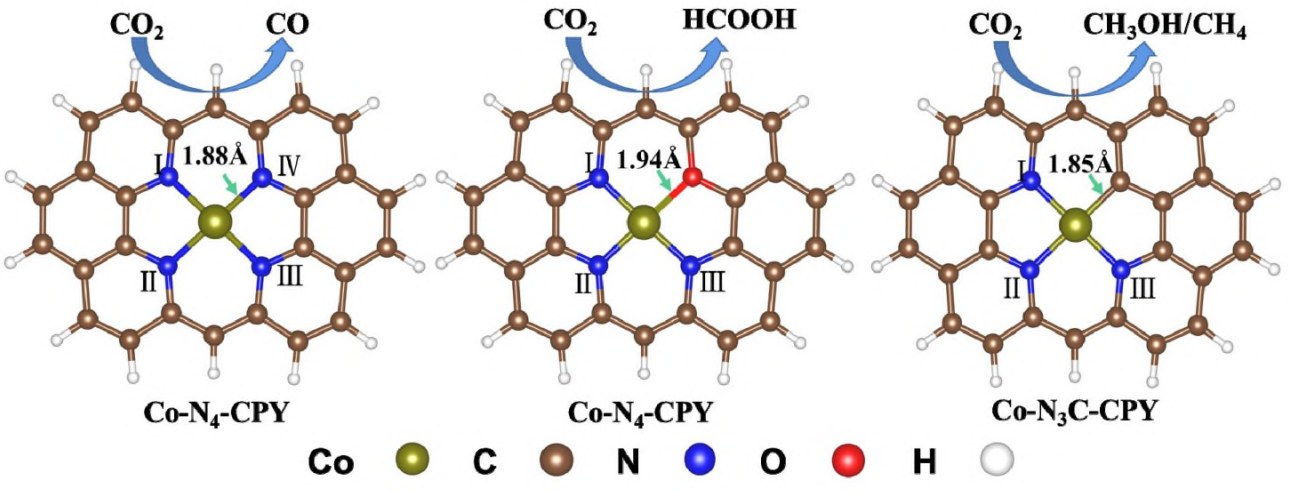


Dual-bed reactors packed with individual C_3N_4/AC and Au/C_3N_4/AC catalysts enabled highly efficient and stable production of vinyl chloride via acetylene coupling with ethylene dichloride.

Chin. J. Catal., 2022, 43: 832–838 doi: 10.1016/S1872-2067(21)63893-7

CO_2 reduction reaction pathways on single-atom Co sites: Impacts of local coordination environment

Haixia Gao, Kang Liu, Tao Luo, Yu Chen, Junhua Hu, Junwei Fu *, Min Liu *
Hunan University of Science and Engineering; Central South University; Zhengzhou University

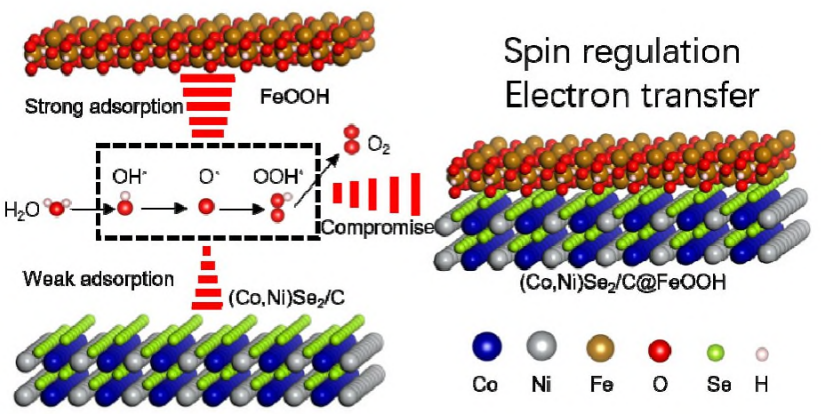


DFT calculations predict that changing the local coordination environment of single-atom Co sites with N substituted by O (Co-N_3O-CPY) and C (Co-N_3C-CPY) affects the CO_2 reduction reaction pathways.

Chin. J. Catal., 2022, 43: 839–850 doi: 10.1016/S1872-2067(21)63922-0

Spin regulation on (Co,Ni)Se_2/C@FeOOH hollow nanocage accelerates water oxidation

Yu Gu, Xiaolei Wang, Muhammad Humayun, Linfeng Li, Huachuan Sun, Xuefei Xu, Xinying Xue, Aziz Habibi-Yangjeh, Kristiaan Temst, Chundong Wang *
Huazhong University of Science and Technology, China; Shanghai Institute of Ceramics, Chinese Academy of Sciences, China; Beijing University of Technology, China; Shihezi University, China; University of Mohaghegh Ardabili, Iran; KU Leuven, Belgium

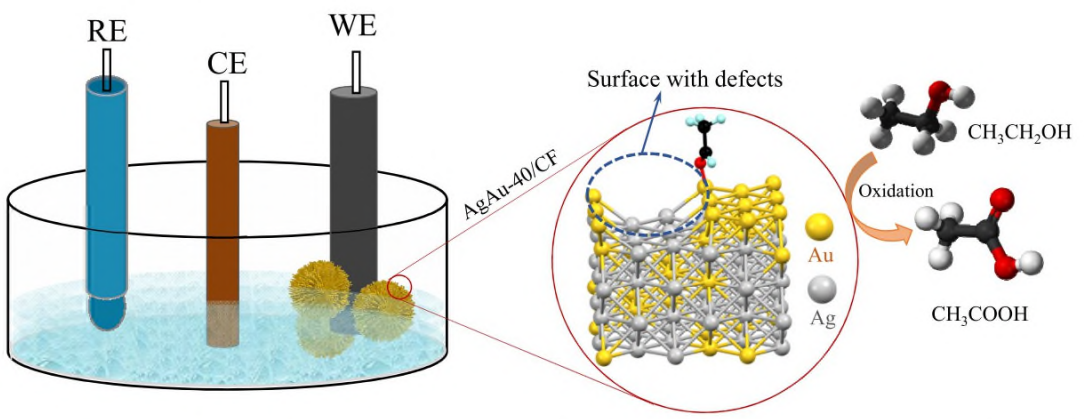


Coupling FeOOH with (Co,Ni)Se_2/C allows introduction of numerous polarized spins into the composites and consequently endows remarkable OER activity, which could be due to the optimized adsorption and desorption energy of the intermediate oxygenated species by spin engineering.

Chin. J. Catal., 2022, 43: 851–861 doi: 10.1016/S1872-2067(21)63895-0

Hierarchical AgAu alloy nanostructures for highly efficient electrocatalytic ethanol oxidation

Caiqin Wang, Danil Bukhvalov, M. Cynthia Goh *, Yukou Du, Xiaofei Yang *
Nanjing Forestry University, China; University of Toronto, Canada; Soochow University, China

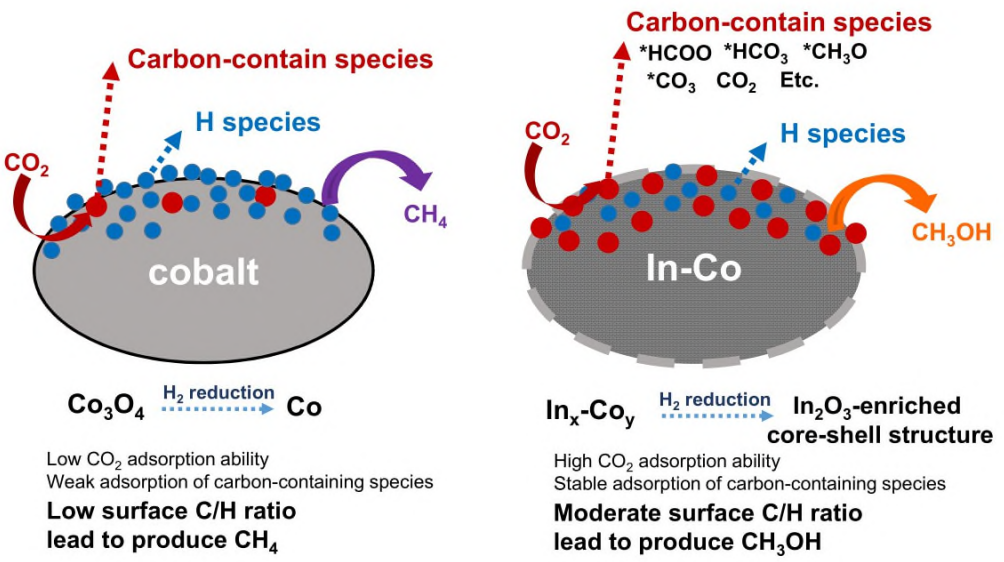


Hierarchical AgAu alloy nanostructures with numerous nanospines are synthesized *via* a partial galvanic replacement reaction, and they exhibit excellent catalytic activity towards ethanol electrooxidation. DFT calculations indicate that surface defects promote catalytic performance.

Chin. J. Catal., 2022, 43: 862–876 doi: 10.1016/S1872-2067(21)63870-6

CO_2 hydrogenation selectivity shift over In-Co binary oxides catalysts: Catalytic mechanism and structure-property relationship

Longtai Li, Bin Yang, Biao Gao, Yifu Wang, Lingxia Zhang, Tatsumi Ishihara, Wei Qi *, Limin Guo *
Huazhong University of Science and Technology, China; University of Chinese Academy of Sciences, China; Shanghai Institute of Ceramics, Chinese Academy of Sciences, China; Kyushu University, Japan



This study demonstrates the structural reconstruction of the In-Co catalyst in a reducing atmosphere, resulting in enhanced CO_2 adsorption and stability of key intermediate species, which in turn leads to a shift in product selectivity.

Chin. J. Catal., 2022, 43: 877–884 doi: 10.1016/S1872-2067(21)63908-6

Insights into effects of ZrO_2 crystal phase on syngas-to-olefin conversion over ZnO/ZrO_2 and SAPO-34 composite catalysts

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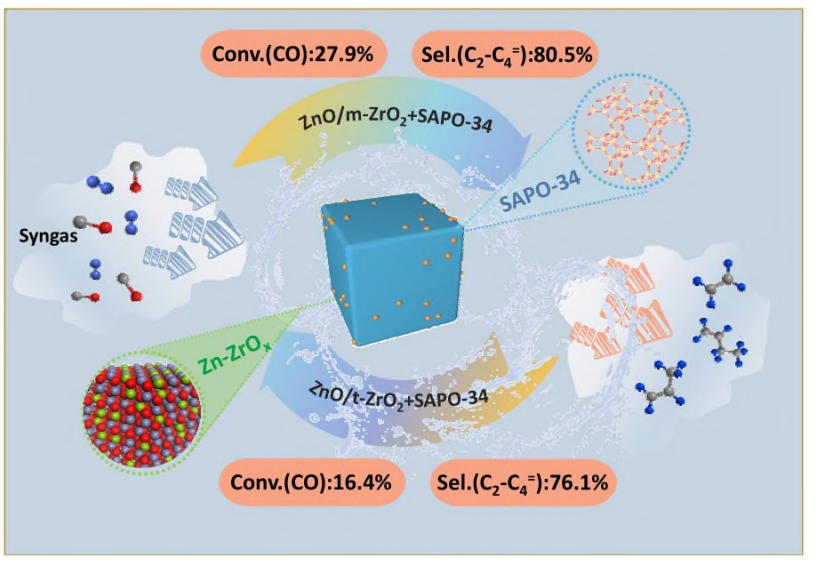

Monoclinic ZnO/ZrO_2 oxide mixed with SAPO-34 zeolite (ZnO/*m*-ZrO_2+SAPO-34) exhibited higher CO conversion and selectivity for C_2–C_4 olefins, with values much higher than those achieved with tetragonal (ZnO/*t*-ZrO_2+SAPO-34) in the STO conversion.

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Non-catalytic, instant iridium (Ir) leaching: A non-negligible aspect in identifying Ir-based perovskite oxygen-evolving electrocatalysts

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The cation leaching process of some well-known Ir-based double perovskite oxides under non-catalytic conditions is investigated. A standard protocol focusing on acid stability is proposed for the fast screening of potential low-Ir oxygen evolution electrocatalysts.