



Chinese Journal of Catalysis

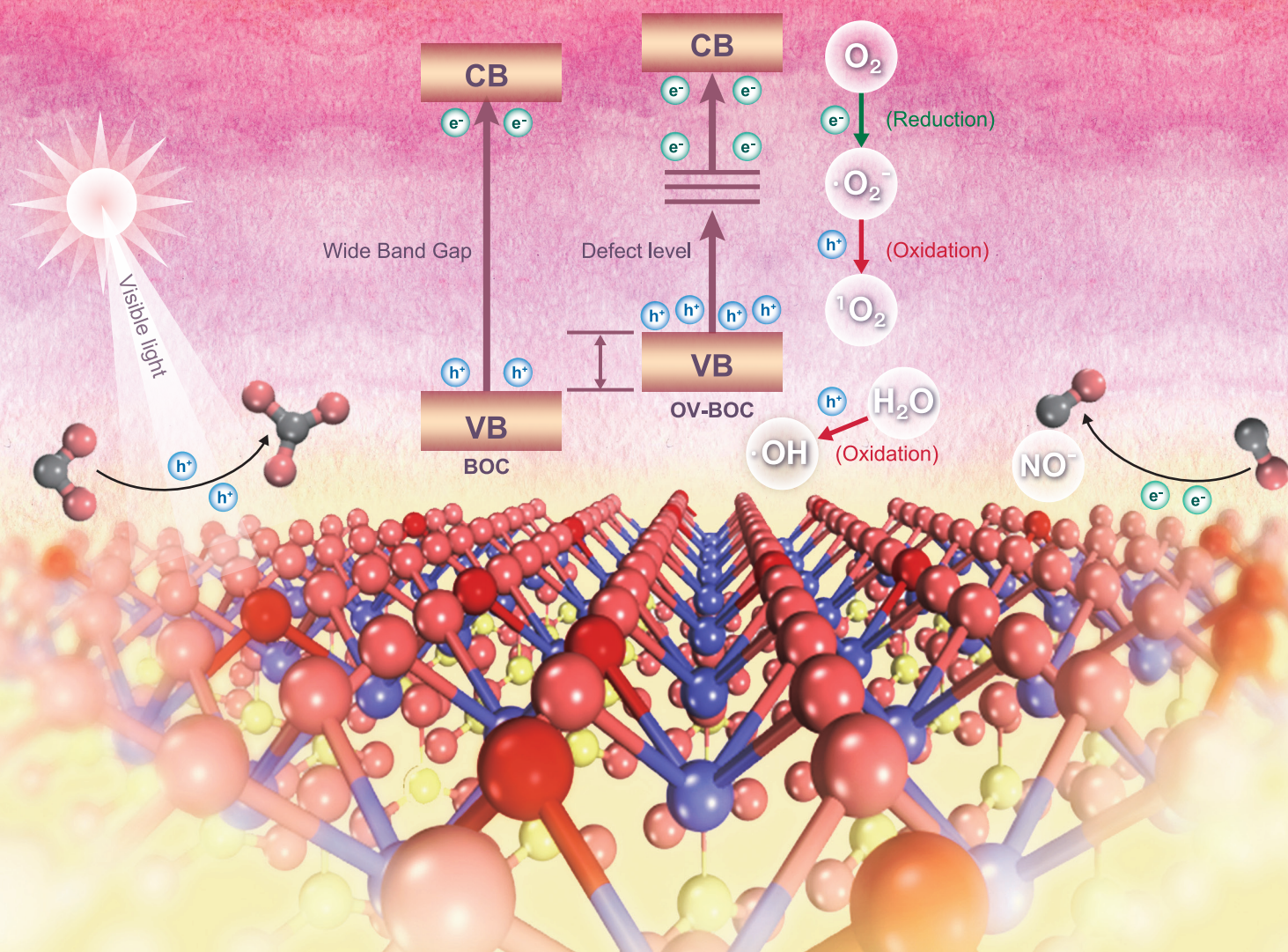
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Volume 40 | Number 5 | May 2019

可持续发展中的环境和能源催化专刊

Special Issue on Environmental and Energy Catalysis for Sustainable Development

Guest Editors: Fan Dong (董帆), Ying Zhou (周莹), Guidong Yang (杨贵东)



In This Issue



Cover: The $\text{Bi}_2\text{O}_2\text{CO}_3$ absorbs only UV light and has a high carrier recombination rate, which limits the overall visible light photocatalytic efficiency in environmental remediation. Prof. Dong and co-authors used in situ DRIFTS spectra combined with ESR spectra and DFT calculation to reveal the electronic structure of oxygen vacancy and the conversion pathway of photocatalytic NO oxidation on defective $\text{Bi}_2\text{O}_2\text{CO}_3$. The results show that oxygen vacancies can increase the generation of active radicals and promote the conversion of NO to target products rather than toxic by-products (NO_2), thus greatly improving the selectivity. This work could provide new strategies for improving photocatalytic selectivity and understanding the gas-phase reaction mechanism (see pages 620–630).

封面: $\text{Bi}_2\text{O}_2\text{CO}_3$ 仅能吸收紫外光且载流子的复合率高, 限制了整体可见光催化效率。董帆教授等采用原位红外光谱技术结合 ESR 谱和 DFT 计算揭示了氧缺陷的电子结构和含缺陷 $\text{Bi}_2\text{O}_2\text{CO}_3$ 光氧化 NO 的转化途径。结果表明, 氧空位可增加活性基的生成, 促进 NO 转化为目标产物, 抑制毒性副产物 (NO_2) 的生成, 从而提高了选择性。本研究为提高光催化选择性和深入认识气相光催化反应机理提供了新策略。见本期第 620–630 页。

About the Journal

Chinese Journal of Catalysis is an international journal published monthly by Chinese Chemical Society, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, and Elsevier. The journal publishes original, rigorous, and scholarly contributions in the fields of heterogeneous and homogeneous catalysis in English or in both English and Chinese. The scope of the journal includes:

- ◆ New trends in catalysis for applications in energy production, environmental protection, and production of new materials, petroleum chemicals, and fine chemicals;
- ◆ Scientific foundation for the preparation and activation of catalysts of commercial interest or their representative models;
- ◆ Spectroscopic methods for structural characterization, especially methods for in situ characterization;
- ◆ New theoretical methods of potential practical interest and impact in the science and applications of catalysis and catalytic reaction;
- ◆ Relationship between homogeneous and heterogeneous catalysis;
- ◆ Theoretical studies on the structure and reactivity of catalysts.
- ◆ The journal also accepts contributions dealing with photo-catalysis, bio-catalysis, and surface science and chemical kinetics issues related to catalysis.

Types of Contributions

- **Reviews** deal with topics of current interest in the areas covered by this journal. Reviews are surveys, with entire, systematic, and important information, of recent progress in important topics of catalysis. Rather than an assemblage of detailed information or a complete literature survey, a critically selected treatment of the material is desired. Unsolved problems and possible developments should also be discussed. Authors should have published articles in the field. Reviews should have more than 80 references.
- **Communications** rapidly report studies with significant innovation and major academic value. They are limited to four Journal pages. After publication, their full-text papers can also be submitted to this or other journals.
- **Articles** are original full-text reports on innovative, systematic and completed research on catalysis.
- **Highlights** describe and comment on very important new results in the original research of a third person with a view to highlight their significance. The results should be presented clearly and concisely without the comprehensive details required for an original article.
- **Perspectives** are short reviews of recent developments in an established or developing topical field. The authors should offer a critical assessment of the trend of the field, rather than a summary of literatures.
- **Viewpoints** describe the results of original research in general in some area, with a view to highlighting the progress, analyzing the major problems, and commenting the possible research target and direction in the future.

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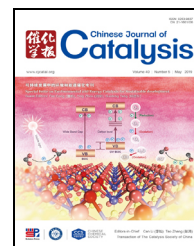
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Special Issue on Environmental and Energy Catalysis for Sustainable Development

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Chin. J. Catal., 2019, 40: 619 doi: S1872-2067(19)63351-6

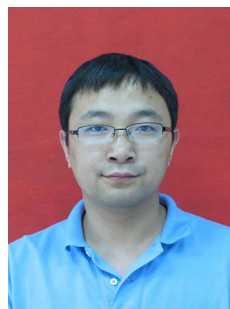
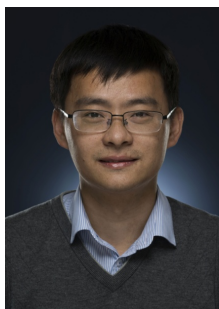
Preface to Special Issue on Environmental and Energy Catalysis for Sustainable Development

Fan Dong, Ying Zhou, Guidong Yang

University of Electronic Science and Technology of China;

Southwest Petroleum University;

Xi'an Jiaotong University



Articles

Chin. J. Catal., 2019, 40: 620–630 doi: S1872-2067(19)63279-1

Pivotal roles of artificial oxygen vacancies in enhancing photocatalytic activity and selectivity on $\text{Bi}_2\text{O}_2\text{CO}_3$ nanosheets

Hongjing Liu, Peng Chen, Xiaoya Yuan, Yuxin Zhang,

Hongwei Huang, Li'ao Wang, Fan Dong*

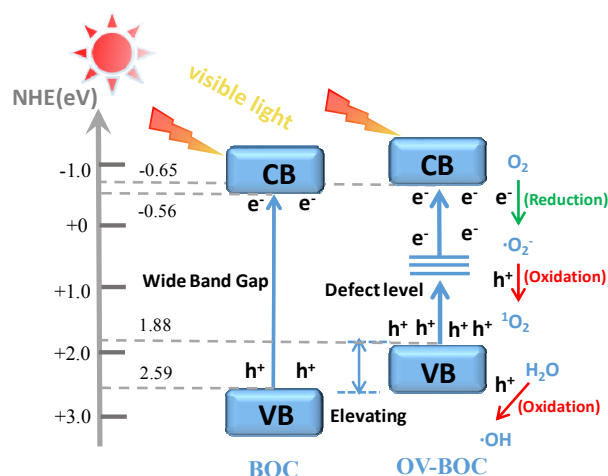
Chongqing University;

University of Electronic Science and Technology of China;

Chongqing Technology and Business University;

China University of Geosciences

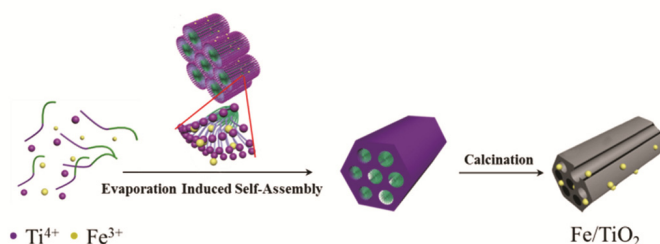
The illustration shows the band structure and photocatalytic NO removal process on OV-BOC. The oxygen vacancies in OV-BOC could reduce the width of the band gap, increase the charge separation efficiency, and activate the reactants to generate abundant reactive oxygen species (ROS) to participate in photocatalytic NO oxidation.



Chin. J. Catal., 2019, 40: 631–637 doi: S1872-2067(19)63309-7

Ordered mesoporous Fe/TiO₂ with light enhanced photo-Fenton activity

Zhenmin Xu, Ru Zheng, Yao Chen, Jian Zhu, Zhenfeng Bian *
Shanghai Normal University

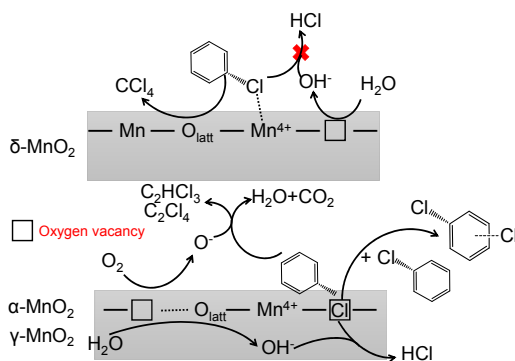


Ordered mesoporous Fe/TiO₂ was prepared by an evaporation-induced self-assembly method. It is a new highly efficient photo-Fenton catalyst that provides a new pathway for designing and fabricating high-performance catalysts for environmental purification.

Chin. J. Catal., 2019, 40: 638–646 doi: S1872-2067(19)63322-X

Structural effect and reaction mechanism of MnO₂ catalysts in the catalytic oxidation of chlorinated aromatics

Xiaole Weng, Yu Long, Wanglong Wang, Min Shao, Zhongbiao Wu *
Zhejiang University; Zhejiang Provincial Engineering Research Center of Industrial Boiler & Furnace Flue Gas Pollution Control;
Peking University; Jinan University

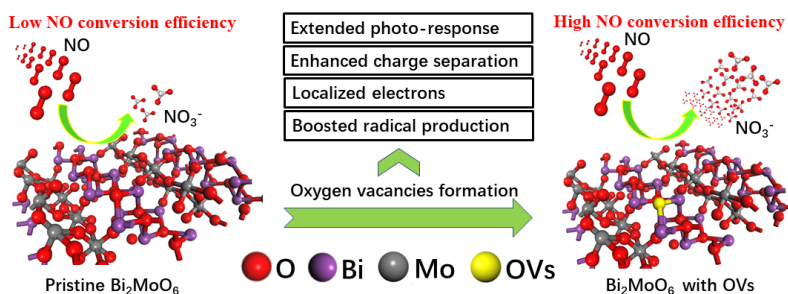


Three different crystal structures of MnO₂ were prepared to explore their reaction mechanisms and environmental risks for the catalytic oxidation of chlorinated aromatics.

Chin. J. Catal., 2019, 40: 647–655 doi: S1872-2067(19)63277-8

The pivotal effects of oxygen vacancy on Bi₂MoO₆: Promoted visible light photocatalytic activity and reaction mechanism

Yanjuan Sun *, Hong Wang, Qian Xing, Wen Cui, Jieyuan Li, Sujuan Wu, Lidong Sun *
Chongqing University; Chongqing Technology and Business University; Sichuan University



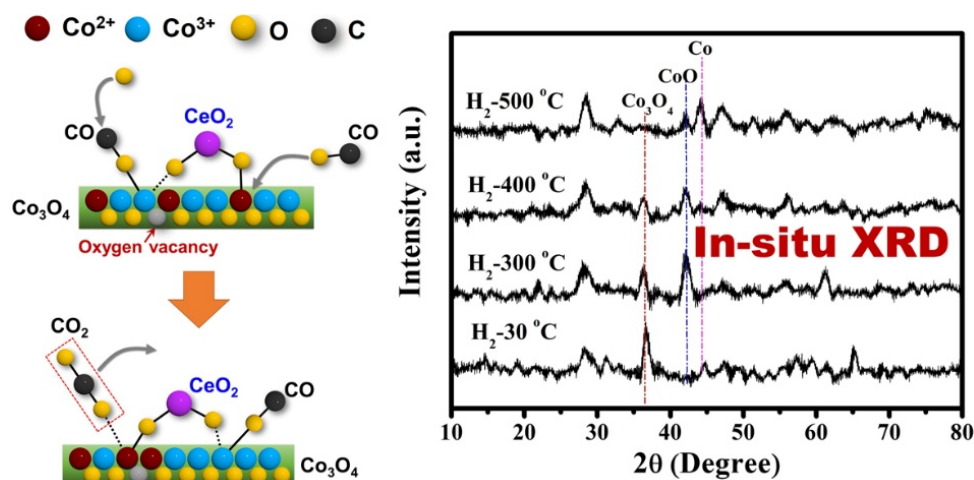
Oxygen vacancies promote the production rate of the final products in Bi₂MoO₆, because they provide an intermediate level to promote the charge transfer and separation, and localize the abundant electrons to activate the adsorbed O₂ and generate reactive radicals.

Chin. J. Catal., 2019, 40: 656–663 doi: S1872-2067(19)63282-1

In situ studies on ceria promoted cobalt oxide for CO oxidation

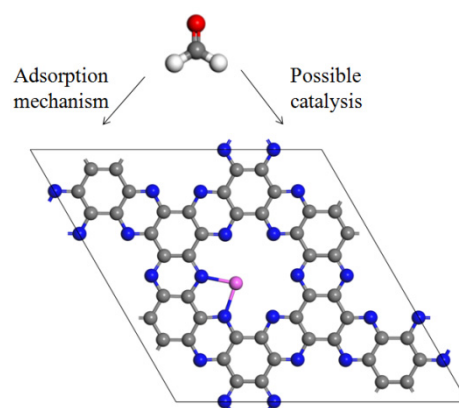
Weiwei Huan, Jie Li*, Jiahui Ji, Mingyang Xing*

Zhejiang A&F University; Zhejiang Provincial Collaborative Innovation Center of Agricultural Biological Resources Biochemical Manufacturing; East China University of Science and Technology



This work presents an in situ study on ceria promoted cobalt oxide for CO oxidation, which reveals the mechanism of ceria promoting CO oxidation over cobalt oxide.

Chin. J. Catal., 2019, 40: 664–672 doi: 10.1016/S1872-2067(18)63201-2

Density functional theory investigation of the enhanced adsorption mechanism and potential catalytic activity for formaldehyde degradation on Al-decorated C_2N monolayerYuetan Su, Wenlang Li, Guiying Li, Zhimin Ao*, Taicheng An
Guangdong University of Technology

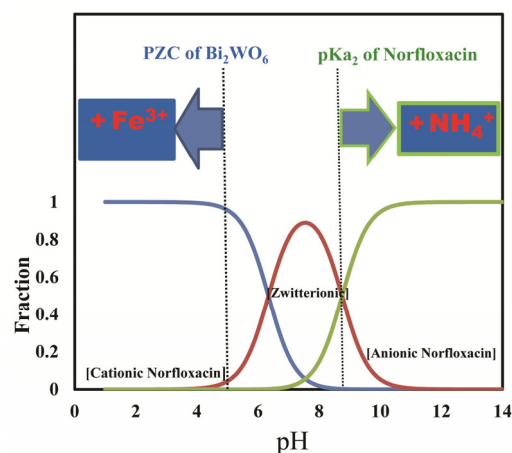
Al-decorated C_2N can enhance the HCHO adsorption capacity and the subsequent generation of hydroxyl ($\cdot\text{OH}$) and superoxide ($\text{O}_2^{\cdot-}$) radicals; therefore, it represents a promising material for the adsorption and possible catalytic degradation of HCHO .

Chin. J. Catal., 2019, 40: 673–680 doi: S1872-2067(19)63285-7

Exploring a broadened operating pH range for norfloxacin removal via simulated solar-light-mediated Bi_2WO_6 process

Meijuan Chen, Yu Huang*, Wei Chu

Xi'an Jiaotong University; Institute of Earth Environment, Chinese Academy of Sciences; The Hong Kong Polytechnic University



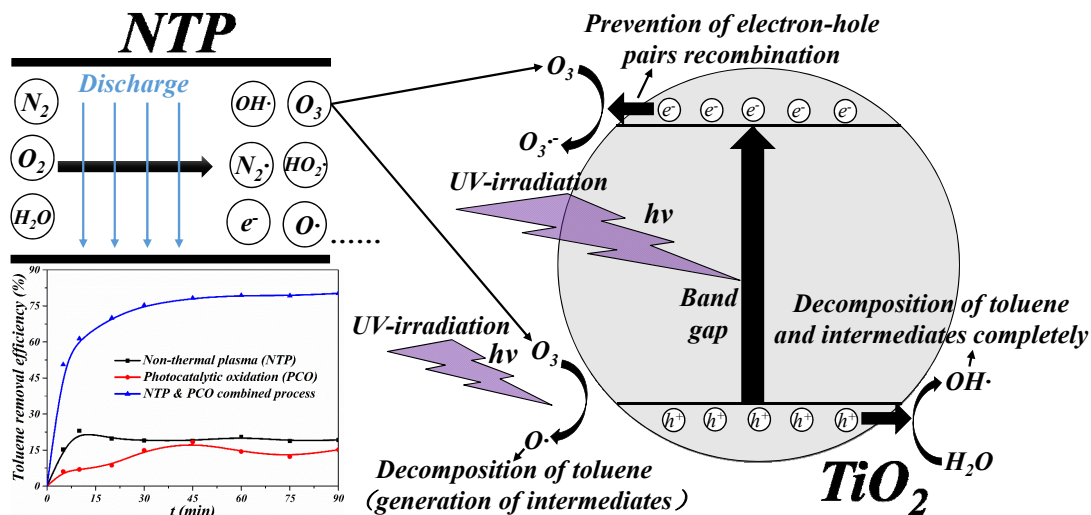
To broaden the operating pH range for Bi_2WO_6 photocatalysis, innovative approaches were designed by creating a buffer system using an NH_4^+ salt under basic pH conditions or introducing a homogeneous SSL/ Fe^{3+} photo-sensitization under acidic conditions.

Chin. J. Catal., 2019, 40: 681–690 doi: 10.1016/S1872-2067(18)63185-7

Synergetic effect between non-thermal plasma and photocatalytic oxidation on the degradation of gas-phase toluene: Role of ozone

Haoling Ye, Yiqiu Liu, Si Chen, Haiqiang Wang *, Zhen Liu, Zhongbiao Wu

Zhejiang University; Zhejiang Provincial Engineering Research Center of Industrial Boiler & Furnace Flue Gas Pollution Control



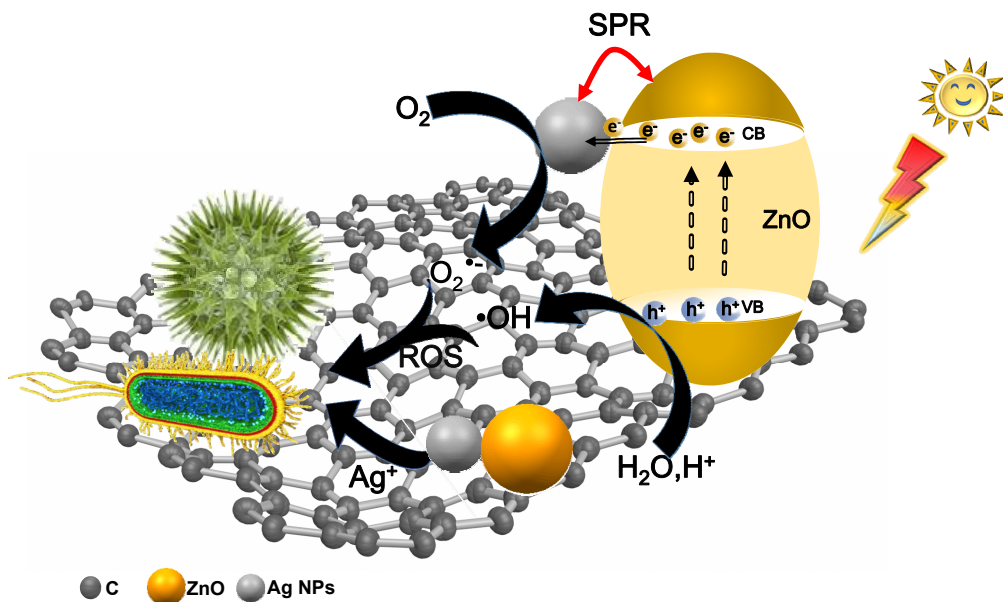
During the combined NTP + PCO process, ozone mainly acted as an electron acceptor and scavenger, generating more hydroxyl radicals and reducing the recombination of electron-hole pairs.

Chin. J. Catal., 2019, 40: 691–702 doi: 10.1016/S1872-2067(18)63193-6

Light-induced ZnO/Ag/rGO bactericidal photocatalyst with synergistic effect of sustained release of silver ions and enhanced reactive oxygen species

Yunyan Wu, Lili Zhang, Yazhou Zhou, Lili Zhang, Yi Li, Qinqin Liu *, Juan Hu, Juan Yang *

Jiangsu University; Huaiyin Normal University



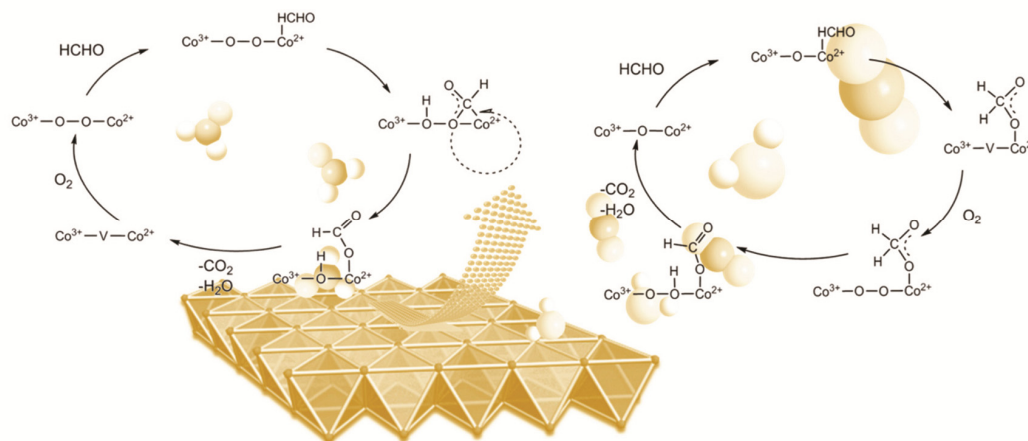
ZnO/Ag/rGO bactericidal photocatalyst can realize effective antibacterial activity against *E. coli* and *S. aureus* by synergistic effects of Ag^+ and reactive oxygen species (ROS). The sufficient radicals, together with sustained Ag^+ can accelerate the death of bacteria through the destruction of biomolecules.

Chin. J. Catal., 2019, 40: 703–712 doi: S1872-2067(19)63273-0

Exploration of the active phase of the hydrotalcite-derived cobalt catalyst for HCHO oxidation

Mengya Lin, Xiaolin Yu *, Xueqin Yang, Xiuyun Ma, Maofa Ge *

Institute of Chemistry, Chinese Academy of Sciences; University of Chinese Academy of Sciences; Institute of Urban Environment, Chinese Academy of Sciences



The Co_3O_4 catalyst calcined in N_2 exhibited enhanced HCHO degradation ability. The enhanced activity was because of the extra octahedrally coordinated Co^{2+} ions and surface oxygen species, and the entire process occurred at $\text{Co}^{2+}\text{-O}\text{-Co}^{3+}$ and $\text{Co}^{2+}\text{-O}_2\text{-Co}^{3+}$.

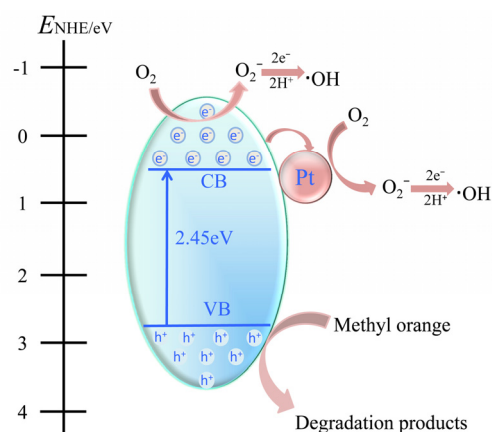
Chin. J. Catal., 2019, 39: 713–721 doi: 10.1016/S1872-2067(18)63156-0

Pt/ $\text{Bi}_{24}\text{O}_{31}\text{Cl}_{10}$ composite nanosheets with significantly enhanced photocatalytic activity under visible light irradiation

Boran Xu, Juan Li, Lu Liu, Yandong Li, Shaohui Guo, Yangqin Gao, Ning Li, Lei Ge *

China University of Petroleum Beijing

$\text{Bi}_{24}\text{O}_{31}\text{Cl}_{10}$ photocatalyst was prepared and modified with Pt nanoparticles. The Pt/ $\text{Bi}_{24}\text{O}_{31}\text{Cl}_{10}$ composite with 1 wt% Pt showed the highest methyl orange photocatalytic degradation efficiency and great stability.



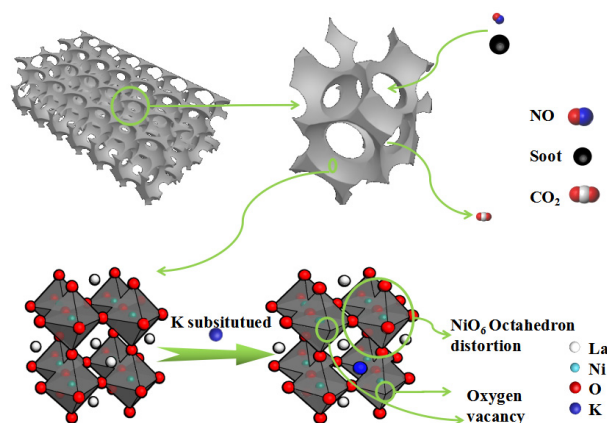
Chin. J. Catal., 2019, 40: 722–732 doi: 10.1016/S1872-2067(18)63269-9

Three-dimensional ordered macroporous perovskite-type $\text{La}_{1-x}\text{K}_x\text{NiO}_3$ catalysts with enhanced catalytic activity for soot combustion: The Effect of K-substitution

Xuele Mei, Jing Xiong, Yuechang Wei *, Chujun Wang, Qiangqiang Wu, Zhen Zhao, Jian Liu

China University of Petroleum-Beijing

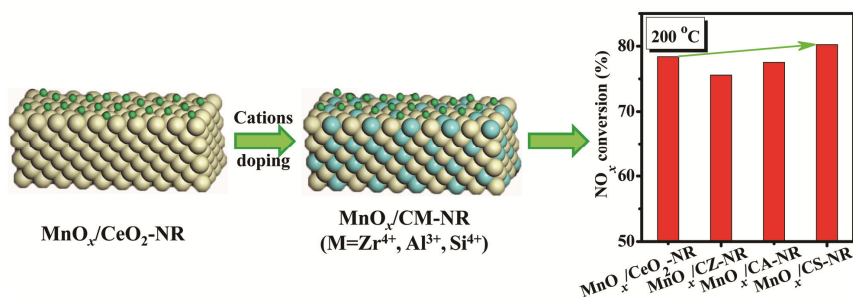
Preparation of $\text{La}_{1-x}\text{K}_x\text{NiO}_3$ catalysts with a three-dimensional ordered macroporous structure and the effect of K-substitution on their catalytic performance in soot combustion are presented.



Chin. J. Catal., 2019, 40: 733–743 doi: 10.1016/S1872-2067(18)63204-8

Doping effect of cations (Zr^{4+} , Al^{3+} , and Si^{4+}) on $\text{MnO}_x/\text{CeO}_2$ nano-rod catalyst for NH_3 -SCR reaction at low temperature

Xiaojiang Yao *, Jun Cao, Li Chen, Keke Kang, Yang Chen, Mi Tian, Fumo Yang
*Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences; Sichuan University;
 Institute of Urban Environment, Chinese Academy of Sciences*



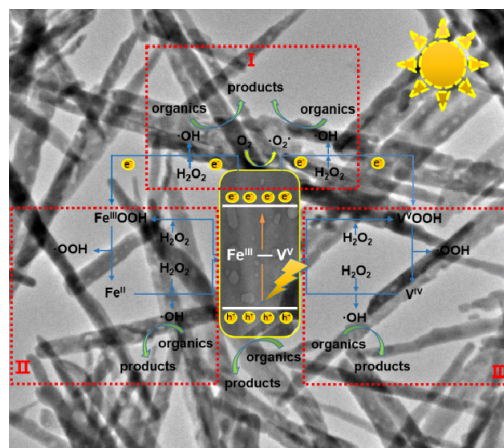
Zr^{4+} , Al^{3+} , and Si^{4+} were incorporated into a $\text{MnO}_x/\text{CeO}_2\text{-NR}$ catalyst. The Si^{4+} -doped catalyst exhibits the best denitration performance due to the largest number of oxygen vacancies, the largest number of acid sites, and highest Mn^{4+} content.

Chin. J. Catal., 2019, 40: 744–754 doi: S1872-2067(19)63272-9

Improved visible light photocatalytic activity of mesoporous FeVO_4 nanorods synthesized using a reactable ionic liquid

Hanxiang Chen, Jie Zeng, Mindong Chen, Zhigang Chen, Mengxia Ji, Junze Zhao, Jiexiang Xia *, Huaming Li *
Jiangsu University; Nanjing University of Information Science & Technology

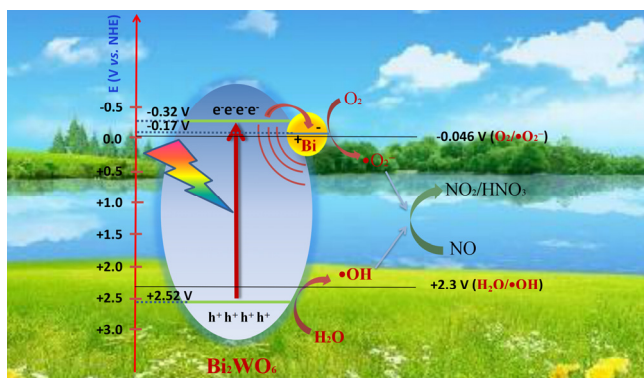
A mesoporous FeVO_4 nanorod photocatalyst with the pore diameter of 5–20 nm was synthesized by an Fe-based ionic liquid-assisted method. The porous structure of the photocatalyst provided a large number of adsorption and reactive sites for photodegradation.



Chin. J. Catal., 2019, 40: 755–764 doi: S1872-2067(19)63320-6

SPR effect of bismuth enhanced visible photoreactivity of Bi_2WO_6 for NO abatement

Li Zhang, Chao Yang, Kangle Lv *, Yachao Lu, Qin Li, Xiaofeng Wu, Yuhan Li, Xiaofang Li, Jiajie Fan, Mei Li *
*South-Central University for Nationalities; Chongqing Technology and Business University;
 Wuhan University of Science and Technology; Zhengzhou University*

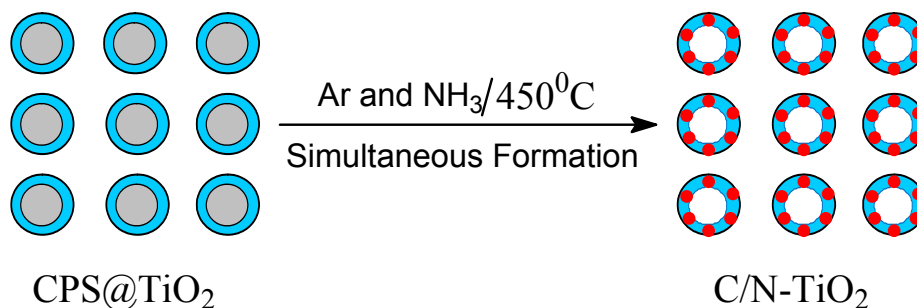


In-situ formed Bi nanospheres stimulates the production of ROSs such as $\bullet\text{O}_2^-$ and $\bullet\text{OH}$ radicals to oxidize NO under visible irradiation of flower-like Bi_2WO_6 microspheres due to the SPR effect of metal Bi.

Chin. J. Catal., 2019, 40: 765–775 doi: S1872-2067(19)63286-9

Simultaneous formation of a C/N-TiO₂ hollow photocatalyst with efficient photocatalytic performance and recyclability

Yingguan Xiao, Dongxiao Sun, linyu Li, Juanrong Chen *, Shidong Zhao, Caiguo Jiang, Luyao Yang, Li Cheng, Shunsheng Cao *
Jiangsu University



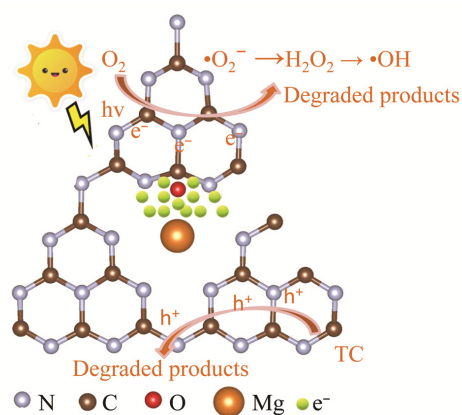
Carbon-modified and N-doped TiO₂ (C/N-TiO₂) was simultaneously synthesized. The photocatalytic properties can be adjusted by changing the shell thickness of the C/N-TiO₂ hollow spheres. C/TiO₂ shows enhanced photocatalytic performance for the degradation of tetracycline.

Chin. J. Catal., 2019, 40: 776–785 doi: S1872-2067(19)63300-0

Unique electronic structure of Mg/O co-decorated amorphous carbon nitride enhances the photocatalytic tetracycline hydrochloride degradation

Xiaolu Wu, Min Fu *, Peng Lu, Qiuyan Ren, Cheng Wang
Chongqing Technology and Business University

The unique electronic structure of Mg/O co-decorated amorphous carbon nitride enhanced the production of $\cdot\text{OH}$ and $\cdot\text{O}_2$ radicals as the main reactive species, which enhanced the photocatalytic tetracycline hydrochloride degradation efficiency five times compared to that of pristine g-C₃N₄.



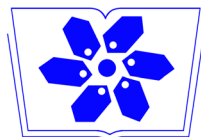
Chin. J. Catal., 2019, 40: 786–794 doi: S1872-2067(19)63332-2

Preparation of amphiphilic TiO₂ Janus particles with highly enhanced photocatalytic activity

Yanting Shi, Qiaoling Zhang *, Youzhi Liu, Junbo Chang, Jing Guo
North University of China;
Shanxi North Xing'an Chemical Industry Co. Ltd.

TiO₂ Janus particles were successfully prepared via toposselective surface modification. The particles adsorbed stably on the interface between pollutants and water, greatly improving the photodegradation efficiency of organic wastewater.





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可持续发展中的环境和能源催化专刊

客座主编: 董帆, 周莹, 杨贵东

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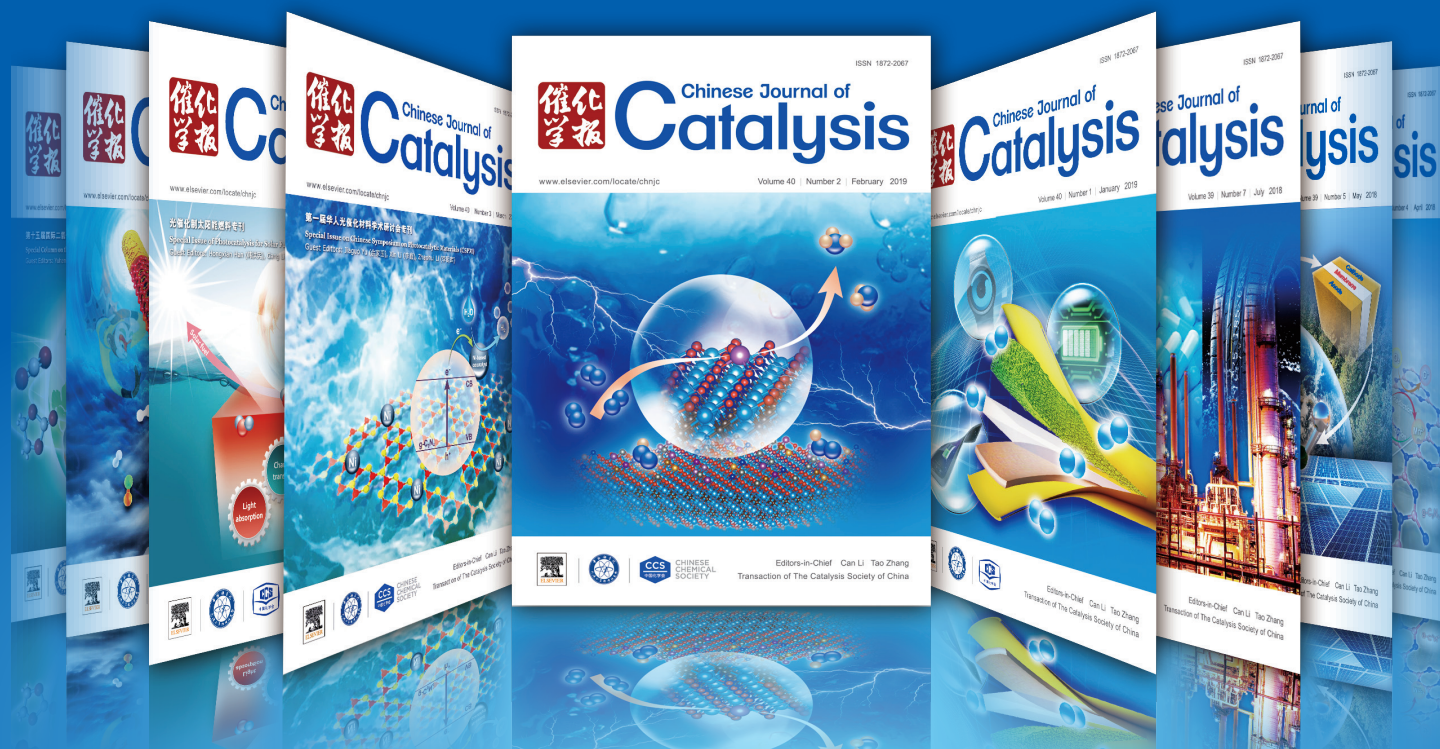


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