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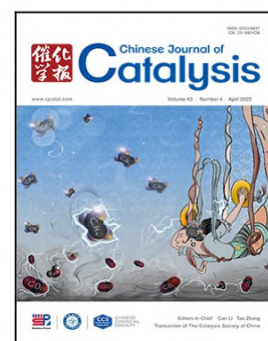
Editors-in-Chief Can Li Tao Zhang
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Chinese Journal of Catalysis

Graphical Contents

Highlight

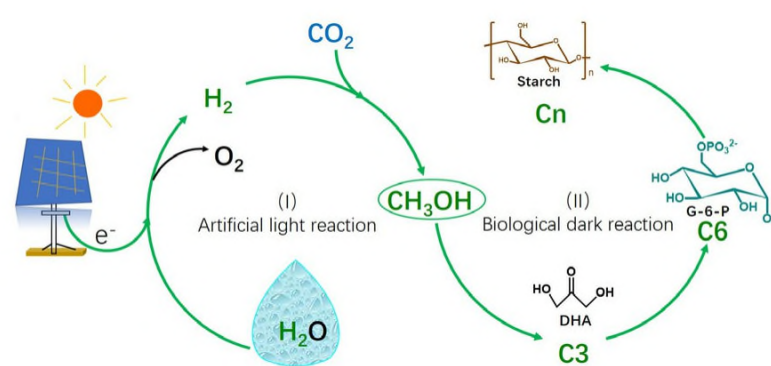
Chin. J. Catal., 2022, 43: 895–897 doi: 10.1016/S1872-2067(21)64023-8

Artificial photosynthetic starch from liquid sunshine

Wangyin Wang*

Dalian Institute of Chemical Physics, Chinese Academy of Sciences

An artificial photosynthetic hybrid pathway merging chemical and biological catalysis is constructed for starch synthesis from liquid sunshine.



Account

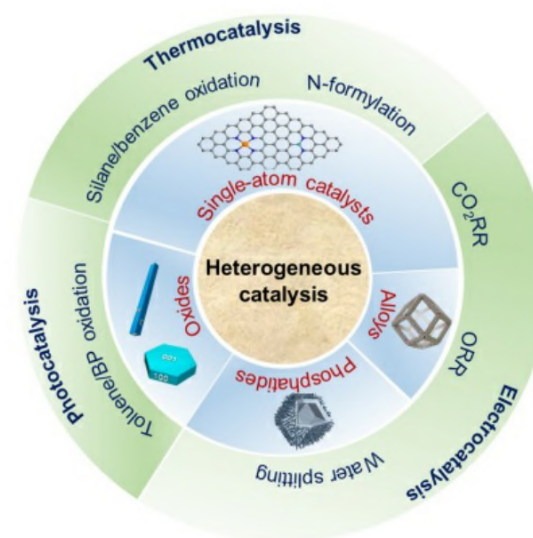
Chin. J. Catal., 2022, 43: 898–912 doi: 10.1016/S1872-2067(21)63933-5

Rational design and precise manipulation of nano-catalysts

Qinggong Liu, Junguo Ma, Chen Chen *

Tsinghua University

Focusing on the recent progress in Chen's group, this review summarizes the combined synthetic chemistry, theoretical modeling, and spectroscopy studies of nano-catalysts together with their applications in electrocatalysis, photocatalysis and thermocatalysis.

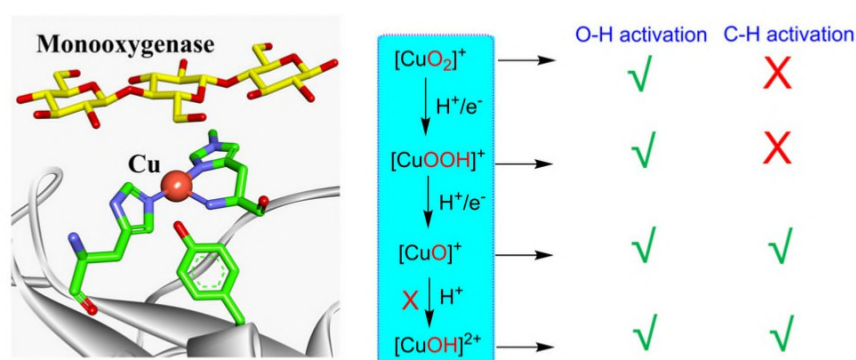


Chin. J. Catal., 2022, 43: 913–927 doi: 10.1016/S1872-2067(21)63974-8

Theoretical perspective on mononuclear copper-oxygen mediated C–H and O–H activations: A comparison between biological and synthetic systems

Peng Wu, Jinyan Zhang, Qianqian Chen, Wei Peng, Binju Wang *
Xiamen University

Reactivities of various mononuclear copper-oxygen have been compared between the synthetic and biological systems, showing that all species are reactive toward O–H activations but only $[\text{CuO}]^+$ species could be responsible for C–H activations in monooxygenases.



Reviews

Chin. J. Catal., 2022, 43: 928–955 doi: 10.1016/S1872-2067(21)63924-4

Coordination environment of active sites and their effect on catalytic performance of heterogeneous catalysts

Chunpeng Wang, Zhe Wang, Shanjun Mao, Zhirong Chen, Yong Wang *
Zhejiang University



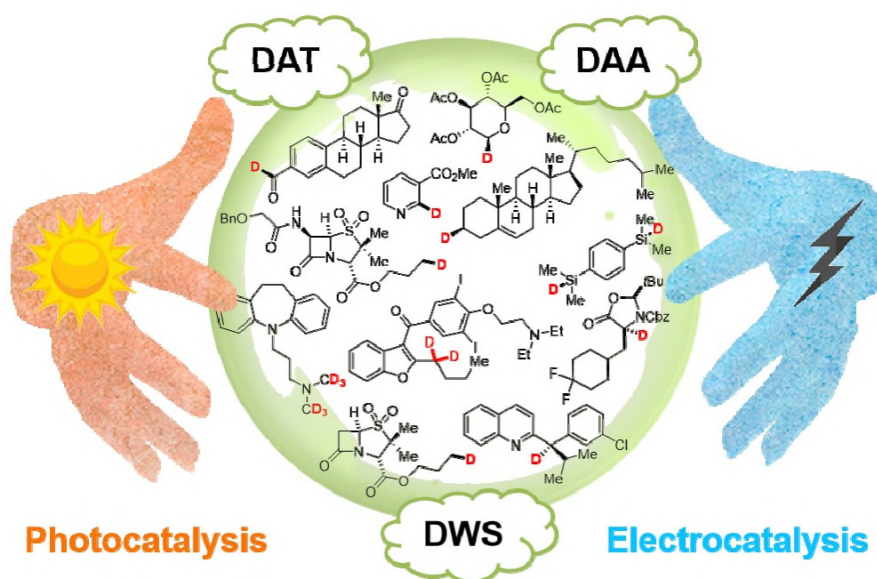
In this review, the key factors affecting the coordinated environment of active centers and advance characterization techniques were systematically summarized. And the structure-performance relationships in various reactions were also analyzed in detail.

Chin. J. Catal., 2022, 43: 956–970 doi: 10.1016/S1872-2067(21)63928-1

Photo- and electro-catalytic deuteration of feedstock chemicals and pharmaceuticals: A review

Wei Ou, Chuntian Qiu *, Chenliang Su *
Shenzhen University

Recent advances in photo/electrocatalytic deuteration strategies were summarized and classified as deuterium atom transfer/abstraction and deuterated water splitting to give mechanistic insights and specific horizon for precise construction of valuable deuterated products.

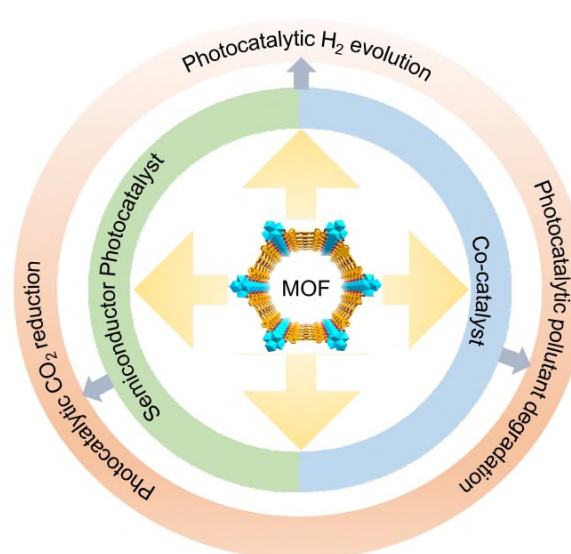


Chin. J. Catal., 2022, 43: 971–1000 doi: 10.1016/S1872-2067(21)63934-7

Metal-organic framework-derived multifunctional photocatalysts

Yaping Zhang, Jixiang Xu *, Jie Zhou, Lei Wang *
Qingdao University of Science and Technology

MOF derivatives, which inherit the multiple advantages of MOF materials, and avoid the disadvantages of poor conductivity and stability, exhibit great application potential in the field of photocatalysis not only as semiconductor photocatalysts but also as cocatalysts.



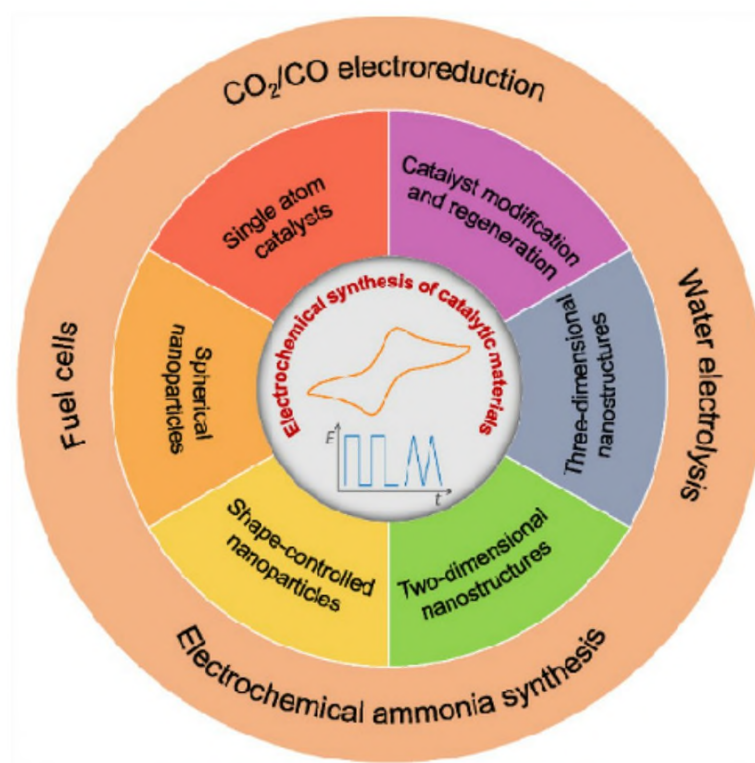
Chin. J. Catal., 2022, 43: 1001–1016 doi: 10.1016/S1872-2067(21)63940-2

Electrochemical synthesis of catalytic materials for energy catalysis

Dunfeng Gao *, Hefei Li, Pengfei Wei, Yi Wang, Guoxiong Wang *, Xinhe Bao

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

The electrochemical synthesis methods for the preparation of catalytically active nanostructures are briefly introduced and the unique roles of electrochemically synthesized catalysts in energy-related electrocatalytic applications are exemplified.



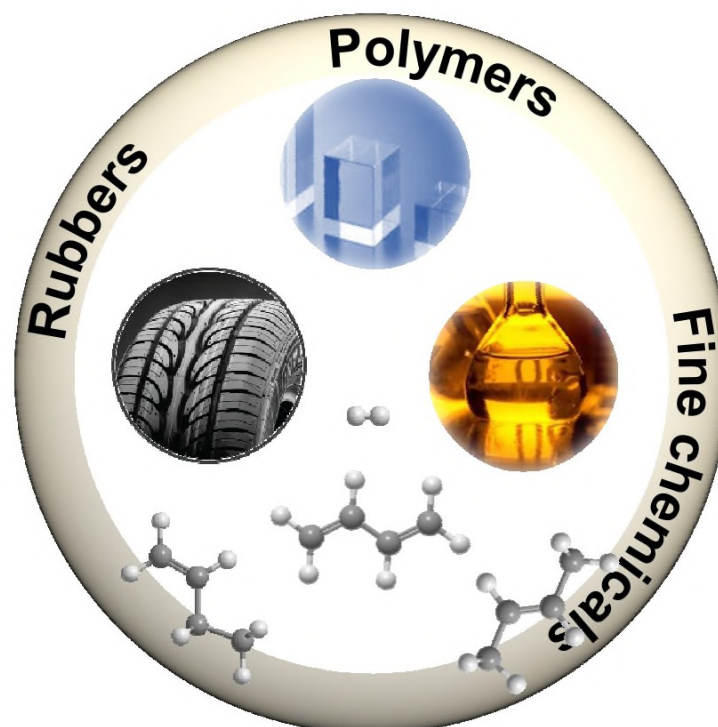
Chin. J. Catal., 2022, 43: 1017–1041 doi: 10.1016/S1872-2067(21)63942-6

Design strategies and structure-performance relationships of heterogeneous catalysts for selective hydrogenation of 1,3-butadiene

Mengru Wang, Yi Wang, Xiaoling Mou *, Ronghe Lin *, Yunjie Ding *

Zhejiang Normal University; Dalian Institute of Chemical Physics,
Chinese Academy of Sciences

The design strategies and structure-performance relationships of heterogeneous catalysts for selective hydrogenation of 1,3-butadiene in the last half century have been critically reviewed, and the challenges and thrilling directions for future work have been provided.



Communication

Chin. J. Catal., 2022, 43: 1042–1048 doi: 10.1016/S1872-2067(21)63966-9

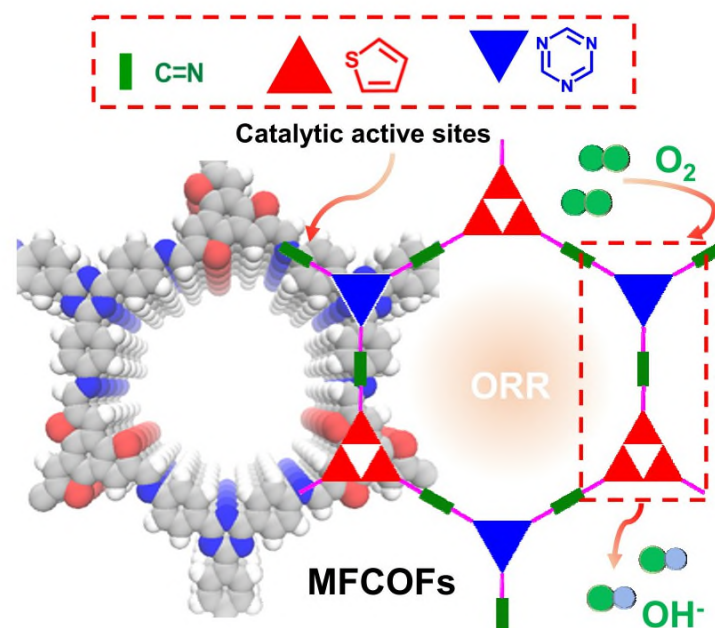
Precise and controllable tandem strategy triggering boosted oxygen reduction activity

Guoxing Jiang, Longhai Zhang, Wenwu Zou, Weifeng Zhang,

Xiujun Wang, Huiyu Song, Zhiming Cui, Li Du *

South China University of Technology

A precise and controllable tandem strategy is developed to boost the oxygen reduction activity based on metal-free covalent organic frameworks, which comprise imine-N, thiophene-S, or triazine-N. The series-connected units induce unique electron density redistribution as a result of the activated conjugated skeleton of the structure, engendering their synergistic catalysis.



Articles

Chin. J. Catal., 2022, 43: 1049–1057 doi: 10.1016/S1872-2067(21)63947-5

Integration of ultrafine CuO nanoparticles with two-dimensional MOFs for enhanced electrochemical CO₂ reduction to ethylene

Linlin Wang, Xin Li, Leiduan Hao, Song Hong, Alex W. Robertson, Zhenyu Sun *

Beijing University of Chemical Technology, China;
University of Oxford, UK;
Shanghai Advanced Research Institute, CAS, China

We report a novel catalyst consisting of fine CuO nanoparticles immobilized on Cu metal-organic framework nanosheets for efficient ambient electrochemical CO₂ reduction, delivering an average C₂H₄ faradaic efficiency of ~50.0% in 0.1 mol/L aqueous KHCO₃.

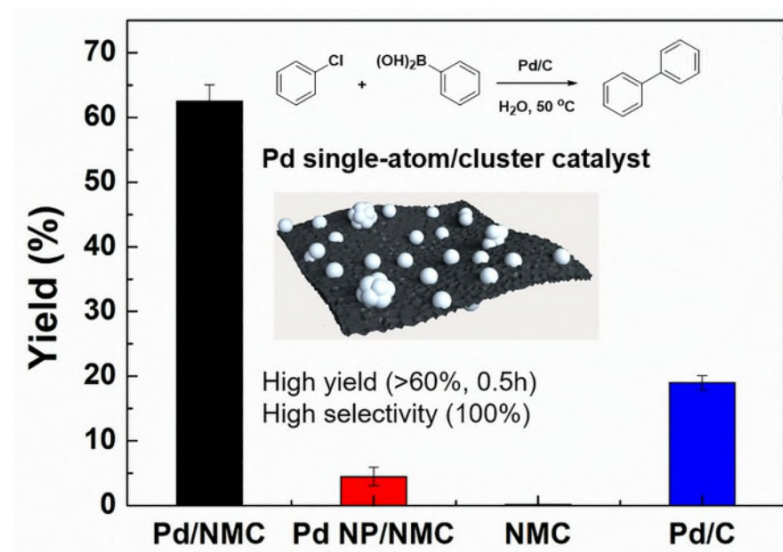


Chin. J. Catal., 2022, 43: 1058–1065 doi: 10.1016/S1872-2067(21)63968-2

Rapid synthesis of Pd single-atom/cluster as highly active catalysts for Suzuki coupling reactions

Hehe Wei, Xiaoyang Li, Bohan Deng, Jialiang Lang, Ya Huang, Xingyu Hua, Yida Qiao, Binghui Ge *, Jun Ge *, Hui Wu *

Tsinghua University; Anhui University; East China University of Science and Technology



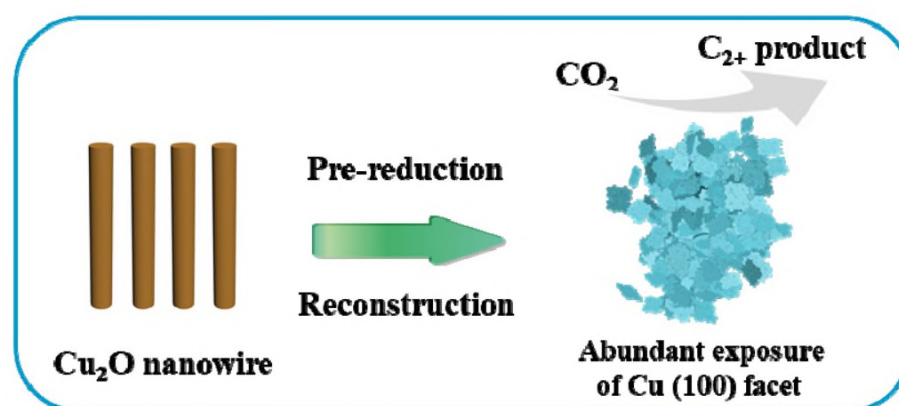
Pd single-atom/cluster catalyst exhibits significantly boosted activity (100% selectivity and 95% yield) and excellent stability (almost no decay in activity after 10 reuse cycles) for the Suzuki coupling reactions of chlorobenzenes in base aqueous solution, together with superior yield and excellent selectivity in the fields of the board scope of the reactants, superior to state-of-the-art commercial Pd/C catalysts.

Chin. J. Catal., 2022, 43: 1066–1073 doi: 10.1016/S1872-2067(21)63981-5

Crystal facet effect induced by different pretreatment of Cu₂O nanowire electrode for enhanced electrochemical CO₂ reduction to C₂+ products

Yang Fu, Qixian Xie, Linxiao Wu, Jingshan Luo *

Nankai University



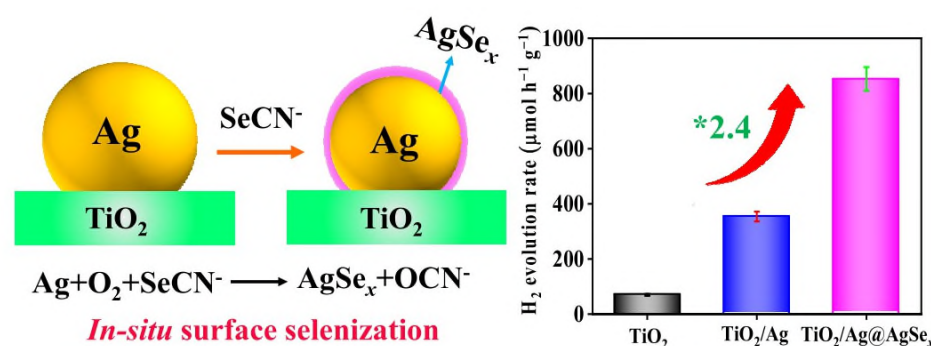
We demonstrated the influence of pretreatment and structure evolution on the product distribution of Cu-based catalyst for electrochemical CO₂ reduction, and achieved high selectivity for C₂+ products.

Chin. J. Catal., 2022, 43: 1074–1083 doi: 10.1016/S1872-2067(21)63969-4

Novel core-shell Ag@AgSe_x nanoparticle co-catalyst: *In situ* surface selenization for efficient photocatalytic H₂ production of TiO₂

Wei Zhong, Jiachao Xu, Ping Wang, Bicheng Zhu *, Jiajie Fan, Huogen Yu *

Wuhan University of Technology; China University of Geosciences; Zhengzhou University



The amorphous AgSe_x as a novel active site has been *in-situ* formed on the metallic Ag surface to fabricate core-shell Ag@AgSe_x nanoparticle-modified TiO₂ photocatalysts with a greatly improved H₂-evolution rate.

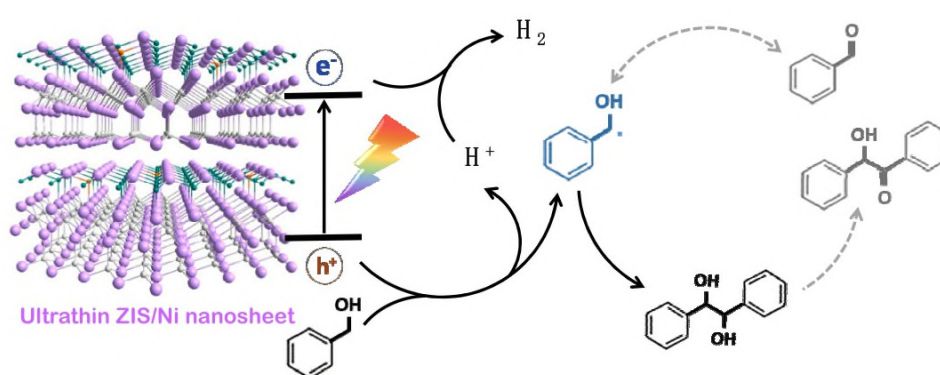
Chin. J. Catal., 2022, 43: 1084–1091 doi: 10.1016/S1872-2067(21)63931-1

Efficient splitting of alcohols into hydrogen and C-C coupled products over ultrathin Ni-doped ZnIn₂S₄ nanosheet photocatalyst

Jing-Yu Li, Ming-Yu Qi, Yi-Jun Xu *

Fuzhou University

Simultaneous e⁻-h⁺ utilization in one photoredox reaction



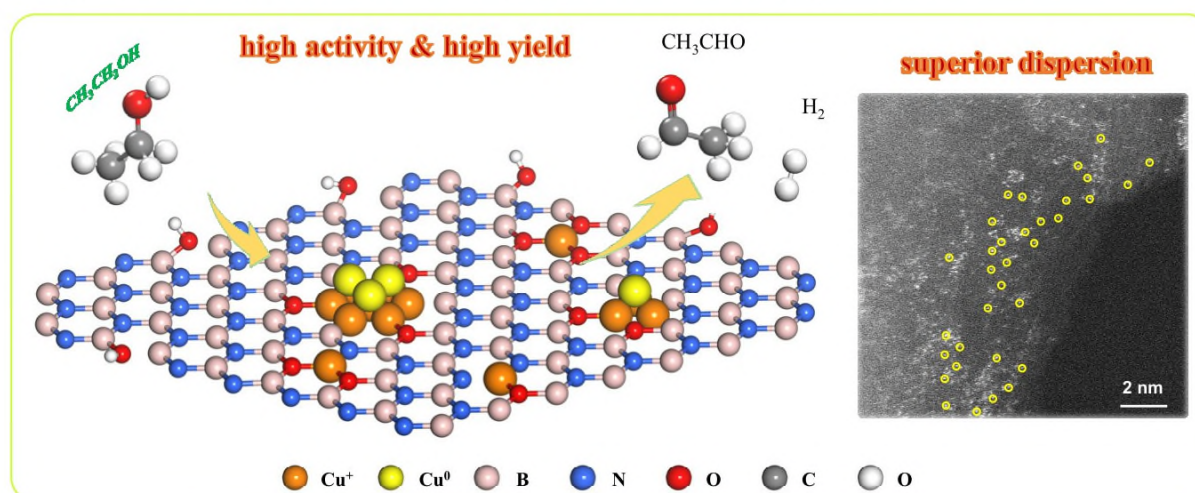
An effective photocatalytic redox system towards the cost-effective H₂ evolution integrated with selective benzyl alcohol dehydrocoupling into hydrobenzoin has been achieved over the noble metal-free 2D ultrathin Ni-doped ZnIn₂S₄ (ZIS/Ni) nanosheet.

Chin. J. Catal., 2022, 43: 1092–1100 doi: 10.1016/S1872-2067(21)63891-3

Defect-rich BN-supported Cu with superior dispersion for ethanol conversion to aldehyde and hydrogen

Shi-Qun Cheng, Xue-Fei Weng, Qing-Nan Wang, Bai-Chuan Zhou, Wen-Cui Li, Ming-Run Li, Lei He, Dong-Qi Wang, An-Hui Lu *

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

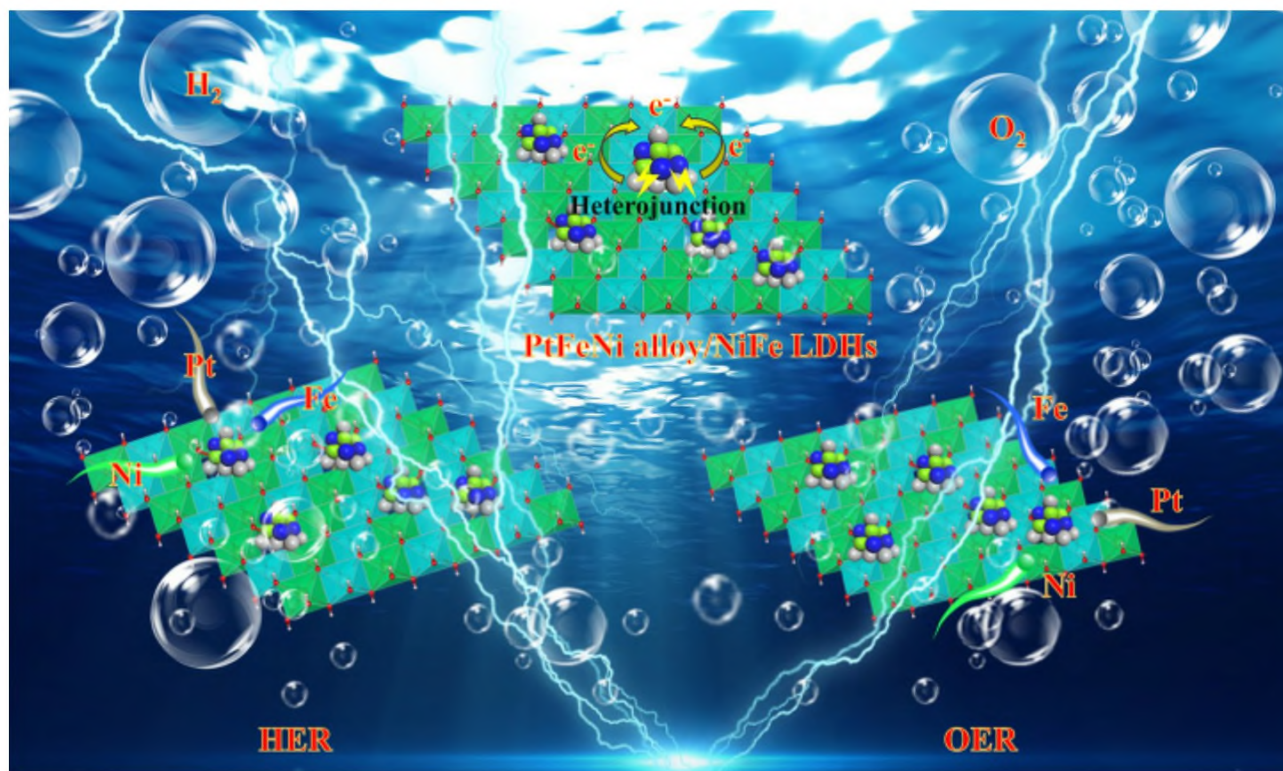


Copper-based heterogeneous catalysts possessing well-dispersed Cu species were prepared using defect-enriched hexagonal boron nitride nanosheets as supports. The fabricated catalysts showed exceptionally stable performance and high activity and yield in the ethanol dehydrogenation reaction.

Chin. J. Catal., 2022, 43: 1101–1110 doi: 10.1016/S1872-2067(21)63926-8

Electrochemically formed PtFeNi alloy nanoparticles on defective NiFe LDHs with charge transfer for efficient water splitting

Gen Huang, Yingying Li, Ru Chen *, Zhaohui Xiao, Shiqian Du, Yucheng Huang, Chao Xie, Chungli Dong, Haibo Yi *, Shuangyin Wang *
Hunan University; Tamkang University; Chiao Tung University

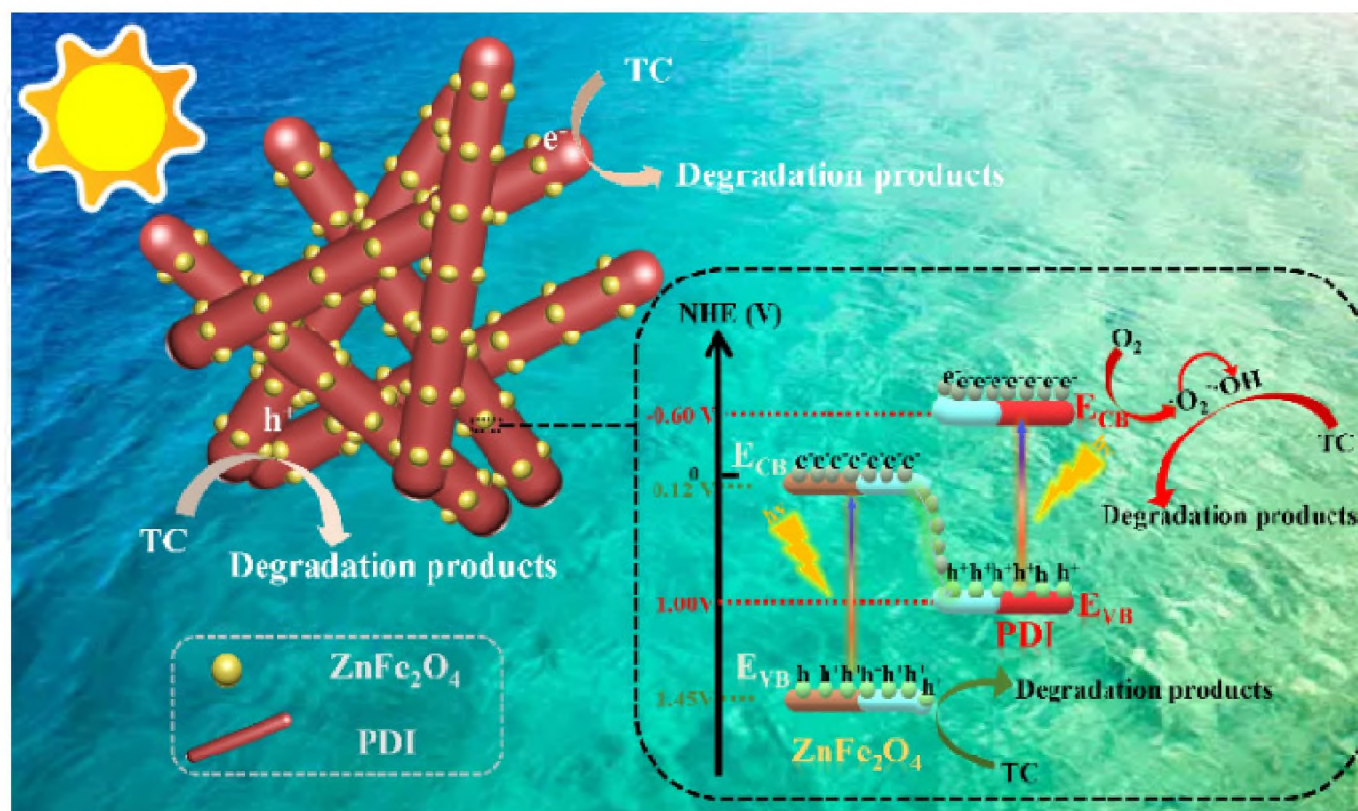


Electrochemically formed PtFeNi alloy nanoparticles on defective NiFe LDHs unravels the moderate charge transfer on the alloy clusters modulated by the defective substrates and exhibits an ultra-low overpotential for overall water splitting.

Chin. J. Catal., 2022, 43: 1111–1122 doi: 10.1016/S1872-2067(21)63930-X

Hydrochloric acid-mediated synthesis of ZnFe₂O₄ small particle decorated one-dimensional Perylene Diimide PDI S-scheme heterojunction with excellent photocatalytic ability

Yangrui Xu, Xiaodie Zhu, Huan Yan, Panpan Wang, Minshan Song, Changchang Ma, Ziran Chen, Jinyu Chu, Xinlin Liu *, Ziyang Lu *
Jiangsu University, China; Jiangsu University of Science and Technology, China; Dongguk University, South Korea; Portland State University, USA; University of Tennessee, USA; Sichuan Vocational and Technical College, China; Suzhou University of Science and Technology, China



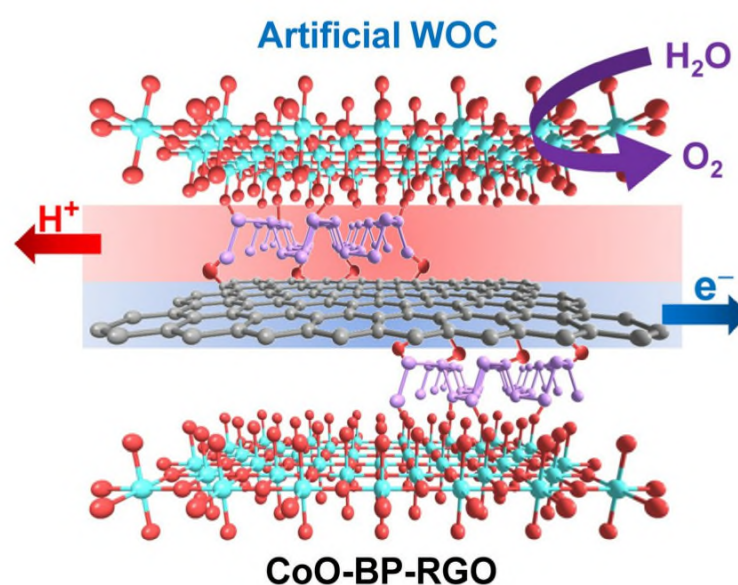
HCl-mediated strategy can regulate PDI to form a uniform rod-like structure, limiting ZnFe₂O₄ to become uniform small particles. The formed S-type heterojunction improves the photoelectron-hole separation ability of 1D PDI/ZnFe₂O₄.

Chin. J. Catal., 2022, 43: 1123–1130 doi: 10.1016/S1872-2067(21)63937-2

Black phosphorus incorporated cobalt oxide: Biomimetic channels for electrocatalytic water oxidation

Xueqing Gao, Xiaomeng Liu, Shujiao Yang, Wei Zhang*, Haiping Lin*,
Rui Cao*
Shaanxi Normal University; Soochow University

BP induced P–O bonds extract and deliver protons. RGO paves the way for electrons transfer. This work will initiate the search of biomimetic channels for protons and electrons transfer in energy conversion and storage.

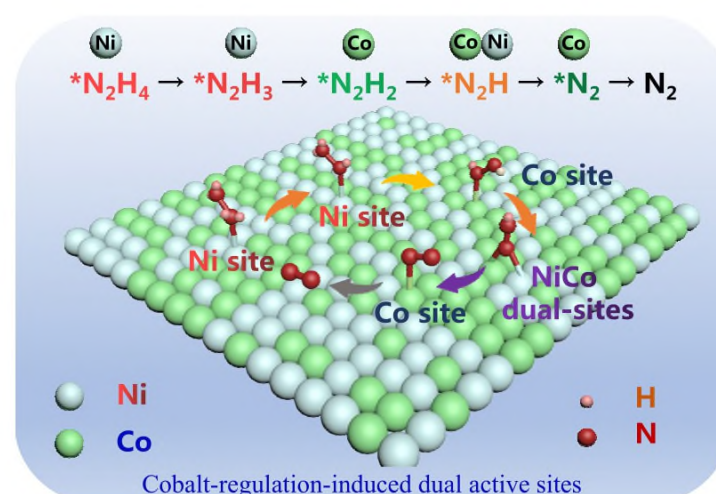


Chin. J. Catal., 2022, 43: 1131–1138 doi: 10.1016/S1872-2067(21)63951-7

Cobalt-regulation-induced dual active sites in Ni₂P for hydrazine electrooxidation

Bo Zhou, Mengyu Li, Yingying Li, Yanbo Liu, Yuxuan Lu, Wei Li,
Yujie Wu, Jia Huo, Yanyong Wang*, Li Tao*, Shuangyin Wang
Hunan University

For the HzOR on (Ni_{0.6}Co_{0.4})₂P, Co can not only optimize dehydrogenation kinetics of hydrazine at Ni site, but also acts as active site to cooperate with the Ni site to form the optimal coordination configuration.

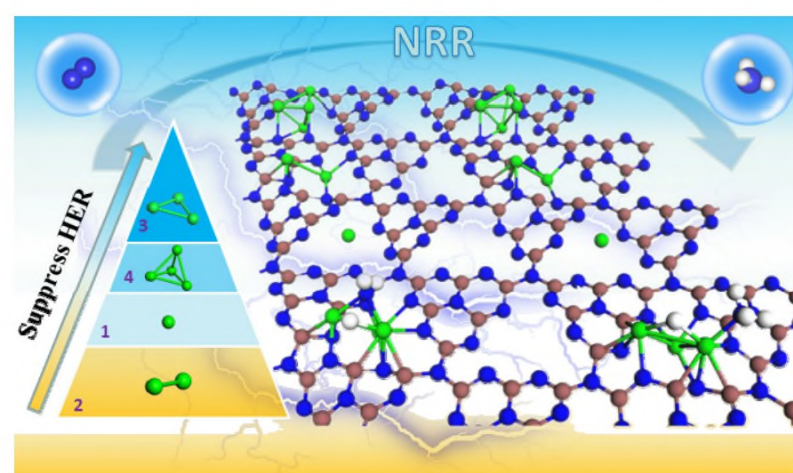


Chin. J. Catal., 2022, 43: 1139–1147 doi: 10.1016/S1872-2067(21)63950-5

Synergistic interaction of Nb atoms anchored on g-C₃N₄ and H⁺ promoting high-efficiency nitrogen reduction reaction

Shaokang Yang, Chaonan Zhang, Dewei Rao*, Xiaohong Yan
Jiangsu University

The synergistic effect between metals has a great influence on N₂ fixation, and the introduction of H⁺ during the reaction is conducive to reducing the free energy especially in the case of multi-atoms.



Chin. J. Catal., 2022, 43: 1148–1155 doi: 10.1016/S1872-2067(21)64012-3

Scalable synthesis of ultra-small Ru₂P@Ru/CNT for efficient seawater splitting

Dan Zhang, Hongfu Miao, Xueke Wu, Zuochao Wang, Huan Zhao,
Yue Shi, Xilei Chen, Zhenyu Xiao, Jianping Lai*, Lei Wang*
Qingdao University of Science and Technology

Solvent-free microwave method was used to synthesize ultra-small Ru₂P@Ru/CNT multi-interface heterojunction nanocatalyst for the first time and used for boosting HER in alkaline media and real seawater.

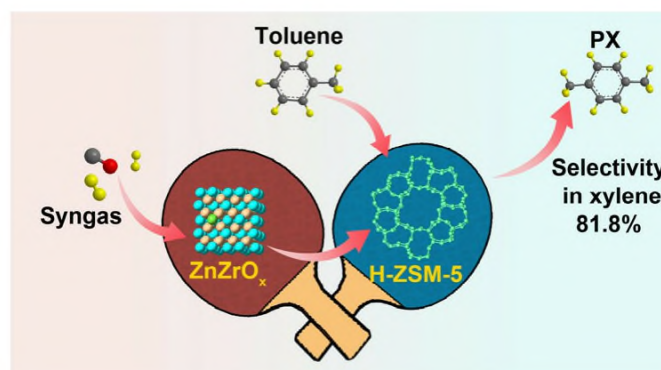


Chin. J. Catal., 2022, 43: 1156–1164 doi: 10.1016/S1872-2067(21)63975-X

Toluene methylation with syngas to *para*-xylene by bifunctional ZnZrO_x-HZSM-5 catalysts

Xiaoqin Han, Jiachang Zuo, Danlu Wen, Youzhu Yuan *
Xiamen University

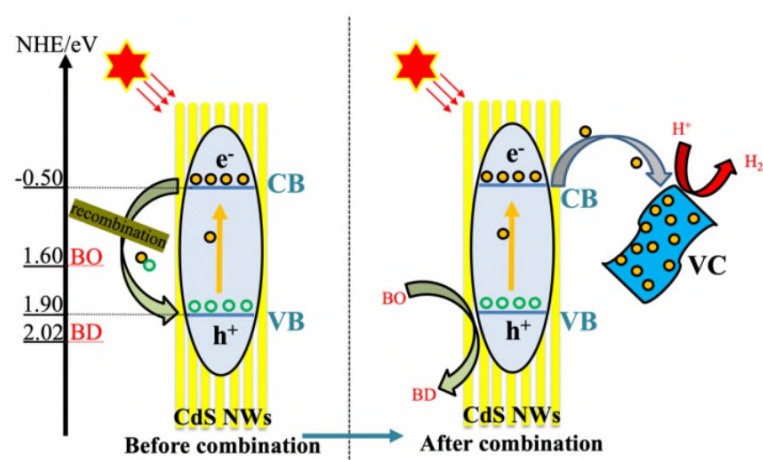
Toluene methylation with syngas conversion shows PX selectivity of up to 81.8% in xylene over bifunctional catalyst ZnZrO_x-nSZ5, which offers a promising route for the production of value-added PX.



Chin. J. Catal., 2022, 43: 1165–1175 doi: 10.1016/S1872-2067(21)63997-9

Simultaneous hydrogen production with the selective oxidation of benzyl alcohol to benzaldehyde by a noble-metal-free photocatalyst VC/CdS nanowires

Muhammad Tayyab, Yujie Liu, Shixiong Min, Rana Muhammad Irfan, Qiaohong Zhu, Liang Zhou *, Juying Lei, Jinlong Zhang *
East China University of Science & Technology; North Minzu University; Soochow University



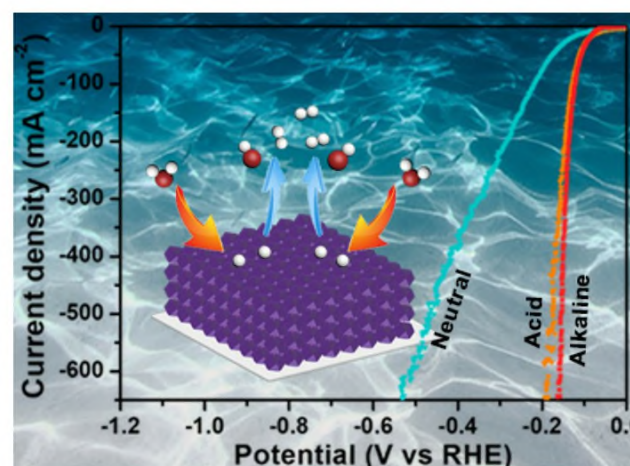
VC integrated CdS nanowires for photocatalytic H₂ production and selective benzyl alcohol oxidation using an aqueous medium and under visible light ($\lambda > 420$ nm) has been developed. The photocatalytic activities present more than 99% selectivity for benzyl aldehyde with hydrogen production. Furthermore, a sequence of photoelectrochemical observations and spectroscopic results elucidated the main electron transfer mechanism and verified that VC/CdS nanowires have faster kinetics and more effective charge separation.

Chin. J. Catal., 2022, 43: 1176–1183 doi: 10.1016/S1872-2067(21)63982-7

A MOF derived hierarchically porous 3D N-CoP_x/Ni₂P electrode for accelerating hydrogen evolution at high current densities

Lan Wang, Ning gong, Zhou Zhou, Qicheng Zhang, Wenchao Peng, Yang Li, Fengbao Zhang *, Xiaobin Fan *
Tianjin University

The N-doping binary transition metal phosphides (TMPs) electrocatalysts (N-CoP_x/Ni₂P/NF) with three-dimensional (3D) conductive network structure were fabricated by facile topochemical conversion between TMPs and Co-MOF. As a result, the N-CoP_x/Ni₂P/NF exhibits excellent HER activity at high current density, indicating significant potential for industrial application.

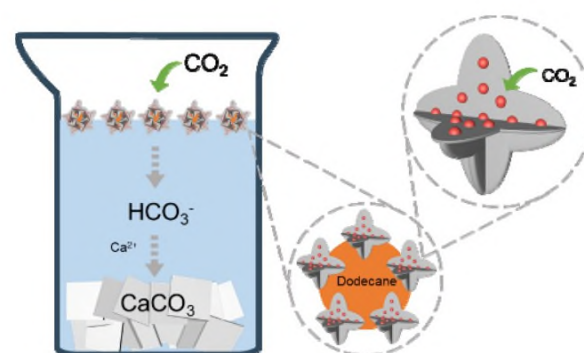


Chin. J. Catal., 2022, 43: 1184–1191 doi: 10.1016/S1872-2067(21)63998-0

Pickering interfacial biocatalysis with enhanced diffusion processes for CO₂ mineralization

Boyu Zhang, Jiafu Shi *, Yang Zhao, Han Wang, Ziyi Chu, Yu Chen, Zhenhua Wu, Zhongyi Jiang *
Tianjin University;
Institute of Process Engineering, Chinese Academy of Sciences

We developed a Pickering interfacial biocatalytic system (PIBS) stabilized by CA-embedded ZIFs which promotes CO₂ mineralization by fortifying internal and external diffusion processes.



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