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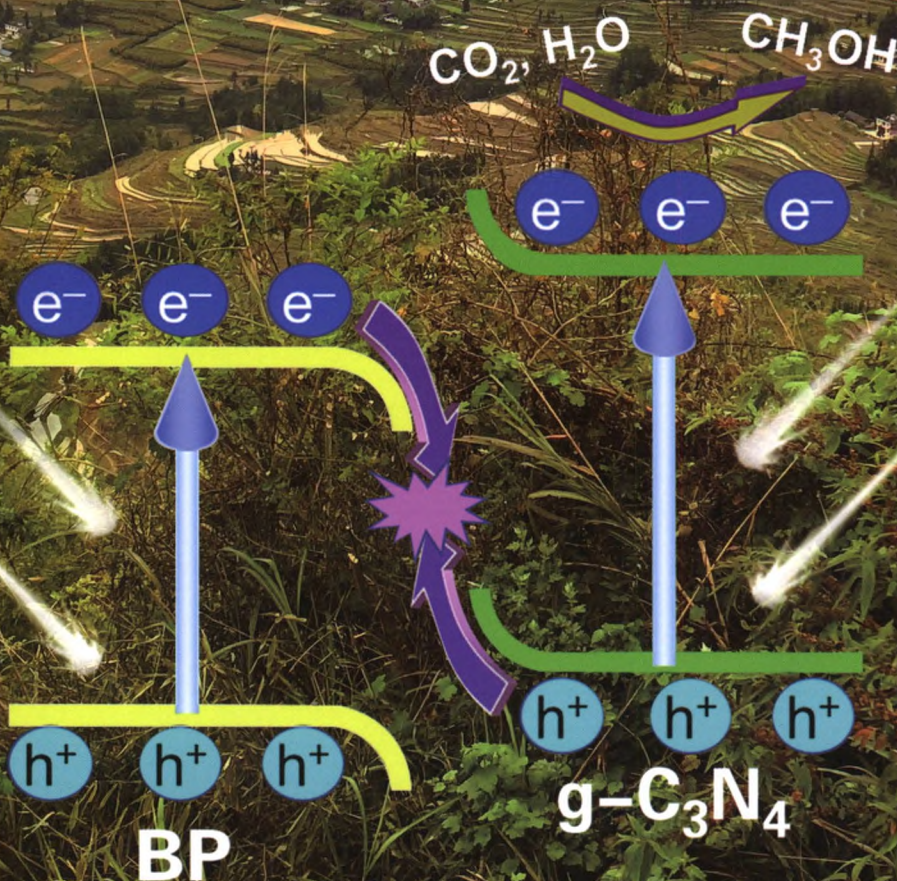
第37卷 第6期 Vol. 37 No. 6 2021

先进光催化剂设计与制备专刊

Design and Fabrication of Advanced Photocatalyst

Guest Editors: Jaguo Yu (余家国)、Wee-Jun Ong (王伟俊)

Xin Li (李鑫)、Liuyang Zhang (张留洋)



S-scheme heterojunction

中国科学技术协会主管

中国化学会、北京大学主办

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COVER



The cover image presents charge transfer pathway in S-scheme heterojunction built by BP and g-C₃N₄. In article No. 2010027, Fei *et al.* elucidate CO₂ reduction mechanism on this heterojunction by density functional theory.

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前言 PREFACE

先进光催化剂设计与制备(Design and Fabrication of Advanced Photocatalysts)

..... 余家国, 李鑫, 王伟俊, 张留洋(Jiaguo Yu, Xin Li, Wee-Jun Ong, Liuyang Zhang) (2012043)

亮点 RESEARCH HIGHLIGHT

S型异质结CO₂还原光催化剂(S-Scheme Heterojunction Photocatalyst for CO₂ Photoreduction)

..... Swelm Wageh, Ahmed A. Al-Ghamdi, 刘丽君(Swelm Wageh, Ahmed A. Al-Ghamdi, Lijun Liu) (2010024)

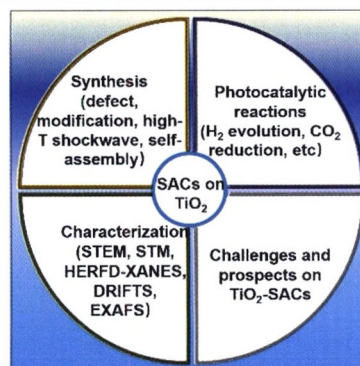
综述 REVIEW

二氧化钛负载单原子催化剂用于光催化反应的研究

周雪梅

TiO₂-Supported Single-Atom Catalysts for Photocatalytic Reactions

Xuemei Zhou



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2008064
doi: 10.3866/PKU.WHXB202008064

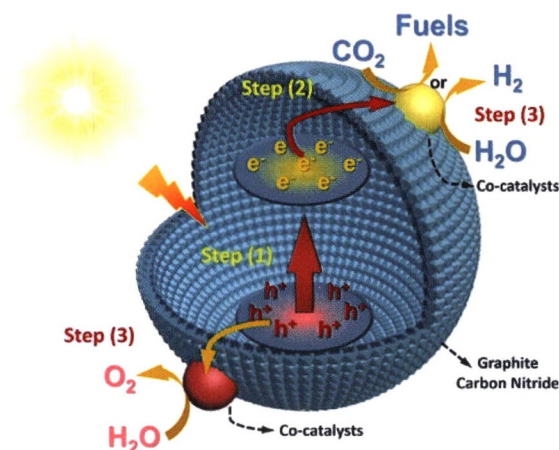
The present review summarizes the approaches for preparing TiO₂-supported SACs and the corresponding characterization methods, as well as the potential applications in photocatalysis.

g-C₃N₄ 表面改性及其光催化制 H₂ 与 CO₂ 还原研究进展

李云锋, 张敏, 周亮, 杨思佳, 武占省, 马玉花

Recent Advances in Surface-Modified g-C₃N₄-Based Photocatalysts for H₂ Production and CO₂ Reduction

Yunfeng Li, Min Zhang, Liang Zhou, Sijia Yang, Zhansheng Wu, Yuhua Ma



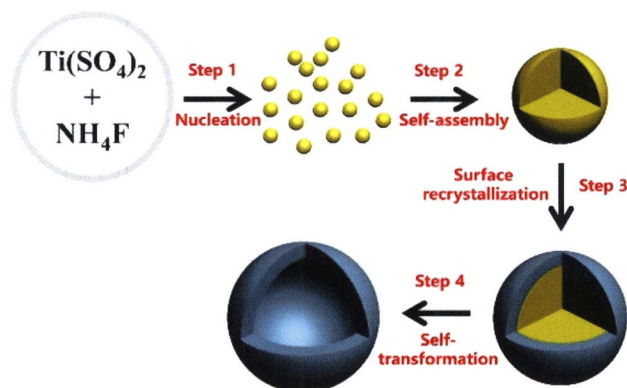
Acta Phys. -Chim. Sin. **2021**, 37 (6), 2009030

doi: 10.3866/PKU.WHXB202009030

This review provides a comprehensive summary of g-C₃N₄-based photocatalysts prepared through surface-modification strategies for photocatalytic H₂ generation and CO₂ reduction.

表面氟化 TiO₂ 空心光催化剂制备及其应用

李嘉碧, 吴熙, 刘升卫



Fluorinated TiO₂ Hollow Photocatalysts for Photocatalytic Applications

Jiabi Li, Xi Wu, Shengwei Liu

Acta Phys. -Chim. Sin. **2021**, 37 (6), 2009038

doi: 10.3866/PKU.WHXB202009038

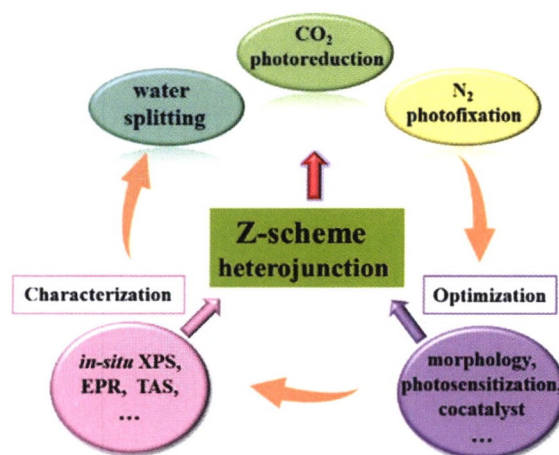
This review provides a brief summary of the recent progress regarding the fabrication and potential photocatalytic applications of fluorinated TiO₂ porous hollow microspheres.

用于光催化能量转换的 Z-型异质结的研究进展

刘东, 陈圣韬, 李仁杰, 彭天右

Review of Z-Scheme Heterojunctions for Photocatalytic Energy Conversion

Dong Liu, Shengtao Chen, Renjie Li, Tianyou Peng



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2010017

doi: 10.3866/PKU.WHXB202010017

This review summarizes the research progress, fundamental principles, performance assessment, mechanism characterization, and applications of Z-scheme heterojunctions.

氧化物钙钛矿的光催化研究进展：CO₂ 还原、水裂解、固氮

王则鉴, 洪佳佳, Sue-Faye Ng, 刘雯, 黄俊杰, 陈鹏飞, Wee-Jun Ong

Recent Progress of Perovskite Oxide in Emerging Photocatalysis Landscape: Water Splitting, CO₂ Reduction, and N₂ Fixation

Zejian Wang, Jiajia Hong, Sue-Faye Ng, Wen Liu, Junjie Huang, Pengfei Chen, Wee-Jun Ong

Acta Phys. -Chim. Sin. **2021**, 37 (6), 2011033

doi: 10.3866/PKU.WHXB202011033



This review summarizes recent progress in perovskite oxide structure and synthesis for photocatalytic CO₂ reduction, water splitting, and N₂ fixation.

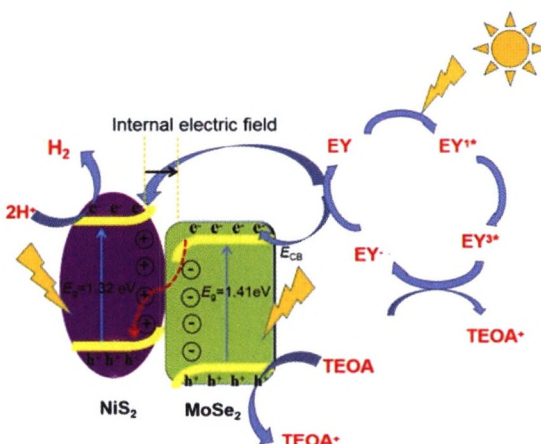
论文 ARTICLE

构建 NiS₂/MoSe₂ S 型异质结高效光催化产氢

刘阳, 郝旭强, 胡海强, 靳治良

High Efficiency Electron Transfer Realized over NiS₂/MoSe₂ S-Scheme Heterojunction in Photocatalytic Hydrogen Evolution

Yang Liu, Xuqiang Hao, Haiqiang Hu, Zhiliang Jin



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2008030

doi: 10.3866/PKU.WHXB202008030

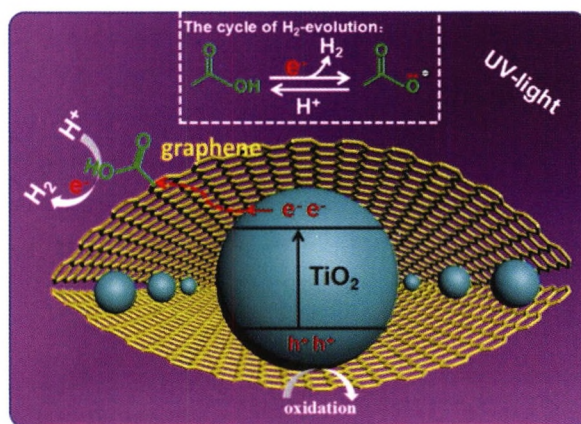
The S-scheme heterojunction was constructed by coupling NiS₂ and MoSe₂ to improve the redox capacity of the reaction system. Simultaneously, sensitization provided more transfer electrons, which promoted the photocatalytic hydrogen production efficiency.

羧基功能化石墨烯增强 TiO₂ 光催化产氢性能

王苹, 李海涛, 曹艳洁, 余火根

Carboxyl-Functionalized Graphene for Highly Efficient H₂-Evolution Activity of TiO₂ Photocatalyst

Ping Wang, Haitao Li, Yanjie Cao, Huogen Yu



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2008047

doi: 10.3866/PKU.WHXB202008047

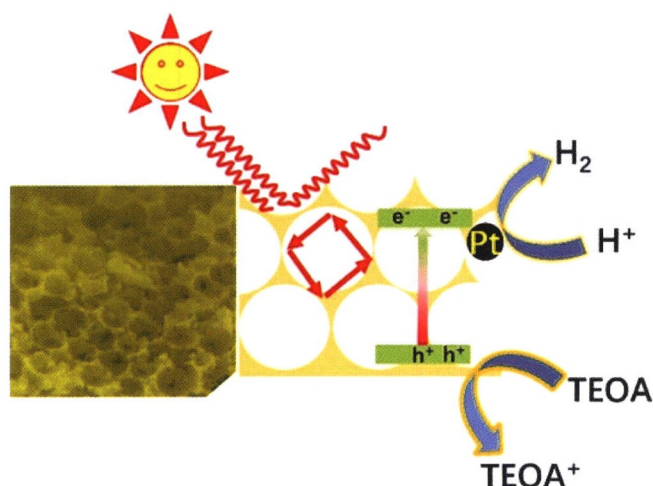
Carboxyl-functionalized graphene (rGO-COOH) as an effective H₂-evolution active site was modified on the TiO₂ surface to prepare efficient TiO₂/rGO-COOH photocatalysts.

反蛋白石结构的 $g\text{-C}_3\text{N}_4$ 可控合成及其优异的光催化产氢性能

陈一文, 李铃铃, 徐全龙, Tina Düren,
范佳杰, 马德琨

Controllable Synthesis of $g\text{-C}_3\text{N}_4$ Inverse Opal Photocatalysts for Superior Hydrogen Evolution

Yiwen Chen, Lingling Li, Quanlong Xu,
Tina Düren, Jiajie Fan, Dekun Ma



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2009080

doi: 10.3866/PKU.WHXB202009080

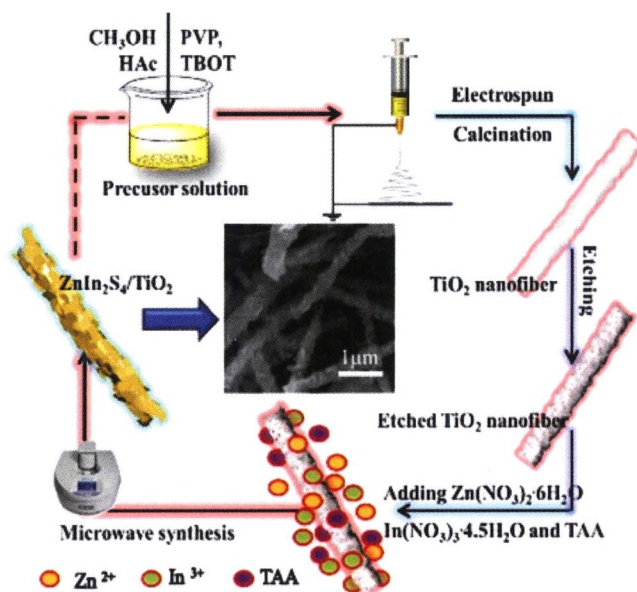
$g\text{-C}_3\text{N}_4$ with an inverse opal structure was rationally fabricated using a well-packed SiO_2 template and exhibited superior photocatalytic H_2 evolution performance.

微波辅助快速制备 2D/1D $\text{ZnIn}_2\text{S}_4/\text{TiO}_2$ S 型
异质结及其光催化制氢性能

梅子慧, 王国宏, 严素定, 王娟

Rapid Microwave-Assisted Synthesis of 2D/1D $\text{ZnIn}_2\text{S}_4/\text{TiO}_2$ S-Scheme Heterojunction for Catalyzing Photocatalytic Hydrogen Evolution

Zihui Mei, Guohong Wang, Suding Yan,
Juan Wang



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2009097

doi: 10.3866/PKU.WHXB202009097

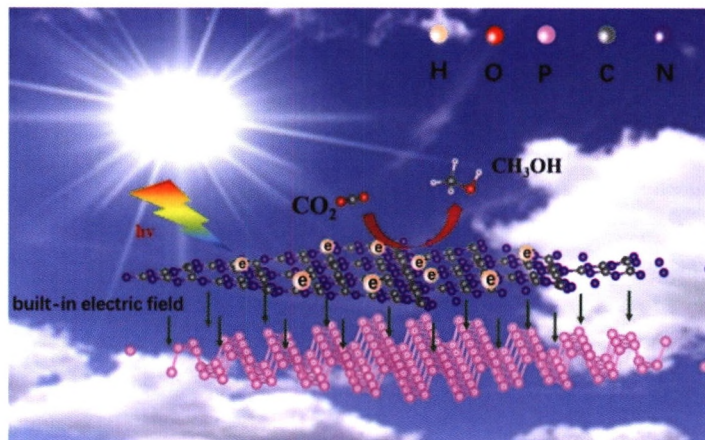
The 2D/1D $\text{ZnIn}_2\text{S}_4/\text{TiO}_2$ S-scheme heterojunction was constructed rapidly by using *in situ* 2D ZnIn_2S_4 nanosheets decorated on 1D TiO_2 NFs through a microwave (MW)-assisted process. The S-scheme heterojunction mechanism was proposed to interpret the enhanced HER activity of the $\text{ZnIn}_2\text{S}_4/\text{TiO}_2$ photocatalysts.

理论计算研究二维/二维 BP/g-C₃N₄ 异质结的
光催化 CO₂ 还原性能

费新刚, 谭海燕, 程蓓, 朱必成, 张留洋

2D/2D Black Phosphorus/g-C₃N₄ S-Scheme
Heterojunction Photocatalysts for CO₂ Reduction
Investigated using DFT Calculations

Xingang Fei, Haiyan Tan, Bei Cheng,
Bicheng Zhu, Liuyang Zhang



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2010027

doi: 10.3866/PKU.WHXB202010027

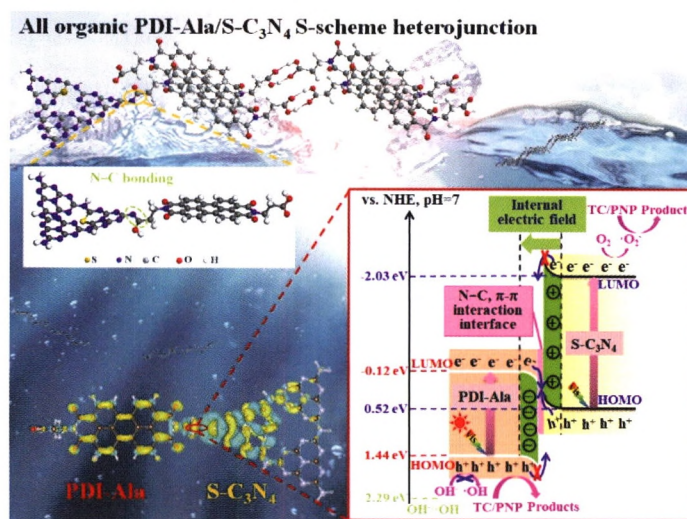
Density functional theory calculation shows that BP/g-C₃N₄ composite is an S-scheme heterojunction photocatalyst with excellent CO₂ reduction performance.

全有机 S 型异质结 PDI-Ala/S-C₃N₄ 光催化剂
增强光催化性能

李喜宝, 刘积有, 黄军同, 何朝政, 冯志军,
陈智, 万里鹰, 邓芳

All Organic S-Scheme Heterojunction PDI-Ala/
S-C₃N₄ Photocatalyst with Enhanced
Photocatalytic Performance

Xibao Li, Jiyou Liu, Juntong Huang, Chaozheng He,
Zhijun Feng, Zhi Chen, Liying Wan, Fang Deng



Acta Phys. -Chim. Sin. **2021**, 37 (6), 2010030

doi: 10.3866/PKU.WHXB202010030

The electron delocalization effect, internal electric field, and newly formed N-C chemical bond jointly promote the separation and migration of photogenerated carriers between the interface of all organic PDI-Ala/S-C₃N₄ S-scheme heterojunction.

石墨烯量子点修饰的 BiOI/PAN 柔性纤维的制备及其增强的光催化活性

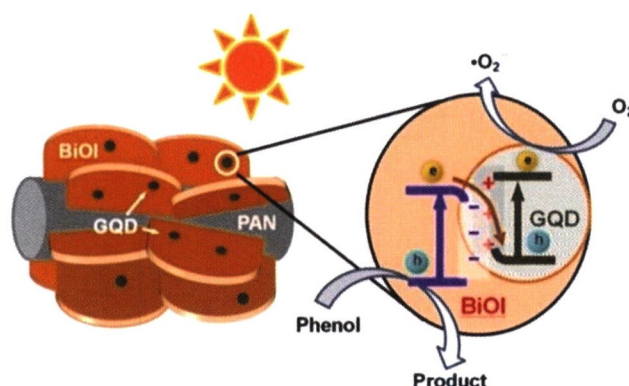
赫荣安, 陈容, 罗金花, 张世英, 许第发

Fabrication of Graphene Quantum Dots Modified BiOI/PAN Flexible Fiber with Enhanced Photocatalytic Activity

Rongan He, Rong Chen, Jinhua Luo,
Shiying Zhang, Difa Xu

Acta Phys. -Chim. Sin. **2021**, 37 (6), 2011022

doi: 10.3866/PKU.WHXB202011022



A GQD-modified BiOI/PAN fibrous composite (GQD-BiOI/PAN) was fabricated. The unique hierarchical fibrous structure of GQD-BiOI/PAN increased light absorption and surface accessibility, resulting in improved photocatalytic activity compared with BiOI. The S-scheme heterojunction between BiOI and GQDs can reserve more reductive electrons on GQDs and oxidative holes on BiOI for the photocatalytic degradation of phenol. Thus, GQD-BiOI/PAN offers largely improved photocatalytic performance.

1D $\text{Mn}_{0.2}\text{Cd}_{0.8}\text{S}$ 纳米棒/2D Ti_3C_2 纳米片肖特基异质结的构建及光催化产氢性能研究

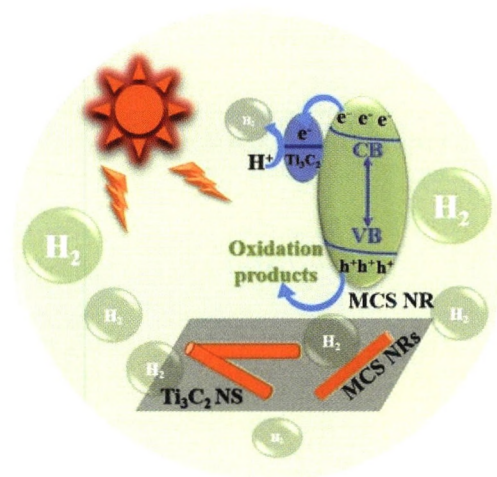
姜志民, 陈晴, 郑巧清, 沈荣晨, 张鹏, 李鑫

Constructing 1D/2D Schottky-Based Heterojunctions between $\text{Mn}_{0.2}\text{Cd}_{0.8}\text{S}$ Nanorods and Ti_3C_2 Nanosheets for Boosted Photocatalytic H_2 Evolution

Zhimin Jiang, Qing Chen, Qiaqing Zheng,
Rongchen Shen, Peng Zhang, Xin Li

Acta Phys. -Chim. Sin. **2021**, 37 (6), 2010059

doi: 10.3866/PKU.WHXB202010059



A facile method was used to synthesize the 1D/2D Schottky-based heterojunctions between $\text{Mn}_{0.2}\text{Cd}_{0.8}\text{S}$ nanorods and Ti_3C_2 nanosheets. The resulting $\text{Mn}_{0.2}\text{Cd}_{0.8}\text{S}/0.5$ MXene exhibited an improved H_2 -evolution rate, demonstrating that Ti_3C_2 nanosheets are an efficient cocatalyst for photocatalytic HER.

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