



Chinese Journal of Catalysis

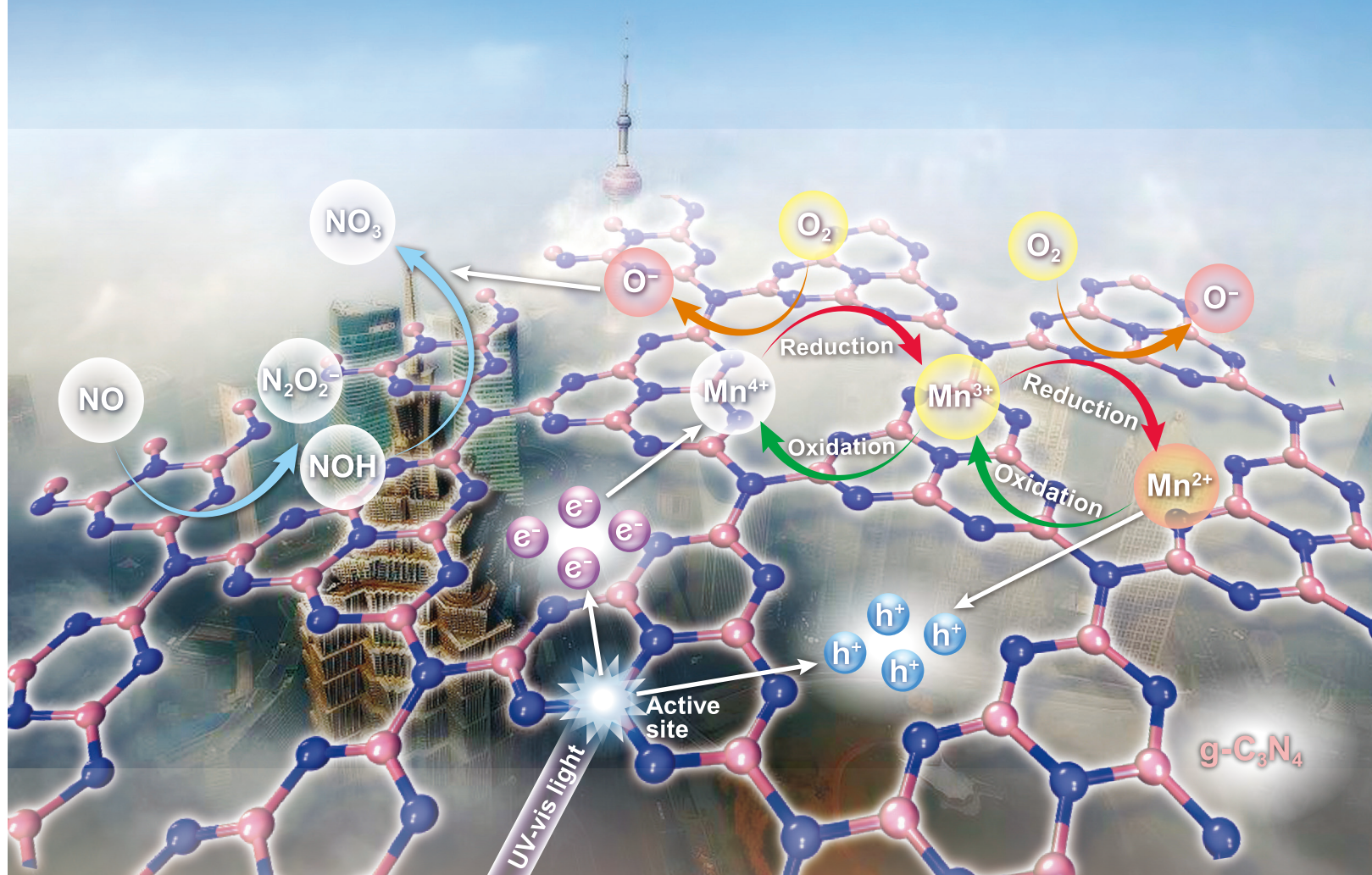
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Volume 39 | Number 4 | April 2018

环境与能源催化专刊

Special Issue on Environmental and Energy Catalysis

Guest Editors: Fan Dong (董帆), Jiguang Deng (邓积光)



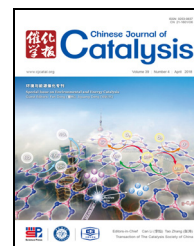
Editors-in-Chief Can Li (李灿) Tao Zhang (张涛)
Transaction of The Catalysis Society of China



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Special Issue on Environmental and Energy Catalysis

Guest Editors: Fan Dong, Jiguang Deng

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Graphical Contents

Editorial

Chin. J. Catal., 2018, 39: 565 doi: 10.1016/S1872-2067(18)63062-1

Preface to Special Issue on Environmental and Energy Catalysis

Fan Dong, Jiguang Deng

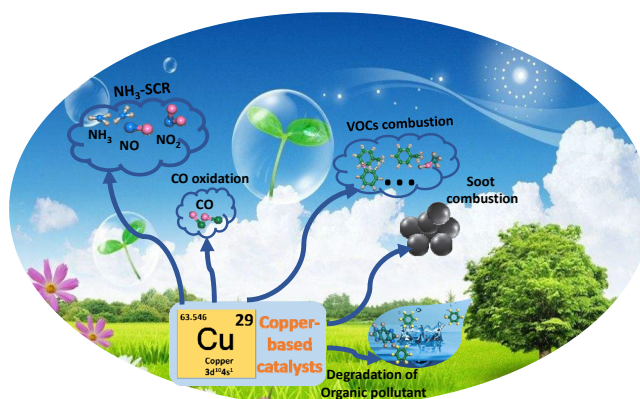
Chongqing Technology and Business University; Beijing University of Technology

Reviews

Chin. J. Catal., 2018, 39: 566–582 doi: 10.1016/S1872-2067(17)62996-6

Copper-based non-precious metal heterogeneous catalysts for environmental remediation

Yarong Fang, Yanbing Guo *

Central China Normal University

This review presents a comprehensive discussion on recent progresses of copper-based non-precious metal heterogeneous catalysts for various environmental remediation reactions, as well as a detailed analysis of catalysts structure-reactivity relationship.

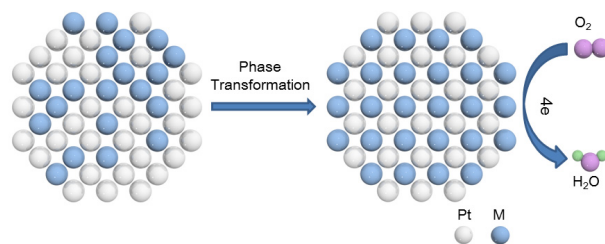
Chin. J. Catal., 2018, 39: 583–589 doi: 10.1016/S1872-2067(17)62989-9

Enhancing oxygen reduction electrocatalysis through tuning crystal structure: Influence of intermetallic MPt nanocrystals

Jiashun Liang, Zhengpei Miao, Feng Ma, Ran Pan, Xian Chen,
Tanyuan Wang, Huan Xie, Qing Li *

Huazhong University of Science and Technology

This mini-review presents the recent development of intermetallic MPt NC catalysts for ORR focusing on how the intermetallic MPt structure/morphology relationship influences activity/stability. Current research challenges and future research perspectives are summarized and proposed.



Chin. J. Catal., 2018, 39: 590–605 doi: 10.1016/S1872-2067(18)63052-9

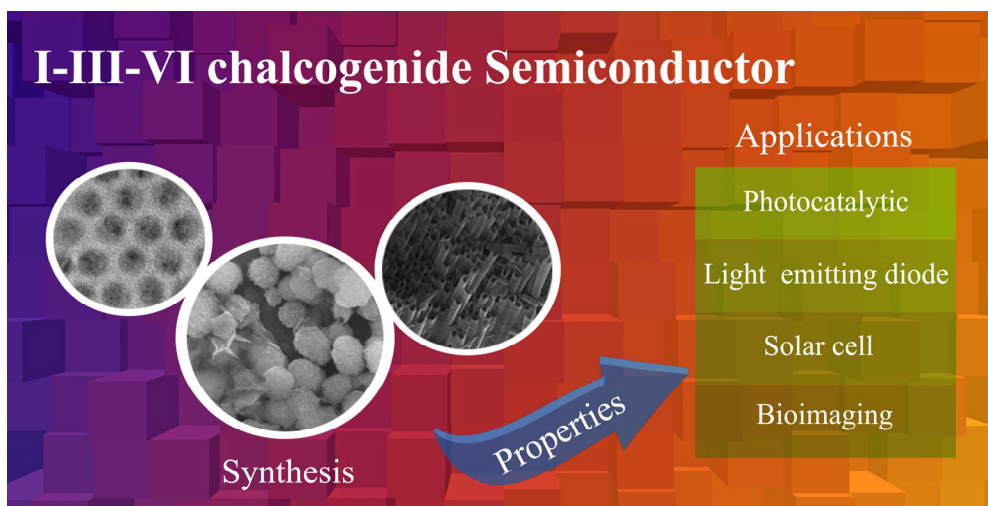
I-III-VI chalcogenide semiconductor nanocrystals: Synthesis, properties, and applications

Shiqi Li, Xiaosheng Tang*, Zhigang Zang, Yao Yao, Zhiqiang Yao, Haizheng Zhong, Bingkun Chen

Chongqing University;

Chengdu University of Information Technology;

Zhengzhou University; Beijing Institute of Technology



The synthesis methods, properties, and applications of I-III-VI chalcogenide semiconductor nanocrystals are reviewed in detail. The challenges and future outlook of this domain are also discussed in this review.

Communications

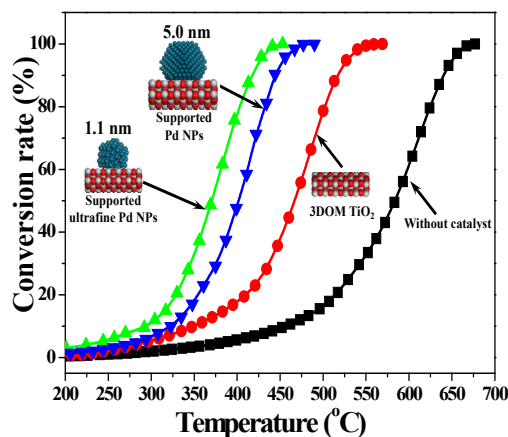
Chin. J. Catal., 2018, 39: 606–612 doi: 10.1016/S1872-2067(17)62939-5

Fabrication of ultrafine Pd nanoparticles on 3D ordered macroporous TiO₂ for enhanced catalytic activity during diesel soot combustion

Yuechang Wei*, Qiangqiang Wu, Jing Xiong, Jian Liu, Zhen Zhao *

China University of Petroleum-Beijing

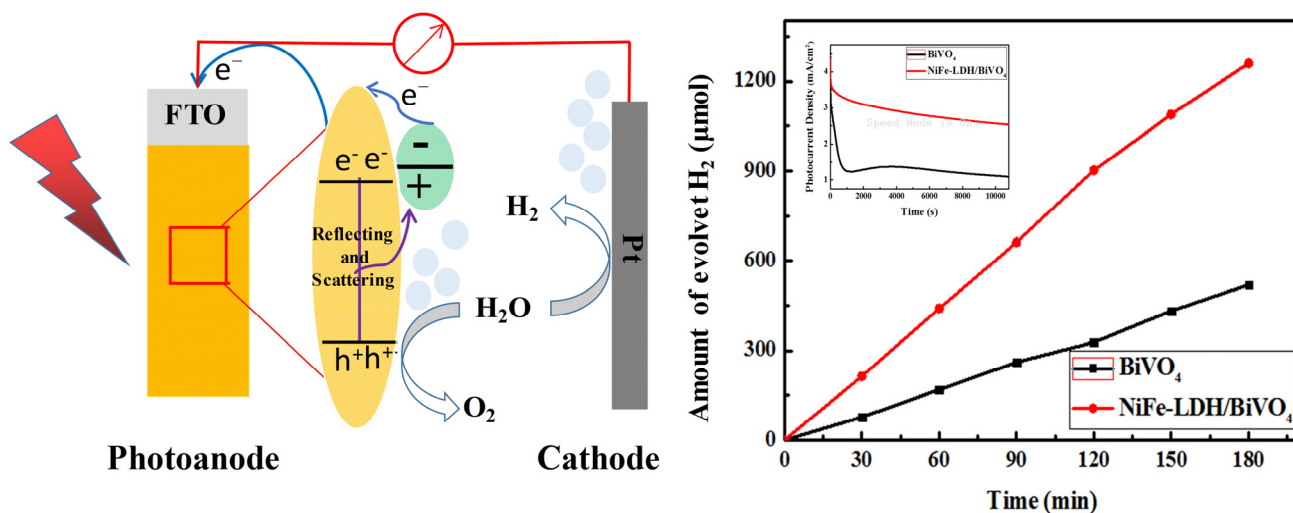
A nanocatalyst composed of three-dimensionally ordered macroporous TiO₂-supported ultrafine 1.1 nm Pd nanoparticles was readily fabricated by gas bubbling-assisted membrane reduction. This material exhibited high catalytic activity and good stability during diesel soot combustion.



Chin. J. Catal., 2018, 39: 613–618 doi: 10.1016/S1872-2067(17)62987-5

NiFe layered double-hydroxide nanoparticles for efficiently enhancing performance of BiVO₄ photoanode in photoelectrochemical water splitting

Qizhao Wang*, Tengjiao Niu, Lei Wang, Jingwei Huang, Houde She
Northwest Normal University



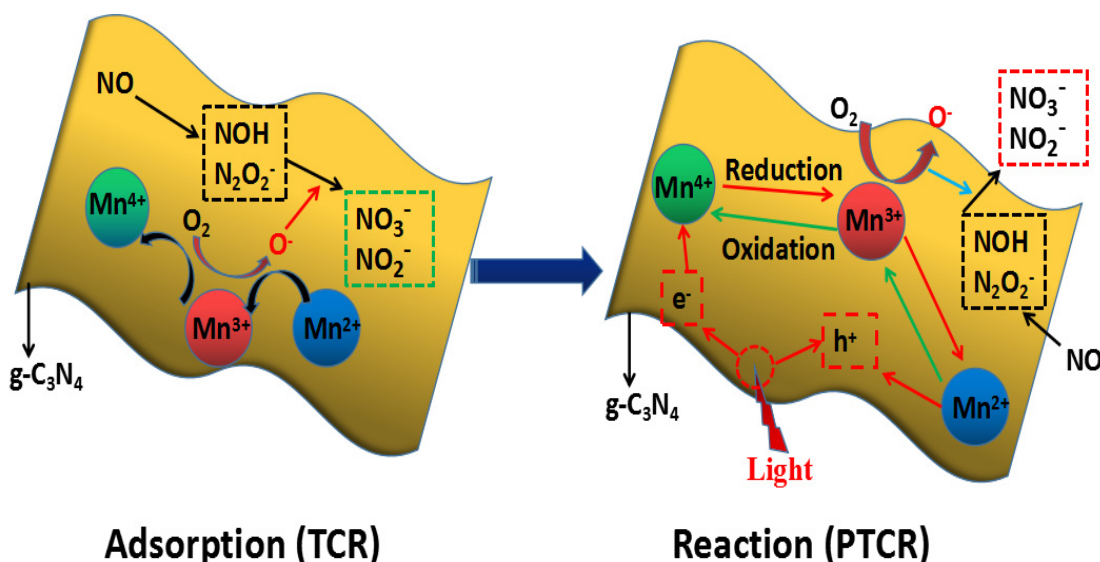
A high-performance BiVO₄ photoanode with a NiFe layered double-hydroxide nanoparticle cocatalyst was fabricated for photoelectrochemical water splitting. The cocatalyst boosted the photocatalytic activity, hydrogen production, and photoanode stability.

Articles

Chin. J. Catal., 2018, 39: 619–629 doi: 10.1016/S1872-2067(18)63029-3

Synergistic photo-thermal catalytic NO purification of MnO_x/g-C₃N₄: enhanced performance and reaction mechanism

Peng Chen, Fan Dong*, Maoxi Ran, Jiarui Li
Chongqing Technology and Business University



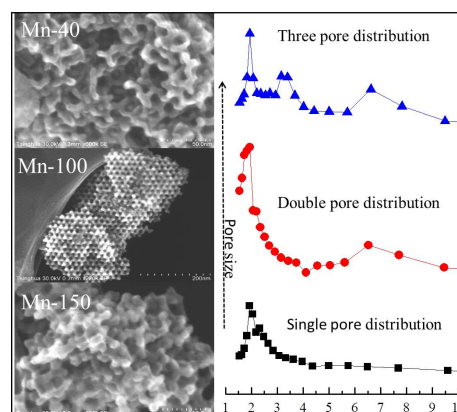
During the adsorption process, the reduced metal centers and oxygen defects are created thermally on MnO_x and are sites of O₂ adsorption and activation. During the PTCR process, g-C₃N₄ produces a large amount of photo-generated electron-hole pairs (e⁻-h⁺) under UV-Vis light irradiation, which could participate in the catalytic cycles to generate abundant O⁻ and regenerate the active oxygen vacancy sites, thus accelerating the transformation of NOH and N₂O₂⁻ to form nitrate species (NO₃⁻ or NO₂⁻).

Chin. J. Catal., 2018, 39: 630–638 doi: 10.1016/S1872-2067(18)63036-0

Effect of pore size in mesoporous MnO_2 prepared by KIT-6 aged at different temperatures on ethanol catalytic oxidation

Bingyang Bai *, Qi Qiao, Yanping Li, Yue Peng, Junhua Li *
Chinese Research Academy of Environmental Sciences;
Tsinghua University

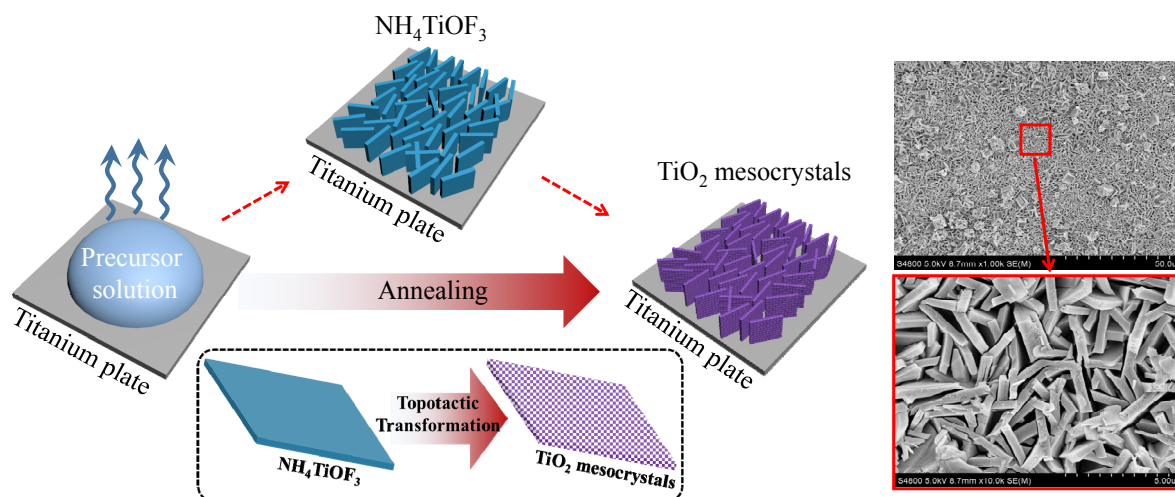
KIT-6 mesoporous silica aged at different temperatures was used as a hard template to prepare different mesoporous MnO_2 catalysts. The catalytic activities for ethanol oxidation of the catalysts were investigated, and the effect of pore size on the ethanol catalytic activity has been discussed.



Chin. J. Catal., 2018, 39: 639–645 doi: 10.1016/S1872-2067(17)62980-2

Synthesis of TiO_2 mesocrystal film with enhanced photocatalytic activity

Lili Ling, Longfei Liu, Yawei Feng, Jian Zhu, Zhenfeng Bian *
Shanghai Normal University



A TiO_2 mesocrystal film was successfully prepared by a direct annealing method. This new high efficient photocatalytic film electrode could be widely applied in photocatalysis and photoelectric catalysis.

Chin. J. Catal., 2018, 39: 646–653 doi: 10.1016/S1872-2067(17)62974-7

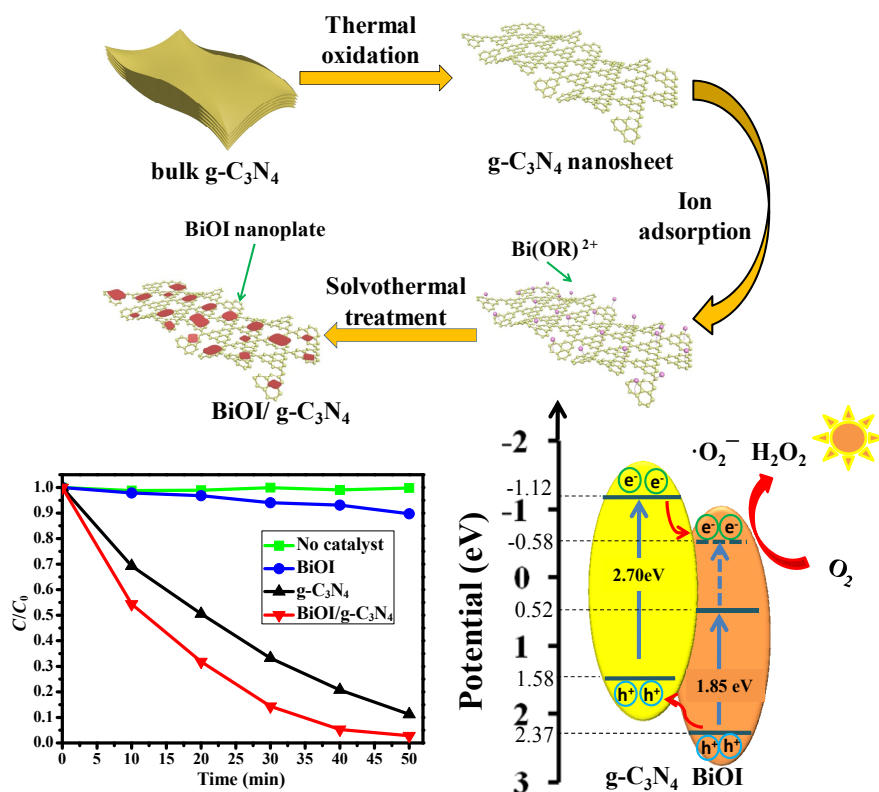
Enhanced visible-light photocatalytic performance of a monolithic tungsten oxide/graphene oxide aerogel for nitric oxide oxidation

Li Yang, Yang Liu, Ruiyang Zhang, Wei Li, Pu Li, Xin Wang, Ying Zhou *
Southwest Petroleum University; Sichun Xuhan New Materials Co., Ltd;
National Institute of Measurement and Testing Technology

A monolithic tungsten oxide (WO_3)/graphene oxide aerogel photocatalyst displaying enhanced visible-light photocatalytic activity towards nitric oxide oxidation and inhibited generation of the harmful intermediate nitrogen dioxide compared with that of the powder WO_3 counterpart was developed.

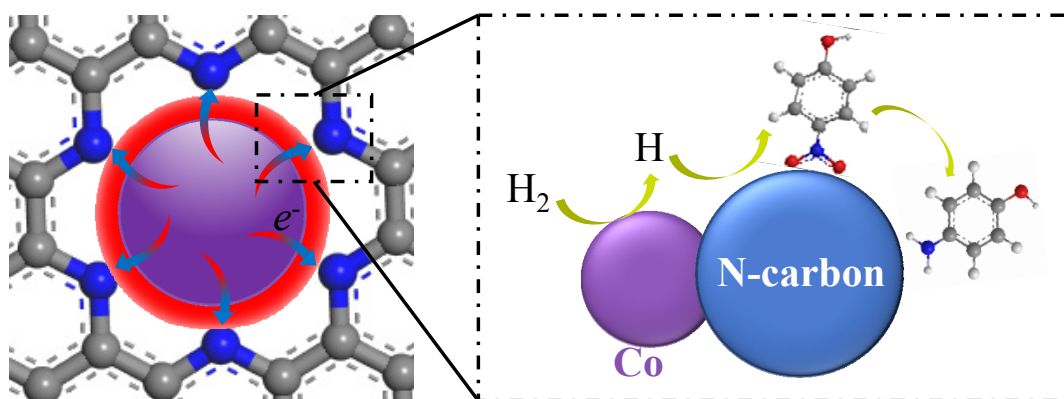


Chin. J. Catal., 2018, 39: 654–663 doi: 10.1016/S1872-2067(17)62927-9

Formation of BiOI/g-C₃N₄ nanosheet composites with high visible-light-driven photocatalytic activityHua An, Bo Lin, Chao Xue, Xiaoqing Yan, Yanzhu Dai, JinJia Wei, Guidong Yang *
Xi'an Jiaotong University

A BiOI/g-C₃N₄ nanosheet composite was constructed via in situ growth of BiOI nanoplates on the surface of g-C₃N₄ nanosheets. The composite showed excellent photocatalytic activity and recyclability under visible-light irradiation. A double-transfer mechanism of photoinduced electrons was proposed to explain the process of charge transfer and separation in the composite.

Chin. J. Catal., 2018, 39: 664–672 doi: 10.1016/S1872-2067(17)62988-7

Cobalt nanoparticles encapsulated in nitrogen-doped carbon for room-temperature selective hydrogenation of nitroarenesRuijie Gao, Lun Pan, Zhengwen Li, Xiangwen Zhang, Li Wang, Ji-Jun Zou *
Tianjin University; Collaborative Innovative Center of Chemical Science and Engineering (Tianjin)

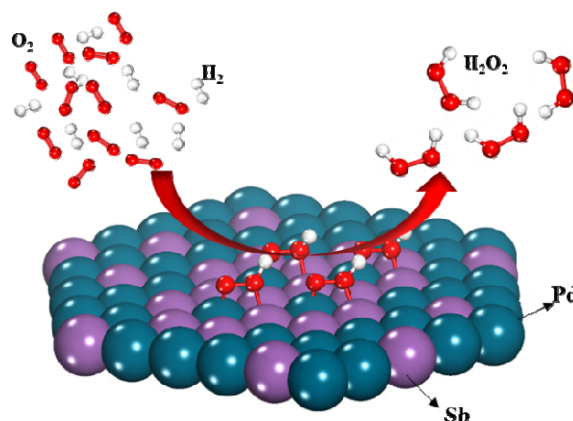
Cobalt nanoparticles encapsulated in N-doped carbon act as an efficient catalyst for room-temperature hydrogenation of nitroarenes owing to the synergetic effect of H₂ activation on the Co nanoparticles and nitro group adsorption on N-doped carbon.

Chin. J. Catal., 2018, 39: 673–681 doi: 10.1016/S1872-2067(18)63031-1

Promotional effects of Sb on Pd-based catalysts for the direct synthesis of hydrogen peroxide at ambient pressure

Doudou Ding, Xingyan Xu, Pengfei Tian, Xianglin Liu, Jing Xu *,
Yi-fan Han *
East China University of Science and Technology; Zhengzhou University

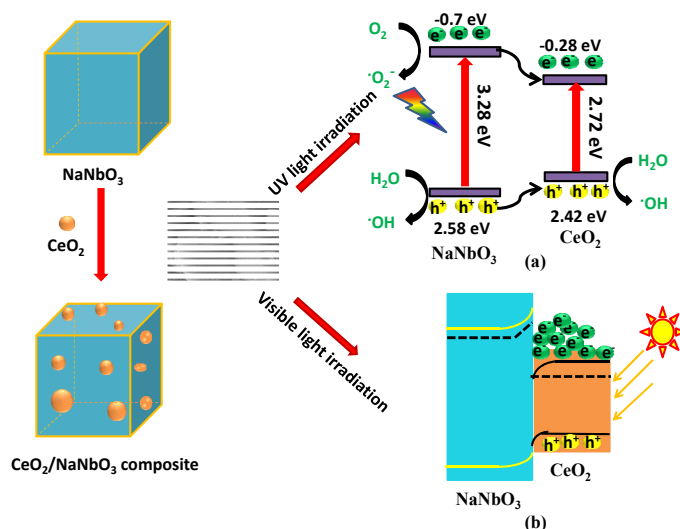
Highly selective Pd-Sb/TiO₂ bimetallic catalysts for the direct synthesis of H₂O₂ were obtained, and the addition of Sb increased the isolated Pd sites, which are favorable for H₂O₂ formation.



Chin. J. Catal., 2018, 39: 682–692 doi: 10.1016/S1872-2067(17)62975-9

Hydrothermal synthesis of CeO₂/NaNbO₃ composites with enhanced photocatalytic performance

Jin Qian, Yao Xue, Yanhui Ao *, Peifang Wang, Chao Wang
Hohai University



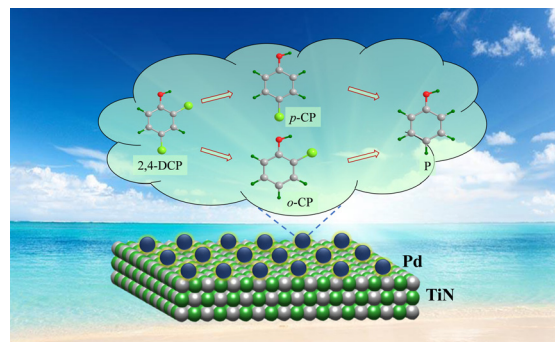
The CeO₂/NaNbO₃ heterojunction composites were synthesized by a simple hydrothermal method. The formation of heterojunctions promoted the separation of photogenerated electrons and holes, thereby resulting in a higher the photocatalytic activity.

Chin. J. Catal., 2018, 39: 693–700 doi: 10.1016/S1872-2067(17)62937-1

Palladium nanoparticles assembled on titanium nitride for enhanced electrochemical hydrodechlorination of 2,4-dichlorophenol in water

Wenyang Fu, Kaifeng Wang, Xiaoshu Lv, Hailu Fu *, Xingan Dong,
Ling Chen, Xianming Zhang, Guangming Jiang *
Chongqing Technology and Business University;
China Jiliang University

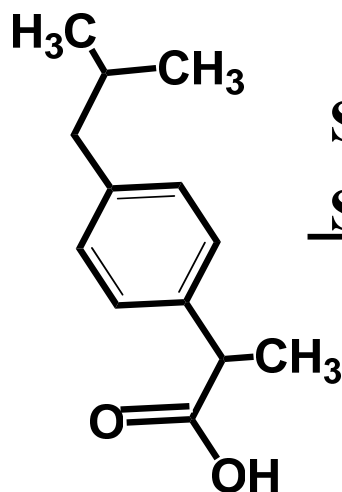
A palladium nanoparticle/titanium nitride composite (Pd/TiN) was successfully synthesized by a one-pot wet-chemical reduction approach, which showed improved efficiency and stability compared with those of a Pd/carbon composite in electrochemical hydrodechlorination of 2,4-dichlorophenol in water.



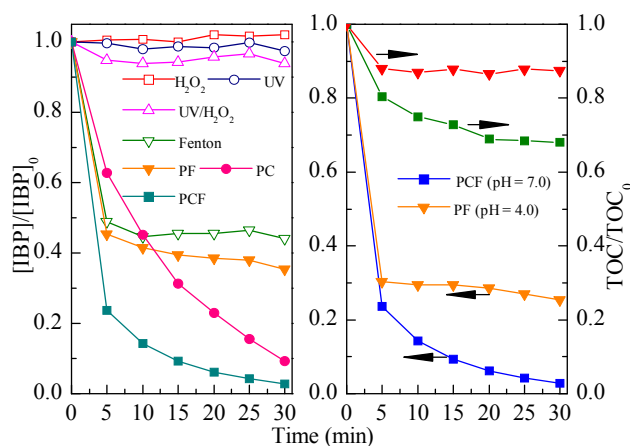
Chin. J. Catal., 2018, 39: 701–709 doi: 10.1016/S1872-2067(17)62916-4

Enhancement of UV-assisted TiO₂ degradation of ibuprofen using Fenton hybrid process at circumneutral pH

Meijuan Chen, Wei Chu*, Jingzi Beiyuan, Yu Huang
 Xi'an Jiaotong University;
 The Hong Kong Polytechnic University;
 Technological and Higher Education Institute of Hong Kong;
 Institute of Earth Environment, Chinese Academy of Sciences



**Simulated
Solar light**

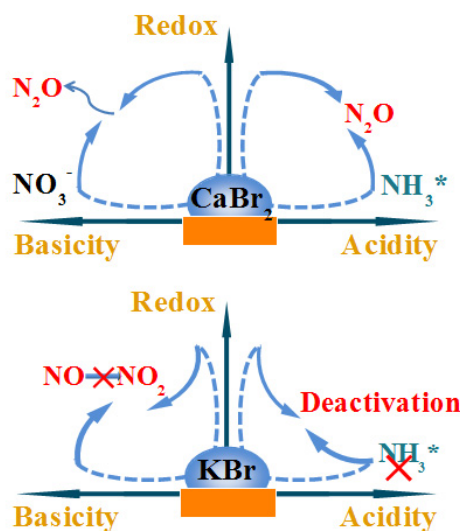
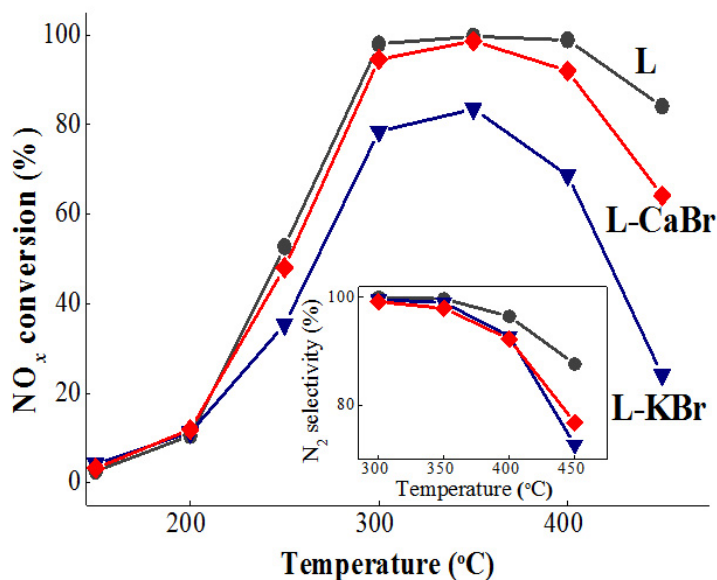


A synergistic PCF process was investigated for the degradation of ibuprofen at circumneutral pH. The IBP decay in the PCF process is much faster than that for the UV, UV/H₂O₂, Fenton, photo-Fenton and photocatalysis processes.

Chin. J. Catal., 2018, 39: 710–717 doi: 10.1016/S1872-2067(18)63011-6

The effect of cations (NH₄⁺, Na⁺, K⁺, and Ca²⁺) on chemical deactivation of commercial SCR catalyst by bromides

Huazhen Chang *, Chuanning Shi, Mingguan Li, Tao Zhang, Chizhong Wang, Lilong Jiang, Xiuyun Wang
 Renmin University of China; Tsinghua University; Fuzhou University



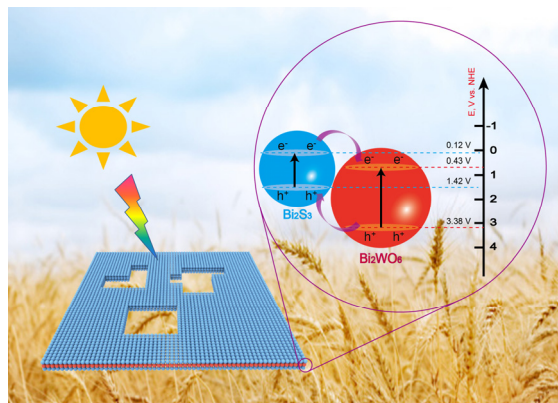
The decrease in the ratio of chemisorbed oxygen (O_a), reducibility and surface acidity contribute to the KBr-poisoned catalyst, and the overoxidation of NH₃ is attributed to the deactivation effect of CaBr₂ on the SCR catalyst.

Chin. J. Catal., 2018, 39: 718–727 doi: 10.1016/S1872-2067(17)62913-9

In-situ transformation of Bi_2WO_6 to high photoreactive $\text{Bi}_2\text{WO}_6@\text{Bi}_2\text{S}_3$ nanoplate via ion exchange

Tingting Huang, Yuhan Li, Xiaofeng Wu, Kangle Lv *, Qin Li, Mei Li *, Dongyun Du, Hengpeng Ye
South-Central University for Nationalities;
The Education University of Hong Kong

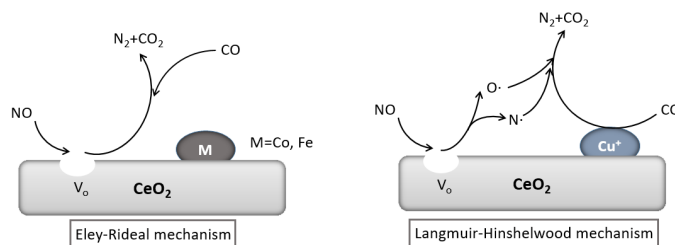
$\text{Bi}_2\text{WO}_6@\text{Bi}_2\text{S}_3$ nanoplates were fabricated by a simple ion-exchange reaction between Bi_2WO_6 and Na_2S . Visible light photocatalytic activity of $\text{Bi}_2\text{WO}_6@\text{Bi}_2\text{S}_3$ in degradation of X3B dye increased 16.5 times owing to the formation of a heterojunction between the two semiconductors.



Chin. J. Catal., 2018, 39: 728–735 doi: 10.1016/S1872-2067(17)63008-0

Supercritical water syntheses of transition metal-doped CeO_2 nano-catalysts for selective catalytic reduction of NO by CO: An *in situ* diffuse reflectance Fourier transform infrared spectroscopy study

Xiaoxia Dai, Weiyu Jiang, Wanglong Wang, Xiaole Weng *, Yuan Shang, Yehui Xue, Zhongbiao Wu
Zhejiang University; Zhejiang Provincial Engineering Research Centre of Industrial Boiler & Furnace Flue Gas Pollution Control

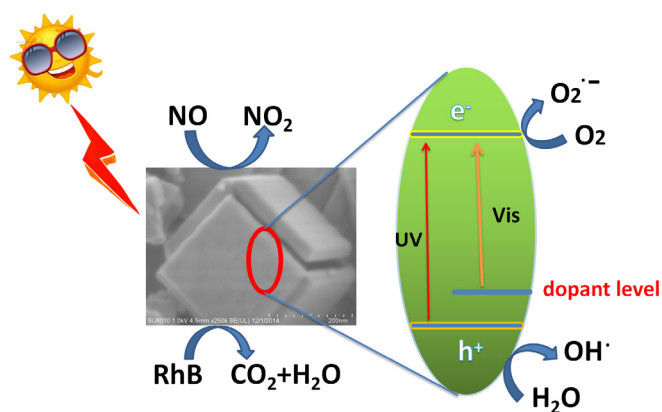


$\text{MO}_x\text{-CeO}_2$ ($\text{M} = \text{Co}$, or Fe) catalysts mainly follow an Eley-Rideal reaction mechanism for the selective catalytic reduction (SCR) of NO by CO, whereas CuO-CeO_2 adopts a Langmuir-Hinshelwood SCR reaction mechanism in which the Cu^+ species ensure effective CO adsorption.

Chin. J. Catal., 2018, 39: 736–746 doi: 10.1016/S1872-2067(18)63039-6

Enhanced visible photocatalytic activity of TiO_2 hollow boxes modified by methionine for RhB degradation and NO oxidation

Xuan Zhao, Yanting Du, Chengjiang Zhang, Lijun Tian, Xiaofang Li, Kejian Deng, Lianqing Chen *, Youyu Duan, Kangle Lv *
South-Central University for Nationalities; Wuhan University of Science and Technology



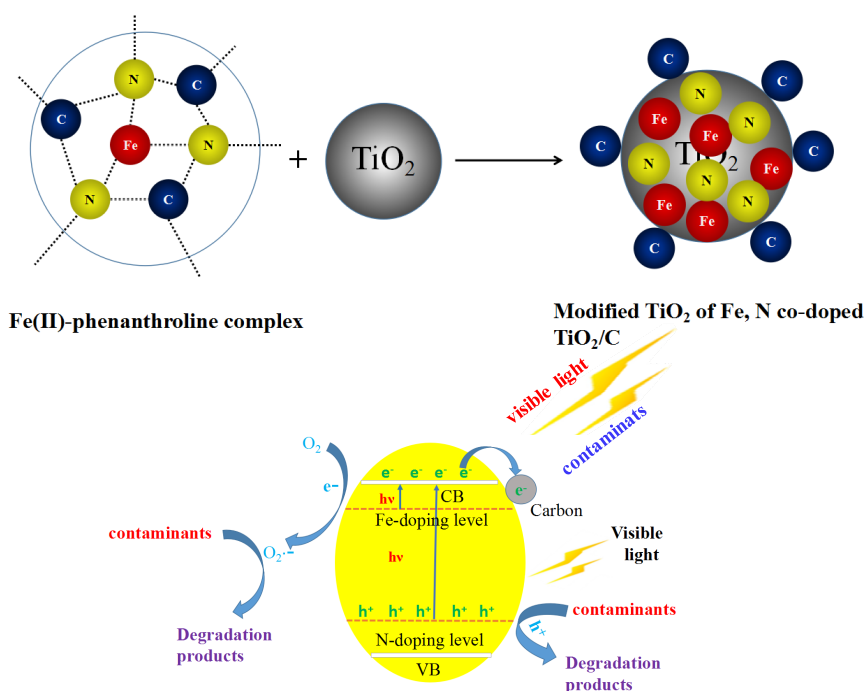
visible-light-driven N and S codoped TiO_2 hollow nanobox

N and S co-doped TiO_2 -hollow nanoboxes assembly from high energy TiO_2 nanosheets were prepared by calcining the mixture of TiOF_2 cubes and methionine ($\text{C}_5\text{H}_{11}\text{NO}_2\text{S}$), which showed improved visible photoreactivity in RhB degradation and NO oxidation.

Chin. J. Catal., 2018, 39: 747–759 doi: 10.1016/S1872-2067(18)63038-4

Facile synthesis of C-decorated Fe, N co-doped TiO₂ with enhanced visible-light photocatalytic activity by a novel co-precursor method

Hualin Jiang, Jun Liu, Menglin Li, Lei Tian, Gongsheng Ding, Pinghua Chen *, Xubiao Luo *
Nanchang Hangkong University



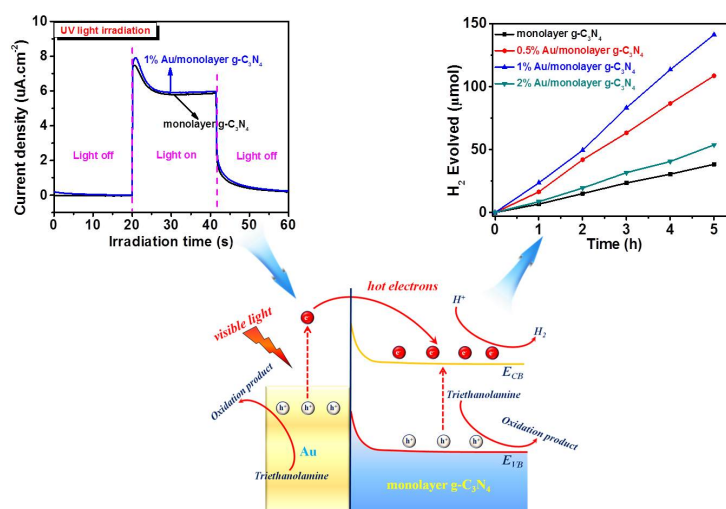
Inner and outer parts of TiO₂ were simultaneously modified to significantly improve its visible-light photocatalytic performance. This complicated modification was facily fulfilled by a novel co-precursor method.

Chin. J. Catal., 2018, 39: 760–770 doi: 10.1016/S1872-2067(17)62978-4

Gold/monolayer graphitic carbon nitride plasmonic photocatalyst for ultrafast electron transfer in solar-to-hydrogen energy conversion

Zhao Mo, Hui Xu *, Zhigang Chen, Xiaojie She, Yanhua Song, Pengcheng Yan, Yuanguo Xu, Yucheng Lei *, Shouqi Yuan, Huaming Li *

Jiangsu University; Jiangsu University of Science and Technology

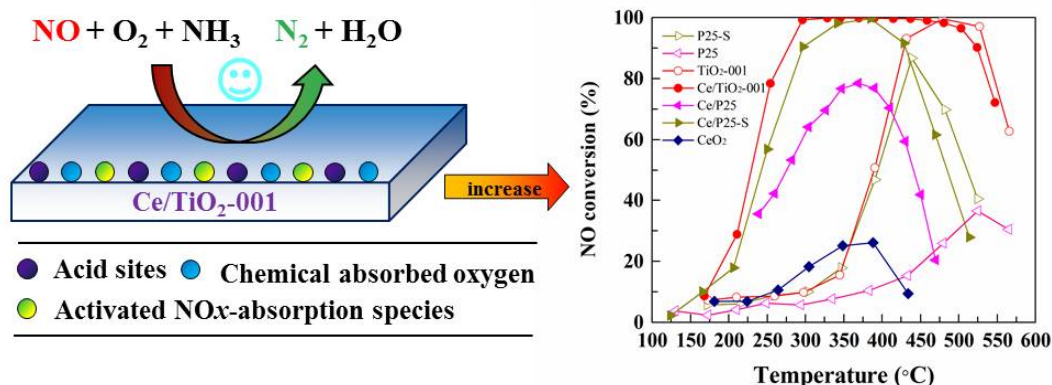


A gold nanoparticle/monolayer graphitic carbon nitride plasmonic photocatalyst prepared by a facile oil-bath method displayed a high photocatalytic hydrogen evolution rate of $565 \mu\text{mol g}^{-1} \text{h}^{-1}$ because of the regulated flow of charge carriers.

Chin. J. Catal., 2018, 39: 771–778 doi: 10.1016/S1872-2067(18)63034-7

One-step synthesized SO_4^{2-} - TiO_2 with exposed (001) facets and its application in selective catalytic reduction of NO by NH_3

Yexuan Wen, Shuang Cao, Xiaoqi Fei, Haiqiang Wang *, Zhongbiao Wu
Zhejiang University; Zhejiang Provincial Engineering Research Center of Industrial Boiler & Furnace Flue Gas Pollution Control



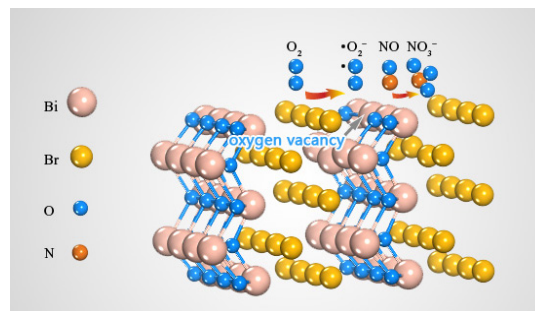
One-step synthesis of SO_4^{2-} - TiO_2 with exposed (001) facet promoted the formation of abundant acid sites, high concentration of chemically absorbed oxygen, and activated NO_x -absorption species, which were responsible for the SCR reaction.

Chin. J. Catal., 2018, 39: 779–789 doi: 10.1016/S1872-2067(18)63056-6

Improving visible-light-driven photocatalytic NO oxidation over BiOBr nanoplates through tunable oxygen vacancies

Jiazheng Liao, Lvcun Chen, Minglu Sun, Ben Lei, Xiaolan Zeng *, Yanjuan Sun *, Fan Dong
Chongqing University;
Chongqing Technology and Business University

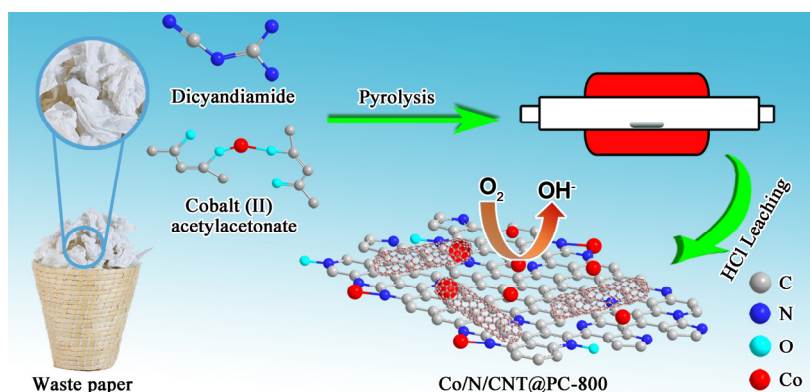
Oxygen vacancies have several roles in photocatalysis, including the introduction of intermediate energy levels to enhance light absorption and promote electron transfer. The vacancies act as active sites for the catalytic reaction and activation of oxygen molecules, facilitating the conversion of intermediate products to the final product and, thus, increasing the overall efficiency of visible light photocatalysis.



Chin. J. Catal., 2018, 39: 790–799 doi: 10.1016/S1872-2067(17)62982-6

Paper-derived cobalt and nitrogen co-doped carbon nanotube@porous carbon as a nonprecious metal electrocatalyst for the oxygen reduction reaction

Gaopeng Liu, Bin Wang, Li Xu, Penghui Ding, Pengfei Zhang, Jiexiang Xia *, Huaming Li *, Junchao Qian
Jiangsu University, China; Oak Ridge National Laboratory, USA; Shanghai Jiao Tong University, China; Suzhou University of Science and Technology, China

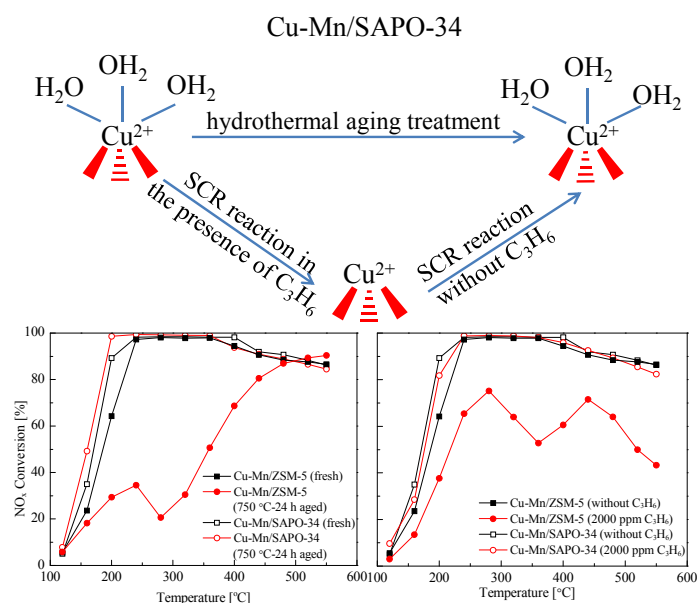


Paper-derived cobalt and nitrogen co-doped carbon nanotube@porous carbon was fabricated as a nonprecious metal electrocatalyst and showed excellent catalytic performance for the oxygen reduction reaction.

Chin. J. Catal., 2018, 39: 800–809 doi: 10.1016/S1872-2067(18)63013-X

Stability of Cu–Mn bimetal catalysts based on different zeolites for NO_x removal from diesel engine exhaust

Shuang Zhao, Liming Huang, Boqiong Jiang *, Min Cheng, Jiawei Zhang, Yijing Hu
Zhejiang Gongshang University

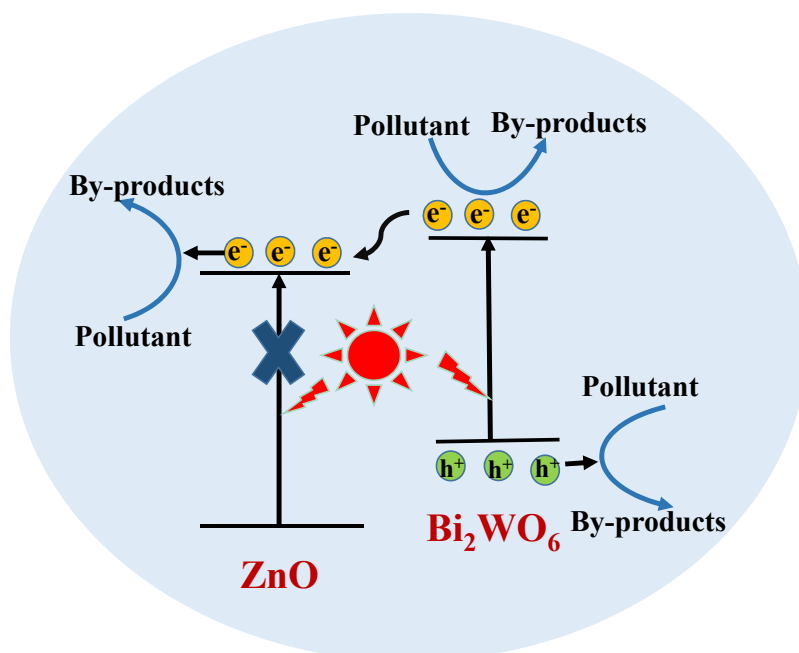


The redox cycle of Cu^+ and octahedrally coordinated Cu^{2+} significantly affected the high hydrothermal stability and resistance to hydrocarbons of Cu-Mn/SAPO-34.

Chin. J. Catal., 2018, 39: 810–820 doi: 10.1016/S1872-2067(17)63004-3

Flower-like $\text{Bi}_2\text{WO}_6/\text{ZnO}$ composite with excellent photocatalytic capability under visible light irradiation

Juan Cheng, Yi Shen, Kuan Chen, Xi Wang, Yongfu Guo *, Xiaoji Zhou, Renbi Bai *
Suzhou University of Science and Technology; Jiangsu Collaborative Innovation Center of Water Treatment Technology and Material

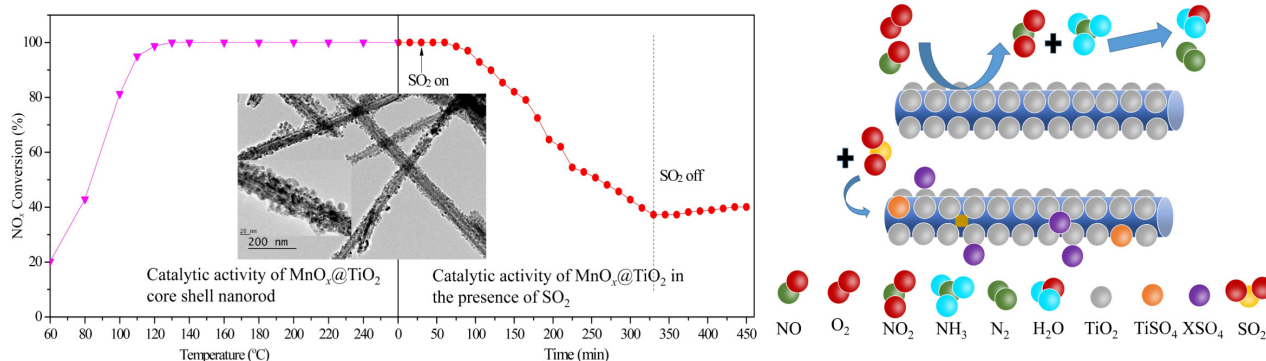


The $\text{Bi}_2\text{WO}_6/\text{ZnO}$ composite photocatalyst was employed to degrade methylene blue and tetracycline. Under visible light, the $\text{Bi}_2\text{WO}_6/\text{ZnO}$ composite shows excellent photocatalytic activity for methylene blue and tetracycline within a short irradiation time.

Chin. J. Catal., 2018, 39: 821–830 doi: 10.1016/S1872-2067(18)63059-1

Synthesis of novel $\text{MnO}_x/\text{TiO}_2$ core-shell nanorod catalyst for low-temperature NH_3 -selective catalytic reduction of NO_x with enhanced SO_2 tolerance

Zhongyi Sheng, Dingren Ma, Danqing Yu, Xiang Xiao, Bingjie Huang, Liu Yang *, Sheng Wang
*Nanjing Normal University; Wuhan University of Science and Technology;
 Suzhou Industrial Technology Research Institute of Zhejiang University;
 State Power Environmental Protection Research Institute*



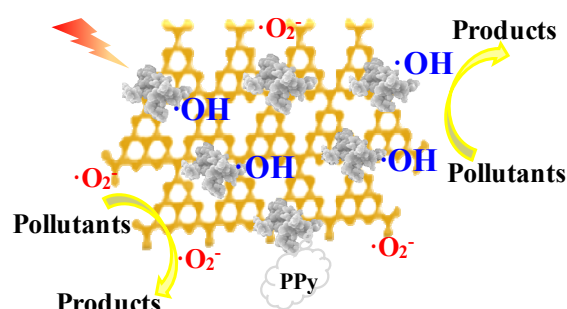
This work reports a novel $\text{MnO}_x/\text{TiO}_2$ core-shell nanorod catalyst, which exhibits high activity and enhanced SO_2 tolerance for the low-temperature selective catalytic reduction of NO_x with NH_3 due to the protective effect of the TiO_2 shell.

Chin. J. Catal., 2018, 39: 831–840 doi: 10.1016/S1872-2067(17)62997-8

In-situ polymerization for PPy/g- C_3N_4 composites with enhanced visible light photocatalytic performance

Hongju Han, Min Fu *, Yalin Li, Wei Guan, Peng Lu, Xueli Hu
*Chongqing Technology and Business University;
 Chongqing Shapingba Environmental Monitoring Station;
 Chongqing University of Arts and Sciences*

The degradation efficiency of methylene blue by PPy/g- C_3N_4 composites synthesized by *in-situ* polymerization was three times higher than that of pure g- C_3N_4 , where $\cdot\text{OH}$ and $\cdot\text{O}_2^-$ radicals are the main reactive species.

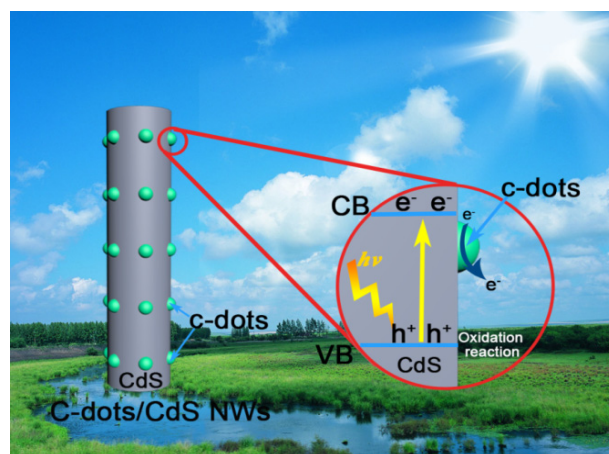


Chin. J. Catal., 2018, 39: 841–848 doi: 10.1016/S1872-2067(17)62972-3

Enhanced visible-light-driven photocatalytic activities of 0D/1D heterojunction carbon quantum dot modified CdS nanowires

Zhiwei Chen, Chang Feng *, Weibing Li *, Zhiyong Sun, Jian Hou, Xiangbo Li, Likun Xu, Mingxian Sun, Yuyu Bu *
*Qingdao University of Science and Technology;
 Luoyang Ship Material Research Institute; Xidian University*

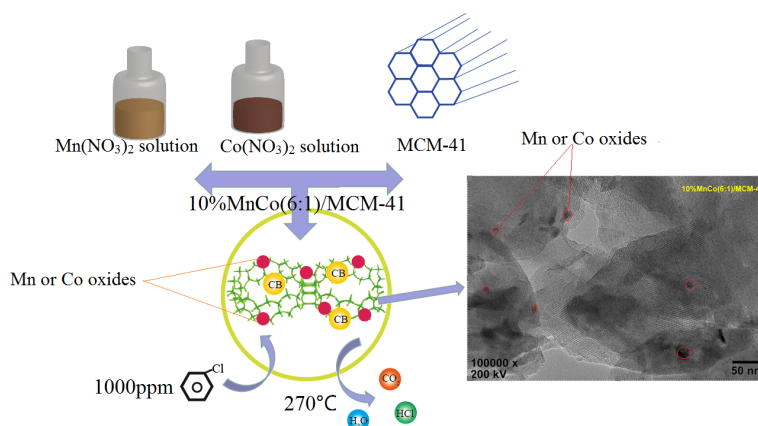
0D/1D heterojunction of C-dots/CdS NWs was prepared to investigate the enhanced photocatalytic performance under visible light irradiation. The heterojunction establishment can effectively improve the electronic transmission capacity, and promote the separation efficiency of photo-generated carriers of C-dots/CdS NWs.



Chin. J. Catal., 2018, 39: 849–856 doi: 10.1016/S1872-2067(17)62950-4

Preparation of MnCo/MCM-41 catalysts with high performance for chlorobenzene combustion

Zhen Cheng, Jingrong Li, Peng Yang, Shufeng Zuo *
Shaoxing University

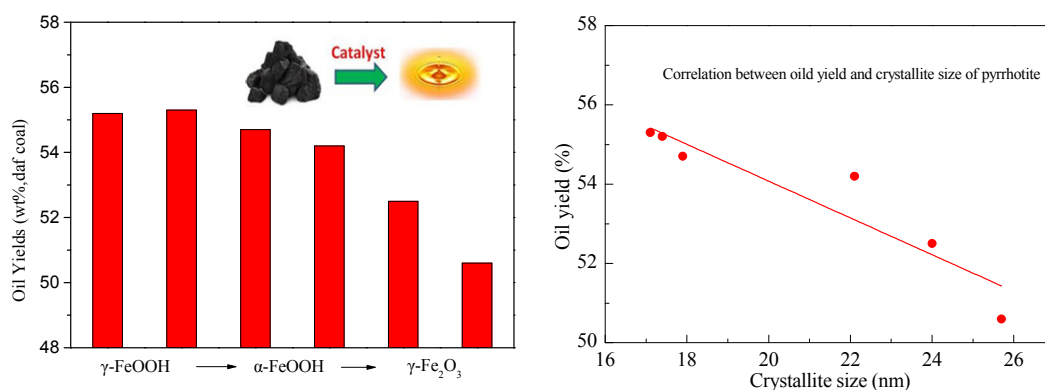


MCM-41 supported mixed oxides catalysts were synthesized by an impregnation method. The 10% MnCo (6:1)/MCM-41 catalyst showed the highest activity for chlorobenzene combustion.

Chin. J. Catal., 2018, 39: 857–866 doi: 10.1016/S1872-2067(17)62919-X

The relationship between the microstructures and catalytic behaviors of iron–oxygen precursors during direct coal liquefaction

Jing Xie, Hanfeng Lu *, Geping Shu, Kejian Li, Xuwen Zhang, Hongxue Wang, Wang Yue, Shansong Gao, Yinfei Chen *
Zhejiang University of Technology;
National Engineering Laboratory for Direct Coal Liquefaction, China Shenhua Coal to Liquid and Chemical Shanghai Research Institute



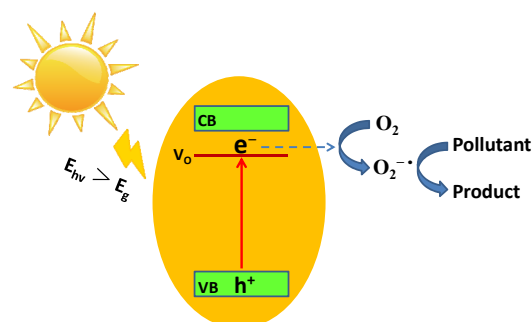
Precursors consisting of iron–oxygen compounds with γ-FeOOH or α-FeOOH crystalline phases that are readily transformed into fine crystallites of pyrrhotite exhibit superior catalytic activity during direct coal liquefaction.

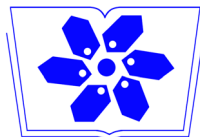
Chin. J. Catal., 2018, 39: 867–875 doi: 10.1016/S1872-2067(17)62999-1

Photocatalytic performance of TiO₂ nanocrystals with/without oxygen defects

Kezhen Qi, Shu-yuan Liu *, Meng Qiu *
Shenyang Normal University; Shenyang Medical College;
Nankai University; Shenzhen University

TiO₂ nanocrystals with/without oxygen defects have been successfully synthesized by the hydrothermal and sol-gel methods, respectively. The obtained TiO₂ with defects exhibits an enhanced photocatalytic performance.





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环境与能源催化专刊

客座主编: 董帆, 邓积光

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