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Chinese Journal of Catalysis

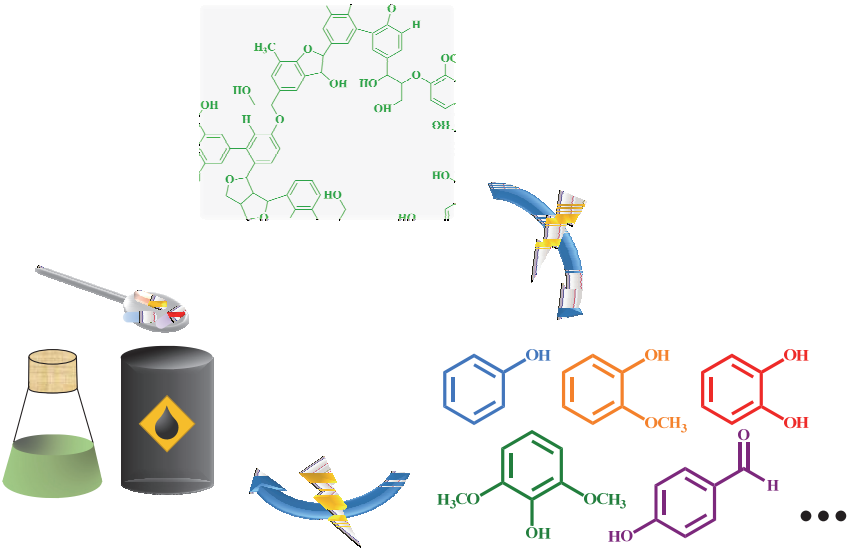
Graphical Contents

Reviews

Chin. J. Catal., 2021, 42: 1831–1842 doi: 10.1016/S1872-2067(21)63839-1

Lignin valorization toward value-added chemicals and fuels *via* electrocatalysis: A perspective

Chenxin Yang, Henan Chen, Tao Peng, Baiyao Liang, Yun Zhang *, Wei Zhao *
Shenzhen University

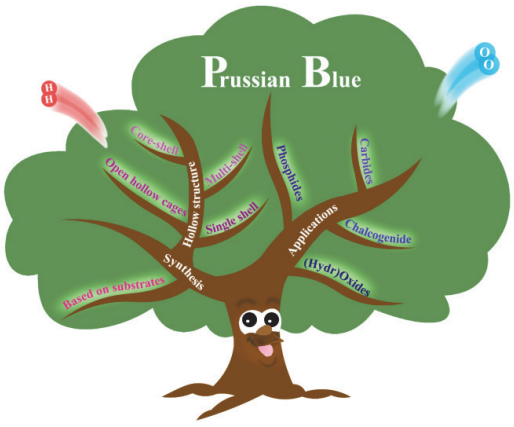


This review provides a brief summary and perspective on lignin valorization toward value-added chemicals and fuels *via* electrocatalysis.

Chin. J. Catal., 2021, 42: 1843–1864 doi: 10.1016/S1872-2067(21)63833-0

Hollow and substrate-supported Prussian blue, its analogs, and their derivatives for green water splitting

Jing-Yi Xie, Bin Dong *
China University of Petroleum (East China)

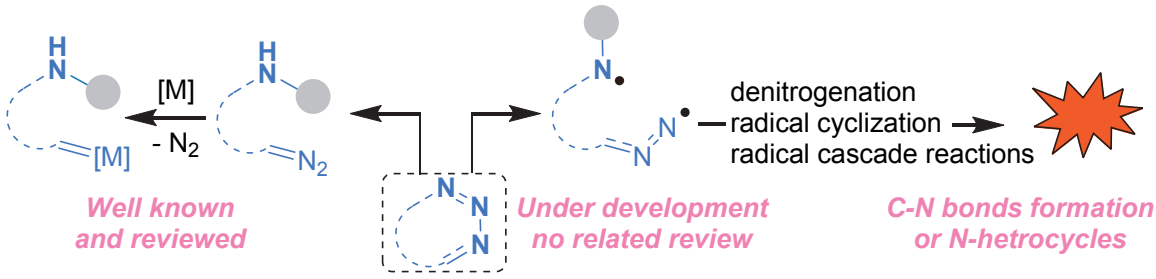


In this review, we discuss PB/PBAs and their derivatives having advanced nanostructures such as hollow structures, as well as substrate-supported structures, and the applications of the derivatives ((hydr)oxides, phosphides, chalcogenides, and carbides) in green water splitting.

Chin. J. Catal., 2021, 42: 1865–1875 doi: 10.1016/S1872-2067(21)63814-7

Radical denitrogenative transformations of polynitrogen heterocycles: Building C–N bonds and beyond

Wen-Chao Yang, Cai-Yun Chen, Jun-Feng Li *, Zu-Li Wang *
Qingdao Agricultural University; Yangzhou University; Nanjing Agricultural University

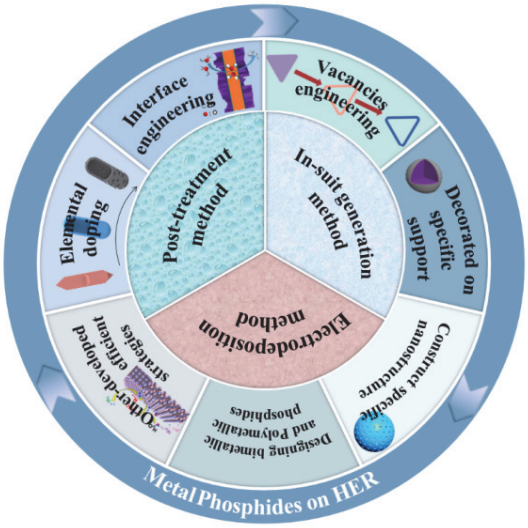


This review provides a thorough overview of radical-initiated denitrogenative cascade reactions of polynitrogen heterocycles in the formation of various C–X bonds and medicinally active nitrogen-containing heterocycles.

Chin. J. Catal., 2021, 42: 1876–1902 doi: 10.1016/S1872-2067(21)63855-X

Strategies on improving the electrocatalytic hydrogen evolution performances of metal phosphides

Wenli Yu, Yuxiao Gao, Zhi Chen, Ying Zhao, Zexing Wu *, Lei Wang *
Qingdao University of Science & Technology



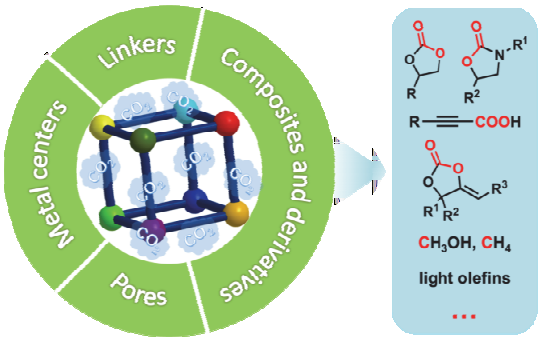
This review summarizes the recent developments in metal phosphides as HER electrocatalysts, focusing on the synthetic strategies and effective ways of boosting electrocatalytic performance.

Chin. J. Catal., 2021, 42: 1903–1920 doi: 10.1016/S1872-2067(21)63841-X

Improving the performance of metal-organic frameworks for thermo-catalytic CO_2 conversion: Strategies and perspectives

Leiduan Hao, Qineng Xia *, Qiang Zhang *, Justus Masa, Zhenyu Sun *
Beijing University of Chemical Technology, China; Jiaxing University, China;
Washington State University, USA; Kyambogo University, Uganda

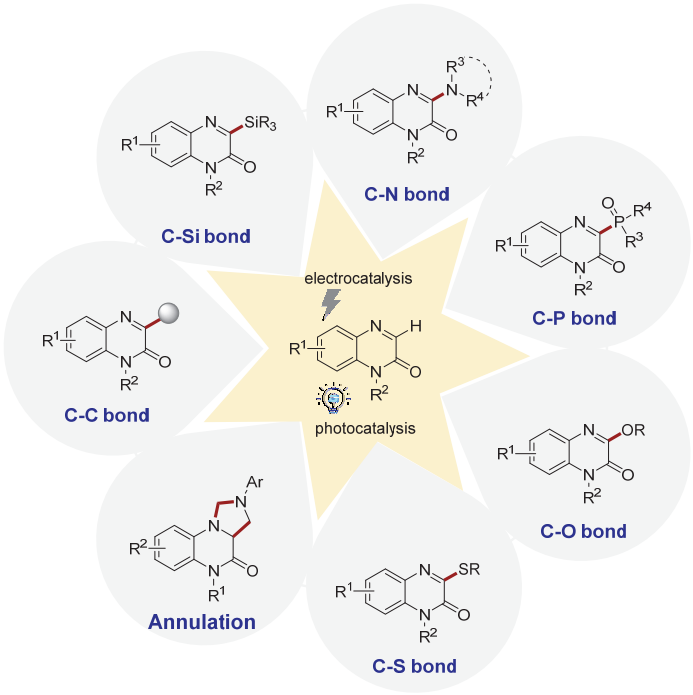
This review demonstrates different strategies of MOFs' design towards improved performance for thermo-catalytic CO_2 conversion to value-added chemicals. The future perspectives and challenges of MOFs as catalysts in CO_2 conversion are also highlighted.



Chin. J. Catal., 2021, 42: 1921–1943 doi: 10.1016/S1872-2067(21)63850-0

Photo-/electrocatalytic functionalization of quinoxalin-2(1*H*)-ones

Kai Sun, Fang Xiao, Bing Yu *, Wei-Min He *
Zhengzhou University; Central South University; University of South China

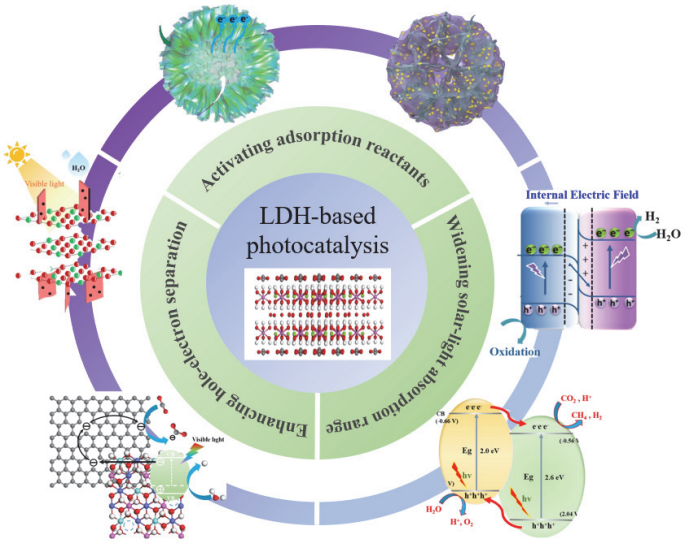


The photo-/electrocatalytic functionalization of quinoxalin-2(1*H*)-ones has emerged as a promising and powerful approach for the post-synthetic modification of quinoxalin-2(1*H*)-ones. This review provides an overview of recent developments in the photo-/electrocatalytic functionalization of quinoxalin-2(1*H*)-ones.

Chin. J. Catal., 2021, 42: 1944–1975 doi: 10.1016/S1872-2067(21)63861-5

Layered double hydroxide photocatalysts for solar fuel production

Kailin Wang, Tianqi Wang, Quazi Arif Islam, Yan Wu *
China University of Geosciences (Wuhan)



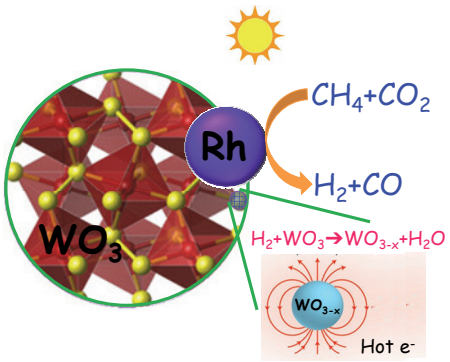
This review provides a comprehensive summary of recent advances in LDH-based photocatalysts for solar fuel production. In particular, various modification strategies for improving the photocatalytic activity of LDH have been discussed.

Communication

Chin. J. Catal., 2021, 42: 1976–1982 doi: 10.1016/S1872-2067(21)63835-4

Photo-thermal CO_2 reduction with methane on group VIII metals: *In situ* reduced WO_3 support for enhanced catalytic activity

Huimin Liu *, Xianguang Meng, Weiwei Yang, Guixia Zhao, Dehua He, Jinhua Ye *
Liaoning University of Technology, China;
National Institute for Materials Science (NIMS), Japan;
Tsinghua University, China



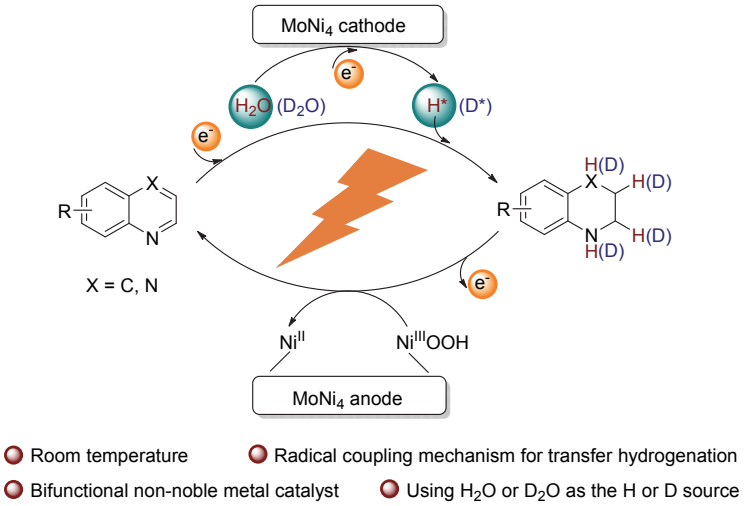
WO_3 could be reduced *in situ* to WO_{3-x} in a photo-thermal CRM reaction system, which facilitated the rate-determining step (CO_2 activation) and improved the performance of supported group VIII metal catalysts.

Articles

Chin. J. Catal., 2021, 42: 1983–1991 doi: 10.1016/S1872-2067(21)63834-2

Water-involving transfer hydrogenation and dehydrogenation of *N*-heterocycles over a bifunctional $MoNi_4$ electrode

Mengyang Li, Cuibo Liu, Yi Huang, Shuyan Han, Bin Zhang *
Tianjin University; Zhengzhou University

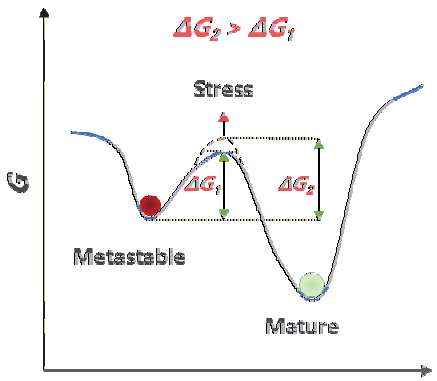


Water-involved transfer hydrogenation and dehydrogenation of *N*-heterocycles were developed by employing $MoNi_4$ as a bifunctional electrode. This method can be used to synthesize a series of functionalized hydrogenated and deuterated quinoxalines using H_2O and D_2O.

Chin. J. Catal., 2021, 42: 1992–1998 doi: 10.1016/S1872-2067(21)63822-6

Metastable-phase β-Fe_2O_3 photoanodes for solar water splitting with durability exceeding 100 h

Yang Li, Ningsi Zhang *, Changhao Liu, Yuanming Zhang, Xiaoming Xu, Wenjing Wang, Jianyong Feng[a], Zhaosheng Li *, Zhigang Zou
Nanjing University

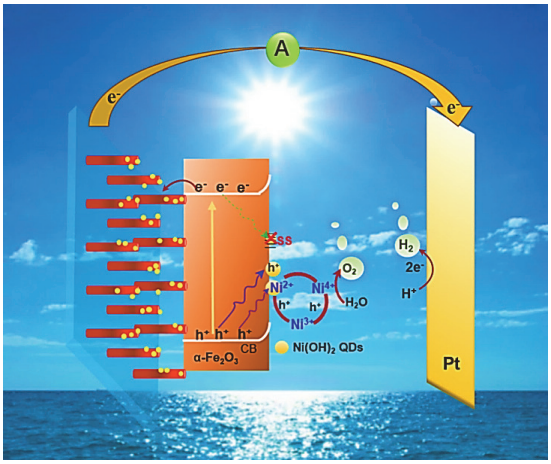


The β-Fe_2O_3 planar films prepared by spray pyrolysis exhibited better thermal stability due to the stress between film and substrate, compared to the β-Fe_2O_3 particle-assembled films. The β-Fe_2O_3 planar films showed photoelectrochemical water splitting with good durability exceeding 100 h.

Chin. J. Catal., 2021, 42: 1999–2009 doi: 10.1016/S1872-2067(21)63829-9

$Ni(OH)_2$ quantum dots as a stable cocatalyst modified α-Fe_2O_3 for enhanced photoelectrochemical water-splitting

Jiayue Rong, Zhenzhen Wang, Jiaqi Lv, Ming Fan, Ruifeng Chong*, Zhixian Chang*
Henan University

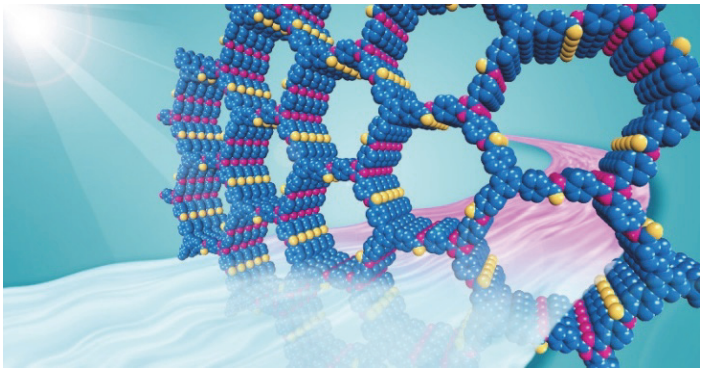


A novel $Ni(OH)_2$ quantum dot cocatalyst was deposited *in situ* on an α-Fe_2O_3 photoanode by a chelation-mediated hydrolysis method, and showed excellent photoelectrochemical performance owing to its numerous active sites for water oxidation and effective separation of electron-hole pairs.

Chin. J. Catal., 2021, 42: 2010–2019 doi: 10.1016/S1872-2067(21)63836-6

Amide-linked covalent organic frameworks as efficient heterogeneous photocatalysts in water

Si Ma, Ziping Li, Ji Jia, Zhenwei Zhang, Hong Xia, He Li *, Xiong Chen, Yanhong Xu, Xiaoming Liu *
Jilin University; Dalian Institute of Chemical Physics, Chinese Academy of Sciences; Fuzhou University; Jilin Normal University

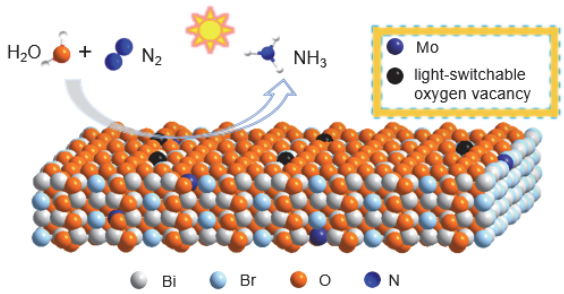


An amide-linked 2D-COF exhibits unprecedented photocatalytic performance, with excellent activity and recyclability in water, attributed to multiple synergistic effects involving the inherent porosity, large surface area, high crystallinity, good wettability and stability, as well as excellent photoelectric properties.

Chin. J. Catal., 2021, 42: 2020–2026 doi: 10.1016/S1872-2067(21)63837-8

Enhanced ambient ammonia photosynthesis by Mo-doped Bi_5O_7Br nanosheets with light-switchable oxygen vacancies

Xue Chen, Ming-Yu Qi, Yue-Hua Li, Zi-Rong Tang, Yi-Jun Xu*
Fuzhou University

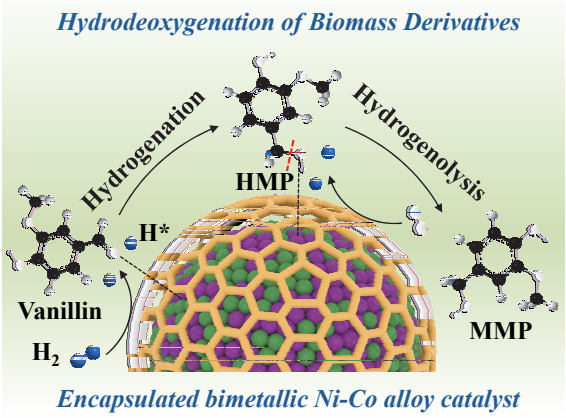


Enhanced ambient ammonia photosynthesis is achieved using Mo-doped Bi_5O_7Br nanosheets; these catalysts exhibit sufficient numbers of light-switchable oxygen vacancies serving as active sites, an optimized electronic structure, and a suitable absorption edge, resulting in enhanced N_2 fixation photoactivity.

Chin. J. Catal., 2021, 42: 2027–2037 doi: 10.1016/S1872-2067(21)63828-7

Encapsulated Ni-Co alloy nanoparticles as efficient catalyst for hydrodeoxygenation of biomass derivatives in water

Dongdong Wang, Wanbing Gong *, Jifang Zhang, Miaomiao Han *, Chun Chen, Yunxia Zhang, Guozhong Wang, Haimin Zhang, Huijun Zhao *
Hefei Institutes of Physical Science, Chinese Academy of Sciences, China; University of Science and Technology of China, China; Huzhou University, China; Griffith University, Australia

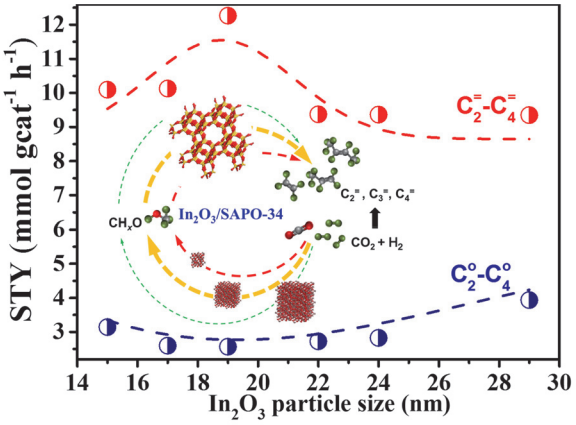


An encapsulated bimetallic Ni-Co alloying strategy is innovatively designed to enhance the hydrodeoxygenation performance of biomass derivatives to the corresponding methylated products in water.

Chin. J. Catal., 2021, 42: 2038–2048 doi: 10.1016/S1872-2067(21)63851-2

Effect of In_2O_3 particle size on CO_2 hydrogenation to lower olefins over bifunctional catalysts

Siyu Lu, Haiyan Yang, Zixuan Zhou, Liangshu Zhong, Shenggang Li *, Peng Gao *, Yuhan Sun *
Shanghai Advanced Research Institute, Chinese Academy of Sciences; University of the Chinese Academy of Sciences; ShanghaiTech University; Shanghai Institute of Clean Technology

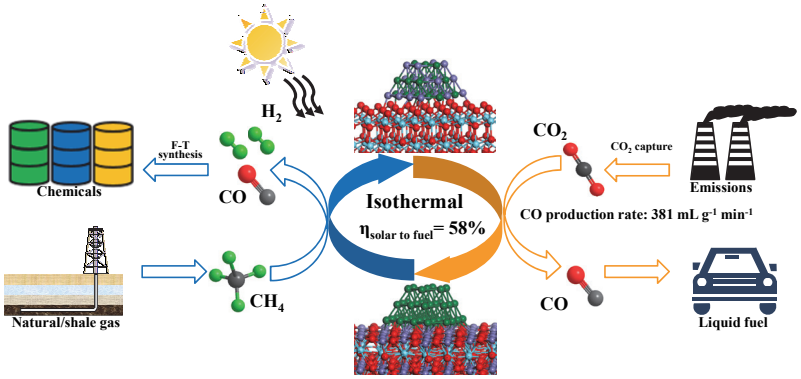


The effect of In_2O_3 particle size on CO_2 hydrogenation over In_2O_3/SAPO-34 bifunctional catalysts was studied. In_2O_3 particles with a size of 19 nm are the most beneficial for CO_2 hydrogenation to lower olefins.

Chin. J. Catal., 2021, 42: 2049–2058 doi: 10.1016/S1872-2067(21)63857-3

Intensified solar thermochemical CO_2 splitting over iron-based redox materials via perovskite-mediated dealloying-exsolution cycles

Yue Hu, Jian Wu, Yujia Han, Weibin Xu, Li Zhang, Xue Xia, Chuande Huang *, Yanyan Zhu, Ming Tian, Yang Su, Lin Li, Baolin Hou, Jian Lin, Wen Liu *, Xiaodong Wang *
Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China; Northwest University, China; Nanyang Technological University, Singpore

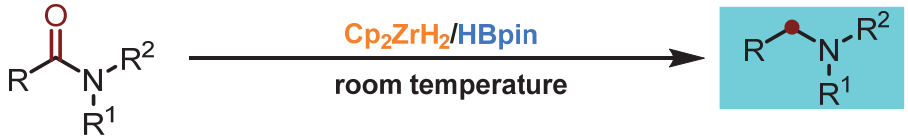


An unprecedented CO production rate of 381 mL g^{-1} min^{-1} with 99% CO_2 conversion was achieved at 850 °C over an Fe-based oxide, with a theoretical solar-to-fuel efficiency of 58% in the absence of any heat integration.

Chin. J. Catal., 2021, 42: 2059–2067 doi: 10.1016/S1872-2067(21)63853-6

Zirconium-hydride-catalyzed site-selective hydroboration of amides for the synthesis of amines: Mechanism, scope, and application

Bo Han, Jiong Zhang, Haijun Jiao *, Lipeng Wu *
Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, China; Leibniz-Institut für Katalyse, Germany; University of Chinese Academy of Sciences, China



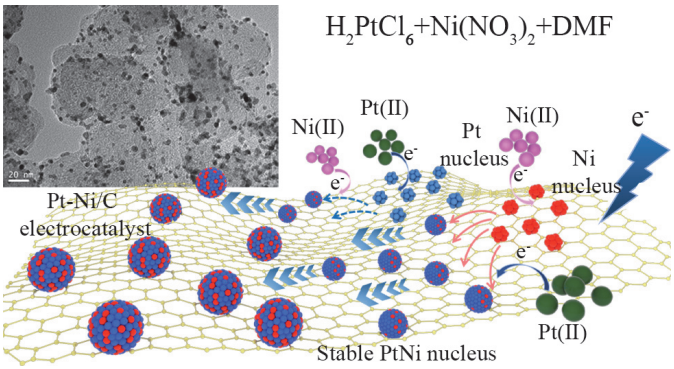
- ✓ **operando IR, NMR spectroscopy studies, DFT calculations**
- ✓ **Zr-H mediated C–N bond cleavage-reforming and then C-O cleavage**
- ✓ **Selective hydroboration of amides with tolerance of other more active functional groups**

Amine synthesis *via* amide hydroboration at room temperature catalyzed by earth-abundant-metal catalyst Zr-H is achieved. Readily reducible functional groups, such as esters, alkynes, and alkenes are well-tolerated.

Chin. J. Catal., 2021, 42: 2068–2077 doi: 10.1016/S1872-2067(21)63860-3

Electrodeposited PtNi nanoparticles towards oxygen reduction reaction: A study on nucleation and growth mechanism

Lutian Zhao, Yangge Guo, Cehuang Fu, Liuxuan Luo, Guanghua Wei, Shuiyun Shen *, Junliang Zhang *
Shanghai Jiao Tong University

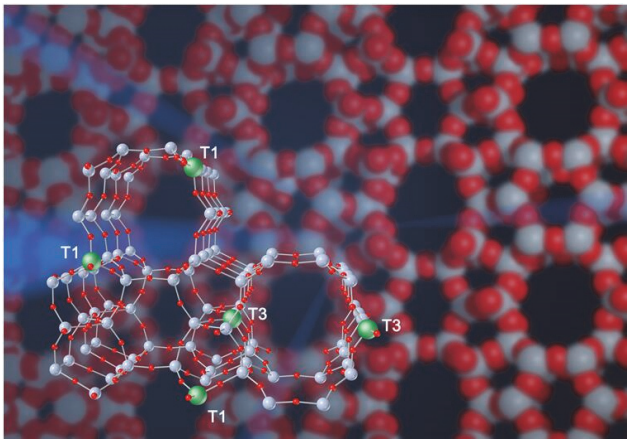


Highly monodispersed Pt-Ni/C alloy electrocatalysts were obtained through a facile electrodeposition method in *N*,*N*-dimethylformamide, which showed promising specific activity towards oxygen reduction reaction. The nucleation and growth mechanisms were explored through the comprehensive physiochemical characterizations as well as density functional theory calculations.

Chin. J. Catal., 2021, 42: 2078–2087 doi: 10.1016/S1872-2067(21)63884-6

Constrained Al sites in FER-type zeolites

Weifeng Chu, Xiaona Liu, Zhiqiang Yang, Hiroya Nakata, Xingzhi Tan, Xuebin Liu, Longya Xu, Peng Guo *, Xiujie Li *, Xiangxue Zhu *
Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China; BP (China) Dalian Office, China;
University of Chinese Academy of Sciences, China;
Kyocera Corporation, Japan



Rietveld refinements against PXRD data reveal that Al atoms of **FER**-type zeolites are constrained at T1 and/or T3 sites no matter what types of structure-directing agents or synthetic medium are utilized. This finding well explains the low activity of **FER**-type zeolites catalyst in the dimethyl ether carbonylation reaction since Brönsted acid sites in the open channels, e.g., at T1 and T3 sites, cannot act as the active centers for this reaction.

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