



Chinese Journal of Catalysis

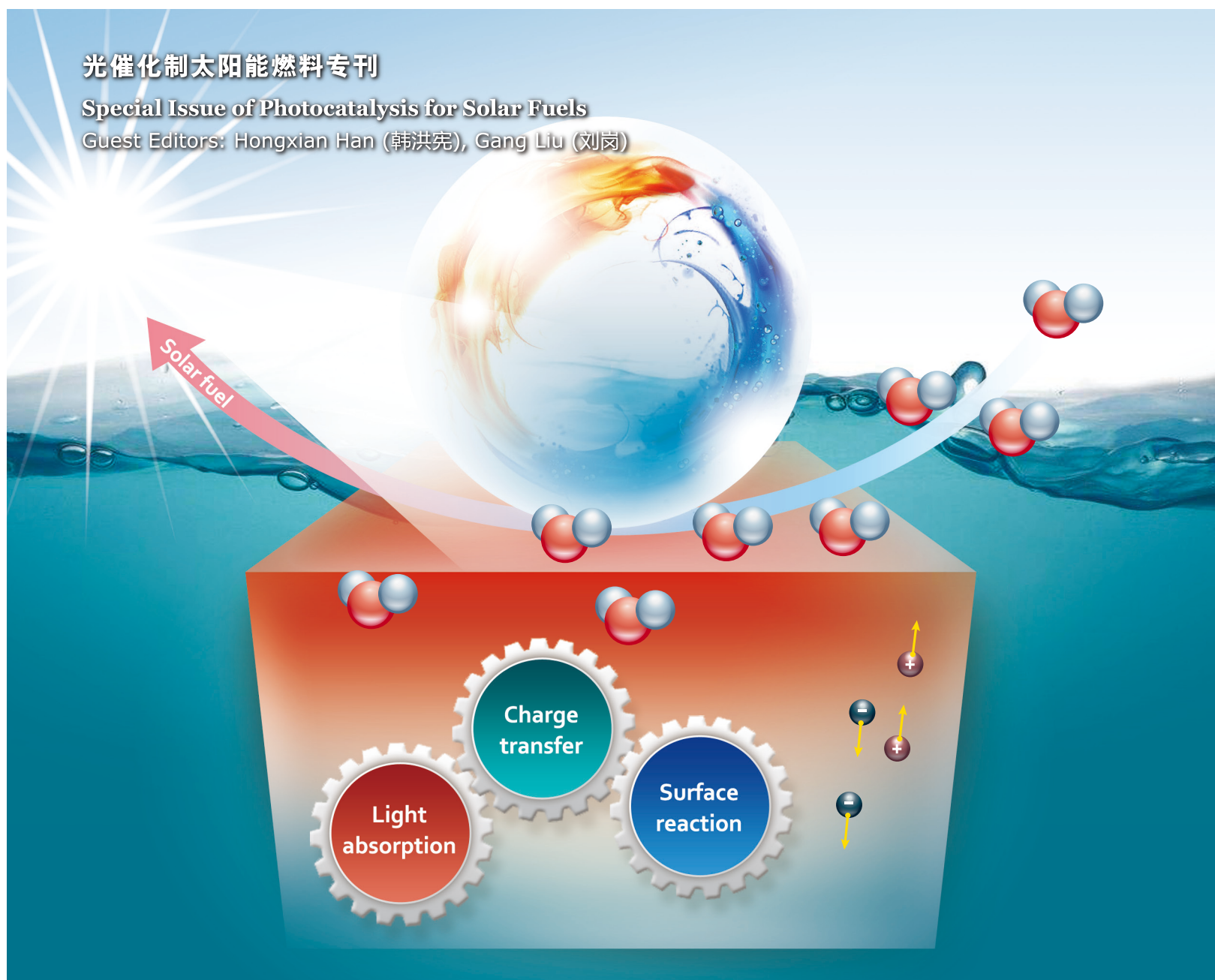
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光催化制太阳能燃料专刊

Special Issue of Photocatalysis for Solar Fuels

Guest Editors: Hongxian Han (韩洪宪), Gang Liu (刘岗)



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

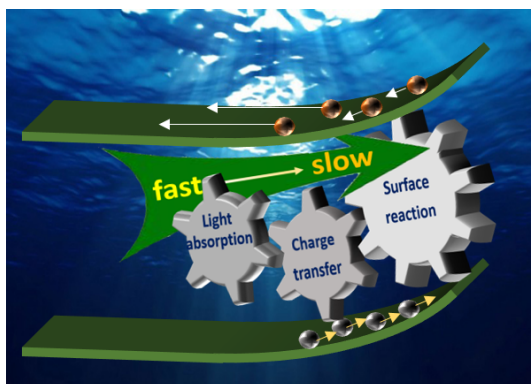
万方数据

available at www.sciencedirect.comjournal homepage: www.elsevier.com/locate/chnjc**Special Issue of Photocatalysis for Solar Fuels**

Guest Editors: Hongxian Han, Gang Liu

Chinese Journal of Catalysis**Graphical Contents****Editorial***Chin. J. Catal.*, 2018, 39: 367–368 doi: 10.1016/S1872-2067(18)63041-4**Preface to Special Issue of Photocatalysis for Solar Fuels**

Hongxian Han, Gang Liu

*Dalian Institute of Chemical Physics, Chinese Academy of Sciences; University of Chinese Academy of Sciences;
Institute of Metal Research, Chinese Academy of Sciences; University of Science and Technology of China***Reviews***Chin. J. Catal.*, 2018, 39: 369–378 doi: 10.1016/S1872-2067(17)62998-X**Progress in designing effective photoelectrodes for solar water splitting**Zhiliang Wang, Lianzhou Wang*
University of Queensland, Australian

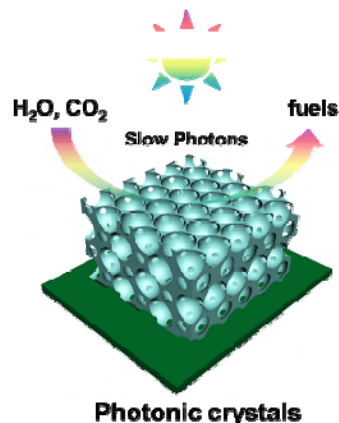
Three key steps, including light absorption, charge transfer and surface reaction with huge time scale difference of individual steps in photoelectrochemical water splitting process, should be considered integrally for efficient photoelectrode design.

Chin. J. Catal., 2018, 39: 379–389 doi: 10.1016/S1872-2067(17)62930-9

Slow photons for solar fuels

Xiuzhen Zheng, Yang Yang, Shifu Chen *, Liwu Zhang *
Fudan university; HuaiBei Normal University

This article reviews recent developments in the applications of photonic crystals to photocatalytic H_2 production and CO_2 reduction based on slow photons, highlighting promising approaches towards improving light harvesting in solar-energy-conversion technologies.

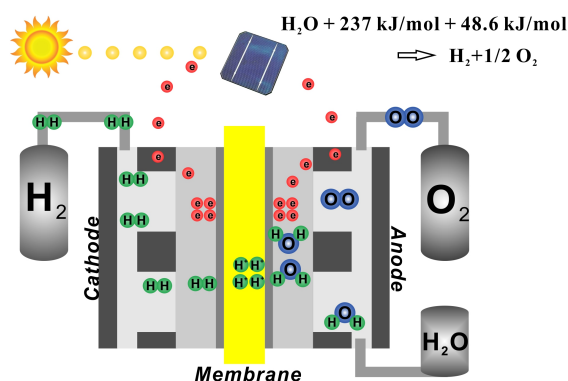


Chin. J. Catal., 2018, 39: 390–394 doi: 10.1016/S1872-2067(17)62949-8

Water electrolysis based on renewable energy for hydrogen production

Jun Chi, Hongmei Yu *
Dalian Institute of Chemical Physics, Chinese Academy of Sciences;
University of Chinese Academy of Sciences

With the increment trend of abandoned wind power and PV power show increasing trend, water electrolysis is becoming promising. Different water electrolysis technologies have been discussed in this review.

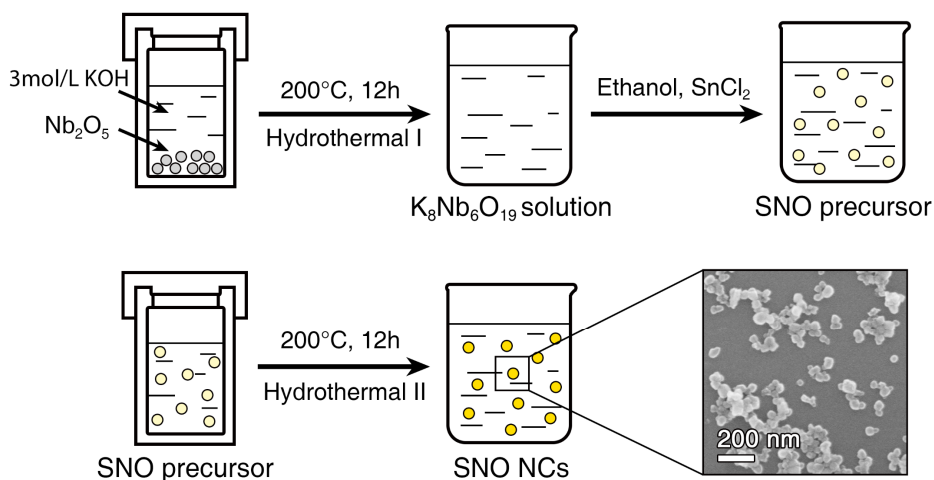


Communications

Chin. J. Catal., 2018, 39: 395–400 doi: 10.1016/S1872-2067(17)62963-2

Two-step hydrothermal synthesis of $\text{Sn}_2\text{Nb}_2\text{O}_7$ nanocrystals with enhanced visible-light-driven H_2 evolution activity

Chao Zhou, Run Shi, Lu Shang, Li-Zhu Wu, Chen-Ho Tung, Tierui Zhang *
Technical Institute of Physics and Chemistry, Chinese Academy of Sciences; University of Chinese Academy of Sciences



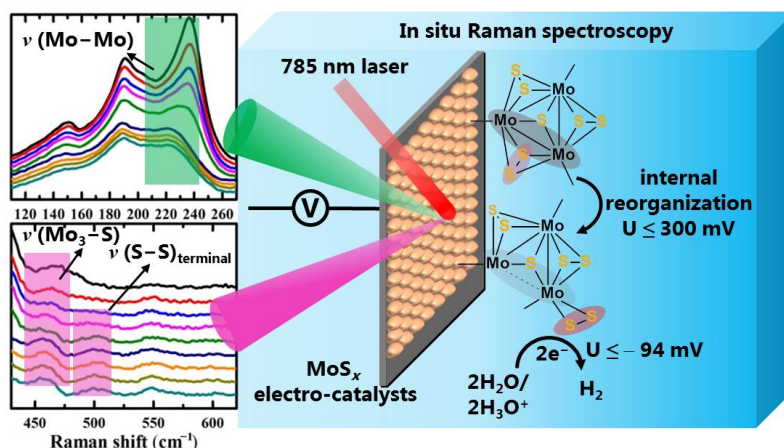
A two-step hydrothermal route is used to synthesize $\text{Sn}_2\text{Nb}_2\text{O}_7$ nanocrystals with an average size of 20 nm. The as-obtained nanocrystals show enhanced visible-light-driven photocatalytic H_2 production activity compared with bulk $\text{Sn}_2\text{Nb}_2\text{O}_7$ powder.

Chin. J. Catal., 2018, 39: 401–406 doi: 10.1016/S1872-2067(17)62945-0

Structural change of molybdenum sulfide facilitates the electrocatalytic hydrogen evolution reaction at neutral pH as revealed by in situ Raman spectroscopy

Yamei Li *, Ryuhei Nakamura

RIKEN Center for Sustainable Resource Science (CSRS), Japan; Tokyo Institute of Technology, Japan



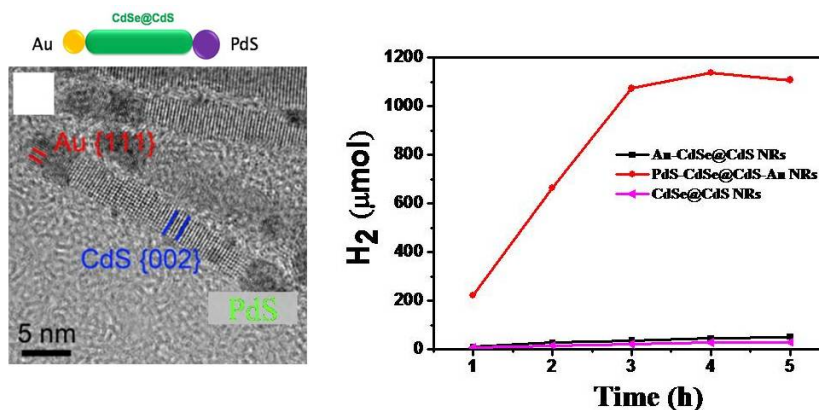
Synergy between trinuclear Mo centers and di-sulfur ligands for facilitating electrocatalytic hydrogen evolution was revealed using in situ Raman spectroscopy at neutral pH, providing important insights into the nature of metal-ligand interactions in the hydrogen evolution.

Chin. J. Catal., 2018, 39: 407–412 doi: 10.1016/S1872-2067(17)62970-X

Synthesis of PdS-CdSe@CdS-Au nanorods with asymmetric tips with improved H₂ production efficiency in water splitting and increased photostability

Xianmei Xiang, Lingjun Chou, Xinheng Li *

Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences



Asymmetrically tipped PdS-CdSe@CdS-Au nanorod heterostructures were successfully synthesized. The heterostructures greatly improved the photocatalytic activity and stability in H₂ production as a result of efficient charge separation.

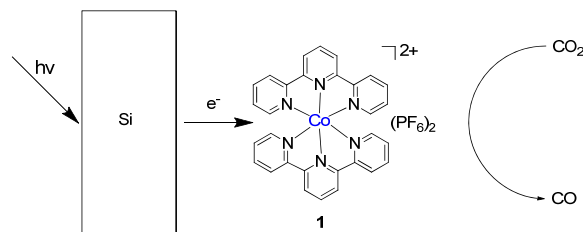
Chin. J. Catal., 2018, 39: 413–420 doi: 10.1016/S1872-2067(17)62993-0

Efficient photoelectrocatalytic CO₂ reduction by cobalt complexes at silicon electrode

Liangfeng Chen, Zhuo Wang, Peng Kang *

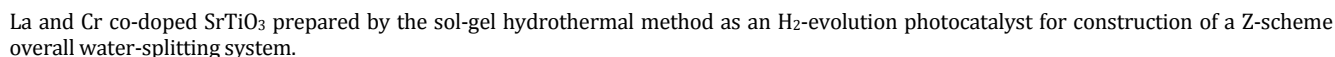
Technical Institute of Physics and Chemistry, Chinese Academy of Sciences; University of Chinese Academy of Sciences

A photoelectrochemical system based on earth-abundant materials for reducing CO₂ to CO is reported. The electrocatalysts are simple cobalt polypyridyl complexes that demonstrate high CO selectivity. Adding methanol as a proton source promotes CO formation.



Chin. J. Catal., 2018, 39: 421–430 doi: 10.1016/S1872-2067(18)63027-X

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



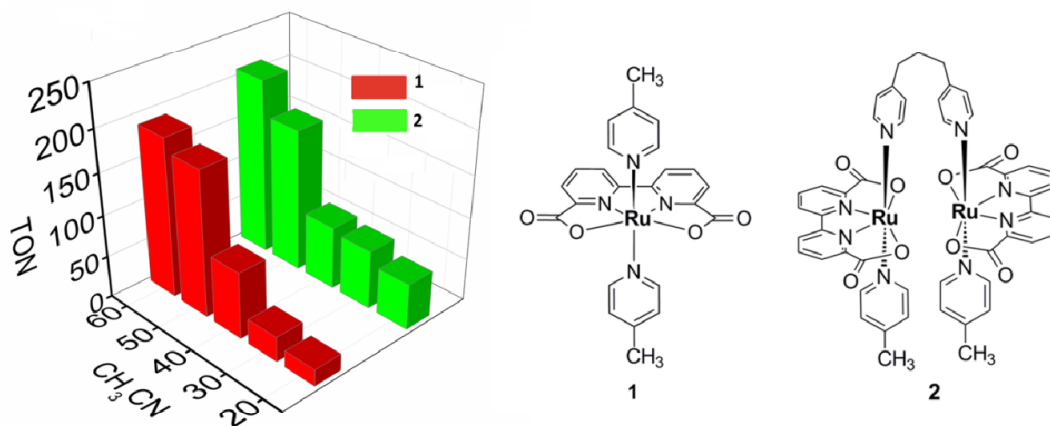
Homogeneous doping of interstitial boron in the TiO₂ shell supported on a TiB₂ core leads to a greatly enhanced photocatalytic water oxidation by shifting valence band maximum downwards.

Type-II-heterojunction TiO₂ nanorod arrays exhibit an enhanced photoelectrochemical water splitting performance, achieved through a simple electrochemical reduction. The prepared photoanode presents enhanced photo efficiency with respect to the pristine and completely reduced TiO₂.

Chin. J. Catal., 2018, 39: 446–452 doi: 10.1016/S1872-2067(18)63024-4

Visible light-driven oxygen evolution using a binuclear Ru-bda catalyst

Fei Li *, Congying Xu, Xiaohong Wang, Yong Wang, Jian Du, Licheng Sun
Dalian University of Technology (DUT), China; KTH Royal Institute of Technology, Sweden

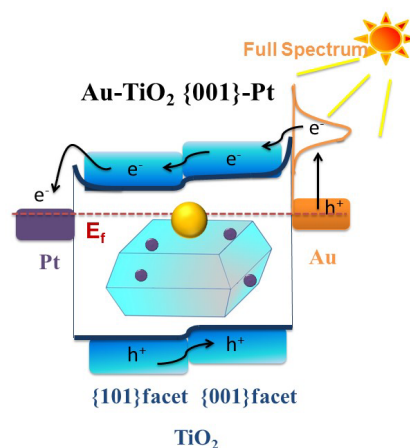


A binuclear ruthenium catalyst exhibited higher activity than its monomeric precursor in photocatalytic water oxidation. However, the difference in the activity between the bi- and mononuclear catalysts was diminished with the increase in the amount of CH_3CN in the reaction solution.

Chin. J. Catal., 2018, 39: 453–462 doi: 10.1016/S1872-2067(17)62938-3

Steering plasmonic hot electrons to realize enhanced full-spectrum photocatalytic hydrogen evolution

Yanrui Li, Yu Guo, Ran Long, Dong Liu, Daming Zhao, Yubo Tan,
Chao Gao *, Shaohua Shen *, Yujie Xiong*
Xi'an Jiaotong University; University of Science and Technology of China

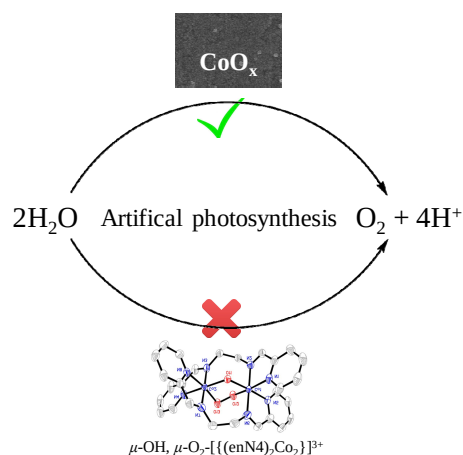


An efficient strategy is developed to steer the migration of plasmonic hot electrons using a well-designed hybrid structure that synergizes a "surface heterojunction" with a Schottky junction to achieve highly efficient full-spectrum photocatalytic hydrogen production.

Chin. J. Catal., 2018, 39: 463–471 doi: 10.1016/S1872-2067(17)62923-1

Water oxidation catalytic ability of polypyridine complex containing a $\mu\text{-OH}$, $\mu\text{-O}_2$ dicobalt(III) core

Junqi Lin, Baochun Ma, Mindong Chen, Yong Ding*
Lanzhou University;
Nanjing University of Information Science & Technology

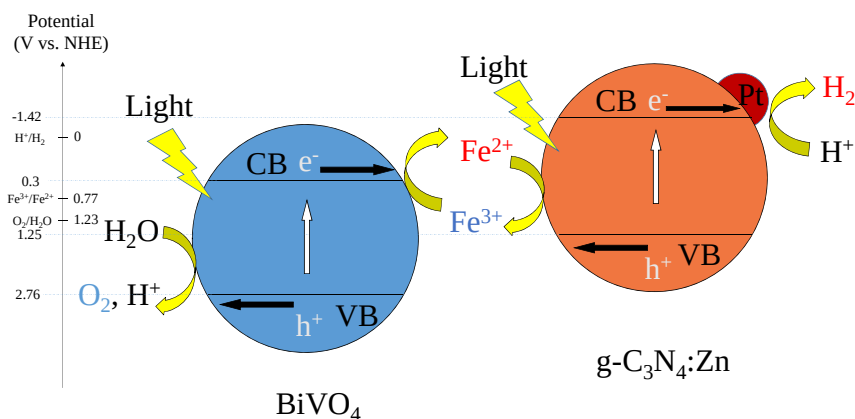


Complex $\mu\text{-OH}, \mu\text{-O}_2\text{-}[(\text{enN}_4)_2\text{Co}_2](\text{ClO}_4)_3$ was found to be inactive for photocatalytic water oxidation. Insight was gained into homogeneous water oxidation catalysts based on dinuclear cobalt complexes.

Chin. J. Catal., 2018, 39: 472–478 doi: 10.1016/S1872-2067(17)62961-9

Zinc-doped g-C₃N₄/BiVO₄ as a Z-scheme photocatalyst system for water splitting under visible light

Zhen Qin, Wenjian Fang, Junying Liu, Zhidong Wei, Zhi Jiang, Wenfeng Shangguan*
Shanghai Jiao Tong University



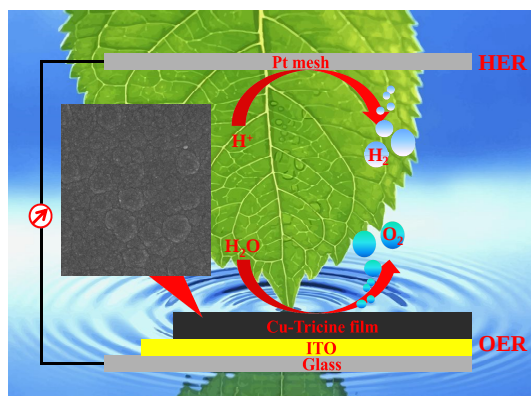
A two-step photocatalytic water splitting system, so called “Z-scheme system”, was achieved using Zn-doped g-C₃N₄ for H₂ evolution and BiVO₄ for O₂ evolution with Fe²⁺/Fe³⁺ as a shuttle redox mediator.

Chin. J. Catal., 2018, 39: 479–486 doi: 10.1016/S1872-2067(17)62892-4

Highly effective electrochemical water oxidation by copper oxide film generated in situ from Cu(II) tricine complex

Yan Gao*, Hu Chen, Lu Ye, Zhongkai Lu, Yanan Yao, Yu Wei,
Xuyang Chen
Dalian University of Technology

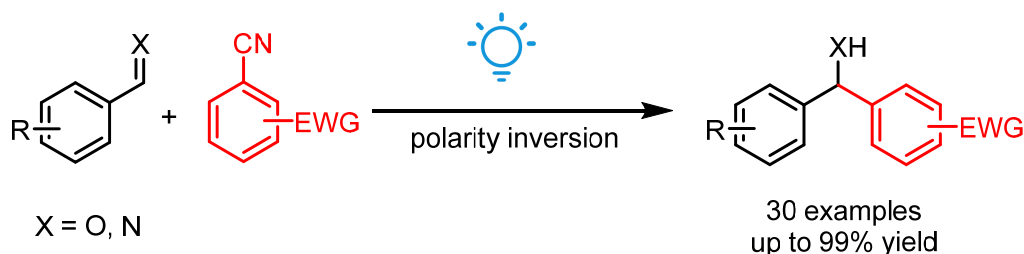
A dense Cu-tricine film was electrodeposited on ITO from phosphate buffer solution (0.2 mol/L) containing Cu²⁺ and tricine ligand. The as-prepared anode showed efficient electrocatalytic water oxidation performance with good stability.



Chin. J. Catal., 2018, 39: 487–494 doi: 10.1016/S1872-2067(17)62896-1

Photo-induced reductive cross-coupling of aldehydes, ketones and imines with electron-deficient arenes to construct aryl substituted alcohols and amines

Zan Liu, Xiaolei Nan, Tao Lei, Chao Zhou, Yang Wang, Wenqiang Liu, Bin Chen, Chenho Tung, Lizhu Wu*
Technical Institute of Physics and Chemistry, Chinese Academy of Sciences; University of Chinese Academy of Sciences

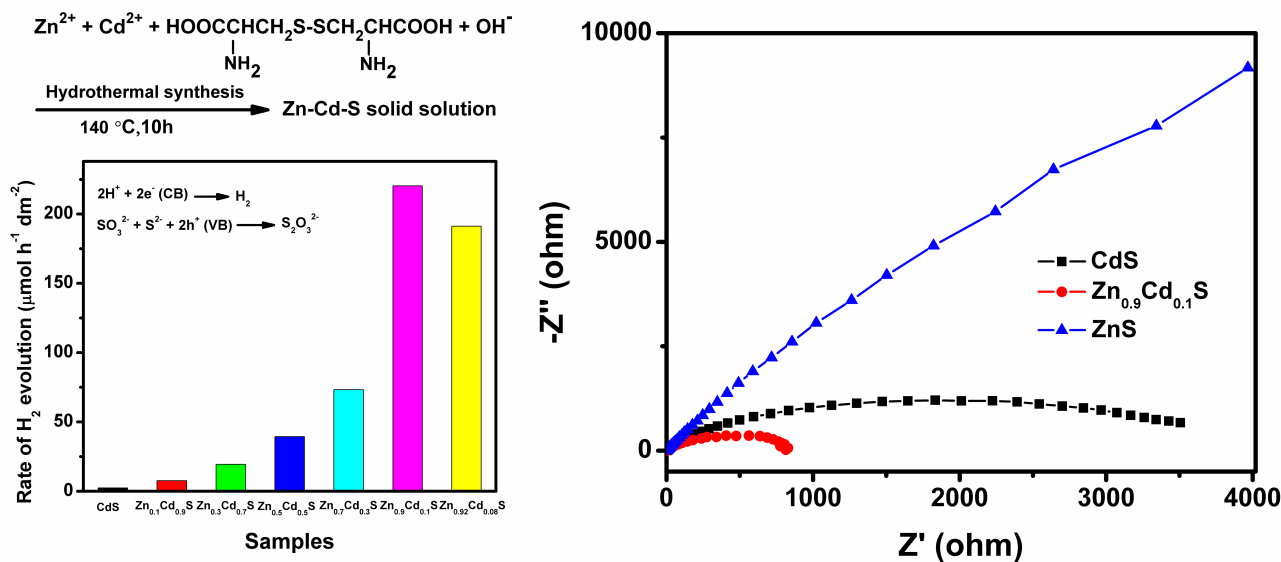


Aryl-substituted alcohols and amines have been efficiently constructed by reductive radical-radical cross-coupling between aldehydes, ketones and imines with electron-deficient arenes under visible-light catalysis. The strategy of polarity inversion of the C=X bond (X = O, N) avoids the use of air- and water-sensitive reagents, tolerates various functional groups and produces the desired products in yields up to 99% at room temperature.

Chin. J. Catal., 2018, 39: 495–501 doi: 10.1016/S1872-2067(17)62946-2

Biomolecule-assisted, cost-effective synthesis of a $\text{Zn}_{0.9}\text{Cd}_{0.1}\text{S}$ solid solution for efficient photocatalytic hydrogen production under visible light

Hongmei Zhao, Yunfei He, Meiying Liu *, Ran Wang, Yunhe Li, Wansheng You *
Liaoning Normal University

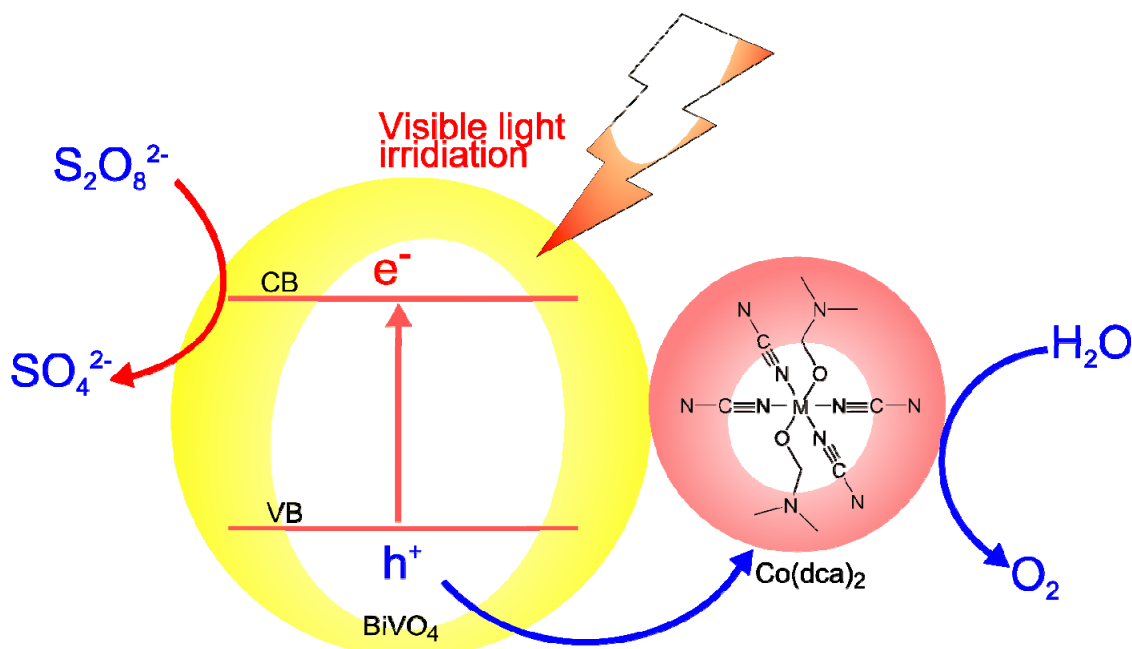


$\text{Zn}_{0.9}\text{Cd}_{0.1}\text{S}$ with a cubic zinc-blende structure was synthesized by a mild L-cysteine-assisted hydrothermal strategy and exhibited excellent and stable performance for photocatalytic H_2 evolution under visible light irradiation.

Chin. J. Catal., 2018, 39: 502–509 doi: 10.1016/S1872-2067(17)62943-7

Photocatalytic water oxidation over BiVO_4 with interface energetics engineered by Co and Ni-metallated dicyanamides

Yi Shang, Fujun Niu, Shaohua Shen *
Xi'an Jiaotong University



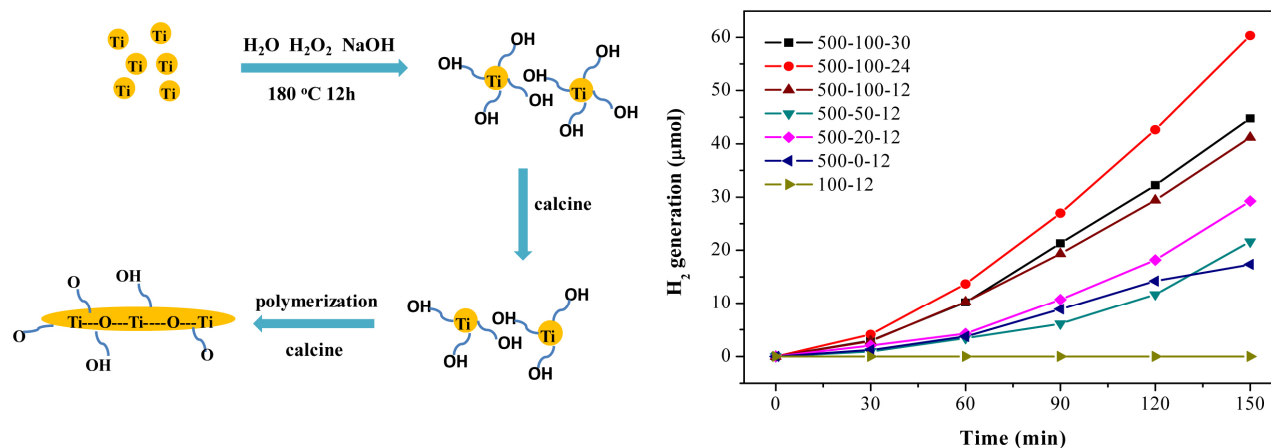
$\text{BiVO}_4/\text{M(dca)}_2$ ($\text{M} = \text{Co}, \text{Ni}$) hybrid systems were constructed and exhibited better photocatalytic activity in water oxidation than pure BiVO_4 , mainly owing to their efficient photogenerated hole transfer from BiVO_4 to M(dca)_2 .

Chin. J. Catal., 2018, 39: 510–516 doi: 10.1016/S1872-2067(17)62968-1

A new approach to inducing Ti^{3+} in anatase TiO_2 for efficient photocatalytic hydrogen production

Shunhang Wei, Shuang Ni *, Xiaoxiang Xu *

Tongji University; Laser Fusion Research Center, China Academy of Engineering Physics



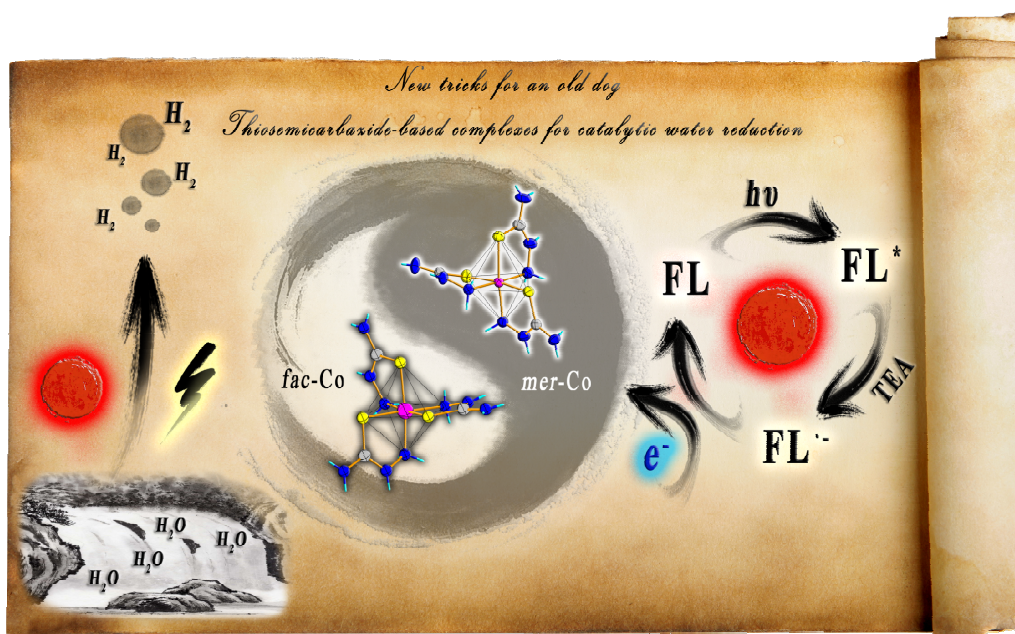
In the synthesis of TiO_2 , the amount of a H_2O_2 precursor and hydrothermal reaction time were adjusted to show that the highest photocatalytic hydrogen production activity featured an optimal oxygen vacancy content.

Chin. J. Catal., 2018, 39: 517–526 doi: 10.1016/S1872-2067(17)62940-1

New tricks for an old dog: Visible light-driven hydrogen production from water catalyzed by *fac*- and *mer*- geometrical isomers of tris(thiosemicarbazide) cobalt(III)

Yang Zhao †, Yongheng Wang †, Qiaoyu Wu, Jinqing Lin, Shenghui Wu, Wenjuan Hou, Ruibo Wu, Genggeng Luo *

Huaqiao University; Sun Yat-sen University



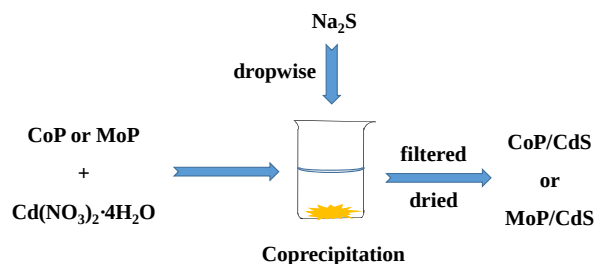
A pair of water-soluble octahedral complexes of cobalt(III) thiosemicarbazide with geometric isomers show efficient activity of photocatalyzing H_2 production. This is the first example of investigating the effect on catalyzing H_2 production using geometric isomers.

Chin. J. Catal., 2018, 39: 527–533 doi: 10.1016/S1872-2067(17)62931-0

Large-scale synthesis of noble-metal-free phosphide/CdS composite photocatalysts for enhanced H₂ evolution under visible light irradiation

Baojun Ma *, Ruisheng Zhang, Keying Lin, Hongxia Liu, Xiaoyan Wang, Wanyi Liu, Haijuan Zhan
Ningxia University

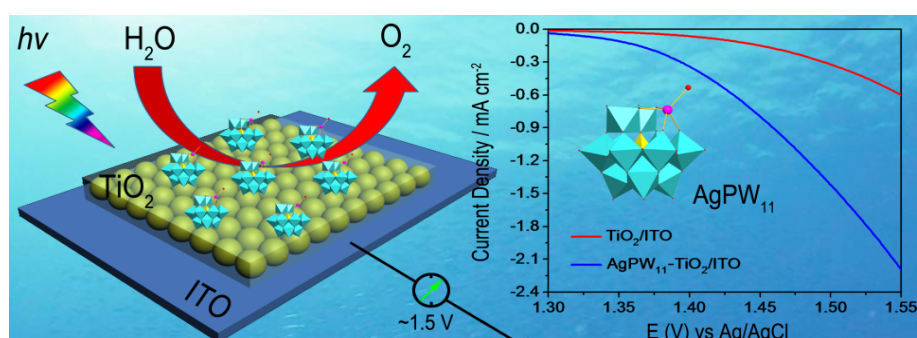
The phosphides/CdS Composites can be synthesized by this coprecipitation method, and it is simple and suitable for large scale production. CoP and MoP can replace Pt as cocatalysts for photocatalytic H₂ evolution reactions.



Chin. J. Catal., 2018, 39: 534–541 doi: 10.1016/S1872-2067(17)62973-5

Catalytic effects of [Ag(H₂O)(H₃PW₁₁O₃₉)]³⁻ on a TiO₂ anode for water oxidation

Jiansheng Li, Lei Wang, Wansheng You *, Meiying Liu *, Lancui Zhang, Xiaojing Sang
Liaoning Normal University



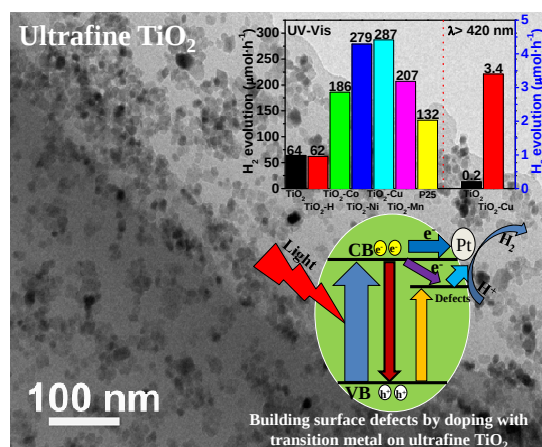
[H₃Ag^I(H₂O)PW₁₁O₃₉]³⁻ was immobilized on a TiO₂/ITO electrode, and showed enhanced electrocatalytic activity for water oxidation to O₂. Our results indicate that the [H₃PW₁₁O₃₉]⁴⁻ ligand plays an important role in transferring electrons and protons in water oxidation process.

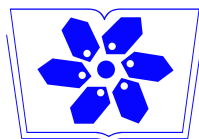
Chin. J. Catal., 2018, 39: 542–548 doi: 10.1016/S1872-2067(18)63044-X

Building surface defects by doping with transition metal on ultrafine TiO₂ to enhance the photocatalytic H₂ production activity

Qi-Feng Liu, Qian Zhang, Bing-Rui Liu, Shiyu Li *, Jing-Jun Ma *
Agricultural University of Hebei; University of South China; Hebei Agricultural Products Processing Engineering Technology Research Center

Surface defects (oxygen vacancies and metal cation replace defects) were induced with a facile and effective method by surface doping with low-cost transition metal (Co, Ni, Cu and Mn) on ultrafine TiO₂.





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