Photocatalysis

1-Covalent Organic Frameworks for Photocatalysis

By Mishra, B (Mishra, Bikash) [1] ; Alam, A (Alam, Akhtar) [1] ; Chakraborty, A (Chakraborty, Avanti) [1] ; Kumbhakar, B (Kumbhakar, Bidhan) [1] ; Ghosh, S (Ghosh, Samrat) [2] ; Pachfule, P (Pachfule, Pradip) [1] , [3] ; Thomas, A (Thomas, Arne) [4] (provided by Clarivate) **Source ADVANCED MATERIALS DOI 10.1002/adma.202413118 Early Access DEC 2024 Indexed 2024-12-18 Document Type Review; Early Access**

Abstract

The global energy crisis and environmental concerns are driving research into renewable energy and sustainable energy conversion and storage technologies. Solar energy, as an ideal sustainable resource, has significant potential to contribute to the goal of net-zero carbon emissions if effectively harnessed and converted into a reliable and storable form of energy. Photocatalysts have the potential to convert sunlight into chemical energy carriers. In this respect, covalent organic frameworks (COFs) have shown great promise due to their tunable structure on different length scales, high surface areas, and beneficial optical properties such as broad visible light absorption. This review offers a comprehensive overview of the key developments in COF-based photocatalysts for various applications, including water splitting, hydrogen peroxide generation, organic transformations, and carbon dioxide and nitrogen reduction. The underlying mechanisms, essential principles for material design, and structure-function relationships of COFs in various photocatalytic applications are discussed. The challenges faced by COF-based photocatalysts are also summarized and various strategies to enhance their performance are explained, such as improving crystallinity, regulating molecular structures, tailoring linkages, and incorporating cocatalysts. Finally, critical strategies are proposed for the utilization of photocatalytically generated chemicals into value-added products.

Keywords

Author Keywords

CO2 reductionCOFsmicroporous materialsPhotocatalysiswater splitting

Keywords Plus

HYDROGEN-PEROXIDE SYNTHESISTRIAZINE FRAMEWORKSCARBON-DIOXIDECO2 REDUCTIONWATERCATALYSISPLATFORMPHOTOSYNTHESISPERSPECTIVEPHOTOLYSIS

Photocatalysis

2-Ferroelectric perovskite $PbTiO_3$ for advanced photocatalysis

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By Zhao, S (Zhao, Shuang) [1] ; Shen, SS (Shen, Shi-Shi) [2] ; Han, L (Han, Lu) [1] ; Tian, BC (Tian, Bo-Chao) [1] ; Li, N (Li, Na) [1] ; Chen, W (Chen, Wei) [3] ; Li, XB (Li, Xi-Bao) [2] , [3] (provided by Clarivate) **Source RARE METALS Volume 43 Issue 9 Page 4038-4055 DOI 10.1007/s12598-024-02847-x Published SEP 2024 Early Access JUL 2024 Indexed 2024-07-18 Document Type Review**

Abstract

The ferroelectric semiconductor material PbTiO3 exhibits remarkable spontaneous polarization and photoelectric properties, positioning it as a promising polar photocatalyst. The internal electric field of ferroelectrics can separate photocarriers and enhance the catalytic performance of photocatalysts. Moreover, when combined with other semiconductors, PbTiO3 contributes to the construction of a depolarization field, extending the catalytic applications of PbTiO3 catalysts. PbTiO3 exhibits optical absorption, semiconductor, and piezoelectric properties. Its piezoelectric polarization field enhances charge separation, modulates band structure, surface charge conduction, and heterojunction interface charge conduction, thereby amplifying photocatalytic activity. This paper begins by examining the structure, properties, and preparation methods of PbTiO3. Subsequently, it delves into the optimization of PbTiO3's structure and performance, exploring applications in photocatalysis as a ferroelectric photocatalyst. Emphasis is placed on the detailed discussion of surface modification, heterostructure formation, and ferroelectric polarization of PbTiO3 ferroelectrics. These aspects are thoroughly explored for their role in regulating activity and optimizing the performance of photocatalysis and photopiezoelectric catalysis. In conclusion, the paper addresses the current research status of PbTiO3 ferroelectric materials and highlights the challenges that lie ahead. The intention is to provide valuable references for the ongoing research in PbTiO3 ferroelectric materials.

Keywords
Author Keywords
PbTiO3Ferroelectric polarizationPhotocatalysisPiezoelectric catalysisPolarization

Keywords Plus
CU-DOPED PBTIO3VISIBLE-LIGHTSELECTIVE DEPOSITIONOPTICAL-PROPERTIESOXYGEN VACANCIESPERFORMANCEGROWTHOXIDEDEGRADATIONCERAMICS

Photocatalysis

3-Metal-organic framework heterojunctions for photocatalysis

By Dhakshinamoorthy, A (Dhakshinamoorthy, Amarajothi) [1] , [2] ; Li, ZH (Li, Zhaohui) [3] ; Yang, SH (Yang, Sihai) [4] , [5] ; Garcia, H (Garcia, Hermenegildo) [6] **(provided by Clarivate) Source CHEMICAL SOCIETY REVIEWS Volume 53 Issue 6 Page 3002-3035 DOI 10.1039/d3cs00205e Published MAR 18 2024 Early Access FEB 2024 Indexed 2024-02-21 Document Type Review**

Abstract

Heterojunctions combining two photocatalysts of staggered conduction and valence band energy levels can increase the photocatalytic efficiency compared to their individual components. This activity enhancement is due to the minimization of undesirable charge recombination by the occurrence of carrier migration through the heterojunction interface with separated electrons and holes on the reducing and oxidizing junction component, respectively. Metal-organic frameworks (MOFs) are currently among the most researched photocatalysts due to their tunable light absorption, facile charge separation, large surface area and porosity. The present review summarizes the current state-of-the-art in MOF-based heterojunctions, providing critical comments on the construction of these heterostructures. Besides including examples showing the better performance of MOF heterojunctions for three important photocatalytic processes, such as hydrogen evolution reaction, CO2 photoreduction and dye decolorization, the focus of this review is on describing synthetic procedures to form heterojunctions with MOFs and on discussing the experimental techniques that provide evidence for the operation of charge migration between the MOF and the other component. Special attention has been paid to the design of rational MOF heterojunctions with small particle size and controlled morphology for an appropriate interfacial contact. The final section summarizes the achievements of the field and provides our views on future developments.

The present review summarizes the current state-of-the-art in MOF-based heterojunctions in three important photocatalytic processes: hydrogen evolution reaction, CO2 photoreduction and photodegradation of dyes.

Keywords

Keywords Plus

STATE Z-SCHEMEVISIBLE-LIGHTCHARGE-TRANSFERHYDROGEN EVOLUTIONARTIFICIAL PHOTOSYNTHESISZNO NANOPARTICLESH-2 EVOLUTIONWATERDEGRADATIONMOF

Photocatalysis

4-Energy transfer photocatalysis: exciting modes of reactivity

By Dutta, S (Dutta, Subhabrata) [1] ; Erchinger, JE (Erchinger, Johannes E.) [1] ; Strieth-Kalthoff, F (Strieth-Kalthoff, Felix) [1] ; Kleinmans, R (Kleinmans, Roman) [1] ; Glorius, F (Glorius, Frank) [1]
(provided by Clarivate) Source CHEMICAL SOCIETY REVIEWS Volume 53 Issue 3 Page 1068-1089 DOI 10.1039/d3cs00190c Published FEB 5 2024 Early Access JAN 2024 Indexed 2024-01-12 Document Type Review

Abstract

Excited (triplet) states offer a myriad of attractive synthetic pathways, including cycloadditions, selective homolytic bond cleavages and strain-release chemistry, isomerizations, deracemizations, or the fusion with metal catalysis. Recent years have seen enormous advantages in enabling these reactivity modes through visible-light-mediated triplet-triplet energy transfer catalysis (TTEnT). This tutorial review provides an overview of this emerging strategy for synthesizing sought-after organic motifs in a mild, selective, and sustainable manner. Building on the photophysical foundations of energy transfer, this review also discusses catalyst design, as well as the challenges and opportunities of energy transfer catalysis.Leveraging light energy to expose the 'dark' reactive states describes the whole essence of triplet-triplet energy transfer. This offers an impressive opportunity to conduct a multitude of diverse reactions and access sought-after molecular motifs.

Keywords
Keywords Plus
ENANTIOSELECTIVE 2+2 PHOTOCYCLOADDITIONTRIPLET PHOTOSENSITIZERSELECTRON-TRANSFERZ ISOMERIZATIONPHOTOREDOX CATALYSISLIGHTCYCLOADDITIONALKENESTRANSFORMATIONSDERACEMIZATION

Photocatalysis

5-Structural Motifs in Covalent Organic Frameworks for Photocatalysis

By Qin, LY (Qin, Liyang) [1] ; Ma, CD (Ma, Chengdi) [1] , [2] ; Zhang, J (Zhang, Jian) [1] , [3] ; Zhou, TH (Zhou, Tianhua) [1] , [2] , [3] (provided by Clarivate) **Source ADVANCED FUNCTIONAL MATERIALS Volume 34 Issue 41 DOI 10.1002/adfm.202401562 Published OCT 2024 Early Access MAR 2024 Indexed 2024-04-03 Document Type Review**

Abstract

Covalent organic frameworks (COFs) attract significant attention due to their ordered, crystalline, porous, metal-free, and predictable structures. These unique characteristics offer great opportunities for the diffusion and transmission of photogenerated charges during photocatalysis. Currently, a considerable number of COFs are used as metal-free organic semiconductor photocatalysts. This review aims to understand the relationships between the structure and photocatalysis performance of COFs and provides in-depth insight into the synthetic strategy to improve photocatalysis performance. Subsequently, the review focuses on the structural motif of COFs in sustainable photocatalytic hydrogen evolution, carbon dioxide reduction, hydrogen peroxide generation, and organic compound transformations. Last, in conjunction with the significant progress achieved and the challenges yet to be overcome, a candid discussion is undertaken regarding the challenges and opportunities in the field of COF photocatalysis, accompanied by the presentation of potential research avenues and future directions. This review seeks to provide readers with a comprehensive understanding of the pivotal role of COFs in the field of photocatalysis, to offer robust guidance for the innovative utilization of COFs in future sustainable photocatalysis.

Keywords
Author Keywords
CO2 reductioncovalent-organic frameworkshydrogen evolutionphotocatalysis

Keywords Plus
HYDROGEN-PEROXIDECARBON-DIOXIDECO2 REDUCTIONSELECTIVE OXIDATIONPOROUS MATERIALSRATIONAL DESIGNFUEL PRODUCTIONEFFICIENTCRYSTALLINEWATER

Photocatalysis

6- Recent advances over the doped g-C_3N_4 in photocatalysis: A review

By Khan, MA (Khan, Muhammad Asim) [1] ; Mutahir, S (Mutahir, Sadaf) [1] ; Shaheen, I (Shaheen, Imrana) [2] ; Qunhui, Y (Qunhui, Yuan) [3] ; Bououdina, M (Bououdina, Mohamed) [4] ; Humayun, M (Humayun, Muhammad) [4] (provided by Clarivate) **Source COORDINATION CHEMISTRY REVIEWS Volume 522 DOI 10.1016/j.ccr.2024.216227 Article Number 216227 Published JAN 1 2025 Early Access SEP 2024 Indexed 2024-09-30 Document Type Review**

Abstract

The fossil fuels energy sources including natural gas, petroleum and coal are the major causes of energy and environmental-related crises. To defend the earth for upcoming generations, the prioritization of renewable energy and sustainability is crucial. To cope with these issues, numerous methodologies have been extensively employed. The most efficient and secondary pollutant-free technology for energy transformation and environmental mitigation is the use of semiconductor photocatalysis. Semiconductor photocatalysts absorb sunlight and produce electron-hole pairs which participate in redox reactions to generate reactive species such as peroxides, superoxides and hydroxide radicals. These reactive species can then drive numerous chemical reactions, making semiconductor photocatalysis a valuable technique for various applications. Thus, the development of ecofriendly and cost-effective photocatalysts capable of harnessing visible light energy and contributing to environmental remediation is highly crucial. Recently, doped graphitic carbon nitride (g-C3N4) received significant interest for photocatalytic energy conversion and environmental remediation. The purpose of current review is to deliver a comprehensive overview of the up-to-date revolution in the doped g-C3N4 for various photocatalytic applications. This review mainly highlights the fundamentals, photocatalytic mechanisms, and factors affecting photocatalysis. Further, this review addresses the influence of metals and nonmetals doping on the performance of g-C3N4. Furthermore, this review emphasizes the latest advancement in the fabrication of doped g-C(3)N(4)and their utilization in water splitting, photodegradation of pollutants, decontamination of bacteria, and reduction of CO2. Finally, the challenges and future perspectives of doped g-C3N4-based materials for addressing energy and environmental issues are discussed.

Keywords
Author Keywords
PhotocatalysisFundamentalsReactions mechanismsApplicationsPhotocatalysisDoped g-C3N4FundamentalsReactions mechanismsApplications

Keywords Plus
GRAPHITIC CARBON NITRIDEVISIBLE-LIGHT-DRIVENFACILE SYNTHESIS(G-C3N4)-BASED PHOTOCATALYSTSEFFICIENT PHOTOCATALYSTSELECTIVE OXIDATIONFUEL PRODUCTIONH-2 PRODUCTIONDEGRADATIONWATER

Photocatalysis

7-Photosensitization of transition metal chalcogenide with metal nanoclusters for boosted photocatalysis

By Xie, HW (Xie, Huawei) [1] , [4] ; Zhang, JY (Zhang, Junyi) [3] ; Xiao, GC (Xiao, Guangcan) [3] ; Xiao, FX (Xiao, Fang-Xing) [2] , [3] (provided by Clarivate) **Source MOLECULAR CATALYSIS Volume 581 DOI 10.1016/j.mcat.2025.115149 Article Number 115149 Published JUN 15 2025 Early Access APR 2025 Indexed 2025-05-09 Document Type Article**

Abstract

Metal nanoclusters (NCs), characterized by the merits of unique stacking structure, quantum confinement effect, and abundant active centers, have garnered enormous attention in photocatalysis. However, inherent instability, fast carrier recombination, and complex interfacial charge transport mechanism of metal NCs remain the core challenges, thereby refraining their wide-spread applications in heterogeneous photocatalysis. In this work, tailor-made L-glutathione reduced (GSH) protected Au22(GSH)18 NCs are anchored on the transition metal chalcogenide (CdS) for constructing CdS/Au22(GSH)18 heterostructure artificial photosystems by a self-assembly approach. The CdS/Au22(GSH)18 nanocomposite exhibits the improved visible-light-driven photoactivity for reduction of aromatic nitro compounds compared with single counterpart. This is mainly attributed to the pivotal role of Au22(GSH)18 NCs as visible-light-absorbing antennas and the suitable energy level alignment between Au22(GSH)18 NCs and CdS, considerably improving the charge migration and separation efficiency and thereby enhancing the photocatalytic performances. Our investigation provides enriched information on the charge transport mechanism of metal NCs in photoredox organic transformation.

Keywords
Author Keywords
Metal nanoclustersCdSNanocompositeCharge transportSelective reduction

Keywords Plus
IMINES SYNTHESIS

Photocatalysis

8-Near-Infrared Light-Driven Photocatalysis with an Emphasis on Two-Photon Excitation: Concepts, Materials, and Applications

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By Han, C (Han, Chuang) [1] ; Kundu, BK (Kundu, Bidyut Kumar) [2] ; Liang, YJ (Liang, Yujun) [1] ; Sun, YJ (Sun, Yujie) [2] **(provided by Clarivate) Source ADVANCED MATERIALS Volume 36 Issue 5 DOI 10.1002/adma.202307759 Article Number 2307759 Published FEB 2024 Early Access NOV 2023 Indexed 2023-12-17 Document Type Review**

Abstract

Efficient utilization of sunlight in photocatalysis is widely recognized as a promising solution for addressing the growing energy demand and environmental issues resulting from fossil fuel consumption. Recently, there have been significant developments in various near-infrared (NIR) light-harvesting systems for artificial photosynthesis and photocatalytic environmental remediation. This review provides an overview of the most recent advancements in the utilization of NIR light through the creation of novel nanostructured materials and molecular photosensitizers, as well as modulating strategies to enhance the photocatalytic processes. A special focus is given to the emerging two-photon excitation NIR photocatalysis. The unique features and limitations of different systems are critically evaluated. In particular, it highlights the advantages of utilizing NIR light and two-photon excitation compared to UV-visible irradiation and one-photon excitation. Ongoing challenges and potential solutions for the future exploration of NIR light-responsive materials are also discussed.
This review article presents a comprehensive survey of the latest developments in near-infrared (NIR) light harvesting strategies, with a particular focus on the emerging field of two-photon excitation NIR photocatalysis. The emphasis is on the unique benefits offered by NIR light and two-photon excitation when compared to UV-visible irradiation and one-photon excitation.image

Keywords
Author Keywords
near-infrared lightphotocatalysisrational designtwo-photon absorption

Keywords Plus
UP-CONVERSIONRUTHENIUM COMPLEXESOPTICAL-PROPERTIESFOSSIL-FUELSABSORPTIONPLASMONDESIGNEFFICIENTSEMICONDUCTORRED

Photocatalysis

9-Novel hydrogen-bonded organic framework (HOF) for highly efficient photocatalysis: From structural designs to multifunctional applications

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By Chauhan, A (Chauhan, Akanksha) [1] ; Kumar, R (Kumar, Rohit) [1] ; Raizada, P (Raizada, Pankaj) [1] ; Thakur, S (Thakur, Sourbh) [2] ; Nguyen, VH (Nguyen, Van-Huy) [3] ; Singh, A (Singh, Archana) [4] ; Le, QV (Le, Quyet Van) [5] ; Singh, P (Singh, Pardeep) [1] ; Sudhaik, A (Sudhaik, Anita) [1] (provided by Clarivate) **Source COORDINATION CHEMISTRY REVIEWS Volume 535 DOI 10.1016/j.ccr.2025.216634 Article Number 216634 Published JUL 15 2025 Early Access MAR 2025 Indexed 2025-03-29 Document Type Review**

Abstract

Hydrogen-bonded organic frameworks (HOFs), an emerging category of porous crystalline materials, are engineered via intermolecular H-bonding between organic monomers. Distinctive features of HOFs, including ease of solution processing, high crystallinity, and facile regeneration, have sparked significant research interest, providing innovative platforms for diverse multifunctional applications. Here, we summarize the strategies to expand the stability of HOFs, such as strengthening intermolecular interactions (via integrating multiple H-bonds and creating assisted H-bonds), introducing additional intermolecular interactions (including it-it stacking and Van der Waals (VDW) interactions), interpenetration, avoiding donor/acceptor structure formation, and crosslinking. In photocatalysis, visible light absorption is crucial, so to enhance this property of HOFs, several building blocks, including pyrene, perylene, porphyrin, heptazine units, and the addition of metal, are thoroughly discussed. Furthermore, this review explored the creation of heterojunctions, such as conventional heterojunction and Z/S-scheme, as modification strategies, along with their synergistic effects on enhancing the photocatalytic performance of HOF-based materials. With the growing immense potential applications of current HOF-related research in addressing critical environmental and energy challenges, this review emphasizes advancements in dyes and antibiotics degradation, energy conversion processes such as CO2 conversion, H2 and O2 evolution, and reduction of toxic metal-ions, especially U(VI). Lastly, the forthcoming prospects and challenges related to HOFs are explored.

Keywords
Author Keywords
Hydrogen-bonded organic frameworksStructural stabilityLight enhancementStrategiesApplications

Keywords Plus
ADSORPTIONPOROSITYDEGRADATIONSEPARATIONMOLECULENETWORKSWATERDYES

Photocatalysis

10-Progress in polarization synergistic mechanism and cross-domain application of multi-field modulated piezo-photocatalysis for ferroelectric materials

By Hong, DP (Hong, Dapeng) [1] ; Zhang, JW (Zhang, Jiawei) [1] ; Li, B (Li, Bo) [1] ; Zhu, GL (Zhu, Guoliang) [1] ; Chen, GR (Chen, Guangri) [1] ; Shan, LW (Shan, Lianwei) [1] ; Xu, HY (Xu, Huanyan) [1] ; Wu, HT (Wu, Haitao) [2] ; Li, D (Li, Dan) [1] ; Dong, LM (Dong, Limin) [1] (provided by Clarivate) **Source JOURNAL OF ALLOYS AND COMPOUNDS Volume 1036 DOI 10.1016/j.jallcom.2025.181611 Article Number 181611 Published JUL 20 2025 Early Access JUN 2025 Indexed 2025-07-02 Document Type Review**

Abstract

The key to improve the photocatalytic performance of ferroelectric materials in the photo-mechanical-electrical multi-field cooperative catalytic system lies in the multi-dimensional dynamic regulation of their internal polarization states. The multi-field synergy of the spontaneous polarization field of ferroelectric materials with mechanical force, electric field and optical field significantly increases the carrier separation and transfer efficiency, exhibiting unprecedented application potential in the field of photocatalysis. However, strategies such as polarization state regulation, heterojunction engineering and defect engineering need to balance the multiphysical field synergy, lattice mismatch and defect concentration to achieve high performances. Based on these issues, this work expounds the built-in electric field regulation mechanism of the catalytic performance of ferroelectric materials by taking polarization state design as the kernel and combining the influence of phase switching and depolarization field rebalancing on the intensity, direction and spatial distribution of polarization vectors. And from the perspectives of material design such as heterojunction engineering, defect engineering and heteroatomic engineering, as well as applications in water purification, water splitting, carbon dioxide reduction, nitrogen fixation and biomedical fields, a comprehensive review is carried out, in order to provide theoretical basis and practical guidance for the development of efficient photocatalysts.

Keywords

Author Keywords

Ferroelectric materialsPolarizationPiezo-photocatalysisPhase switchingDepolarization field

Keywords Plus

OXYGEN VACANCYVISIBLE-LIGHTWATERHETEROJUNCTIONSEPARATIONNANOSHEETS

Photocatalysis

11-Perovskite Type ABO_3 Oxides in Photocatalysis, Electrocatalysis, and Solid Oxide Fuel Cells: State of the Art and Future Prospects

By Humayun, M (Humayun, Muhammad) [1] , [2] ; Li, ZS (Li, Zhishan) [3] ; Israr, M (Israr, Muhammad) [4] ; Khan, A (Khan, Abbas) [5] ; Luo, W (Luo, Wei) [1] ; Wang, CD (Wang, Chundong) [1] , [2] ; Shao, ZP (Shao, Zongping) [6] (provided by Clarivate) **Source CHEMICAL REVIEWS Volume 125 Issue 6 Page 3165-3241 DOI 10.1021/acs.chemrev.4c00553 Published MAR 12 2025 Early Access MAR 2025 Indexed 2025-03-21 Document Type Review**

Abstract

Since photocatalytic and electrocatalytic technologies are crucial for tackling the energy and environmental challenges, significant efforts have been put into exploring advanced catalysts. Among them, perovskite type ABO3 oxides show great promising catalytic activities because of their flexible physical and chemical properties. In this review, the fundamentals and recent progress in the synthesis of perovskite type ABO3 oxides are considered. We describe the mechanisms for electrocatalytic oxygen evolution reactions (OER), oxygen reduction reactions (ORR), hydrogen evolution reactions (HER), nitrogen reduction reactions (NRR), carbon dioxide reduction reactions (CO2RR), and metal-air batteries in details. Furthermore, the photocatalytic water splitting, CO2 conversion, pollutant degradation, and nitrogen fixation are reviewed as well. We also stress the applications of perovskite type ABO3 oxides in solid oxide fuel cells (SOFs). Finally, the optimization of perovskite type ABO3 oxides for applications in various fields and an outlook on the current and future challenges are depicted. The aim of this review is to present a broad overview of the recent advancements in the development of perovskite type ABO3 oxides-based catalysts and their applications in energy conversion and environmental remediation, as well as to present a roadmap for future development in these hot research areas.

Keywords

Keywords Plus

OXYGEN EVOLUTION REACTIONDOPED BIFEO3 NANOPARTICLESMICROWAVE-HYDROTHERMAL SYNTHESISELECTROCHEMICAL CO2 REDUCTIONSOLUTION COMBUSTION SYNTHESISVISIBLE-LIGHT ACTIVITIESREDUCED GRAPHENE OXIDEFLAME-SPRAY-PYROLYSISMOLTEN-SALT SYNTHESISMETAL-AIR BATTERIES

Photocatalysis

12-A review on green synthesis of silver nanoparticles (SNPs) using plant extracts: a multifaceted approach in photocatalysis, environmental remediation, and biomedicine

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By Shahzadi, S (Shahzadi, Sehar) [1] ; Fatima, S (Fatima, Sehrish) [1] ; ul Ain, Q (ul Ain, Qurat) [1] ; Shafiq, Z (Shafiq, Zunaira) [1] ; Janjua, MRSA (Janjua, Muhammad Ramzan Saeed Ashraf) [1] **(provided by larivate) Source RSC ADVANCES Volume 15 Issue 5 Page 3858-3903 DOI 10.1039/d4ra07519f Published JAN 29 2025 Indexed 2025-02-13 Document Type Review Open Peer Reviews**

Abstract

A sustainable and viable alternative for conventional chemical and physical approaches is the green production of silver nanoparticles (SNPs) using plant extracts. This review centers on the diverse applications of plant-mediated SNPs in biomedicine, environmental remediation, and photocatalysis. Ocimum sanctum (tulsi), Curcuma longa (turmeric), and Azadirachta indica (neem) and many others are plant extracts that have been used as stabilizing and reducing agents because of their extensive phytochemical profiles. The resulting SNPs have outstanding qualities, such as better photocatalytic degradation of organic dyes like methylene blue, antibacterial efficacy towards multidrug-resistant pathogens, biocompatibility for possible therapeutic applications, and regulated magnitude (10-50 nm), enhanced rigidity, and tunable surface plasmon resonance. Significant effects of plant extract type, amount, and synthesis parameters on the physical and functional characteristics of SNPs are revealed by key findings. Along with highlighting important issues and potential paths forward, this review also underlines the necessity of scalable production, thorough toxicity evaluations, and investigating the incorporation of SNPs into commercial applications. This work highlights how plant-based SNPs can be used to address global environmental and biological concerns by straddling the division between sustainable chemistry and nanotechnology.

Keywords

Keywords Plus

SURFACE-PLASMON RESONANCELEAF EXTRACTIN-VITROANTIBACTERIAL ACTIVITYGOLD NANOPARTICLESCATALYTIC-ACTIVITYANTIMICROBIAL ACTIVITYANTICANCER ACTIVITYMEDIATED SYNTHESISAQUEOUS EXTRACT

Photocatalysis

13-In situ growth of carbon quantum dots on acid/base 3D Co_2V_O4 nanoplates to regulate photocatalysis and peroxymonosulfate activation towards highly efficient degradation of ciprofloxacin

By Jiteshwaran, T (Jiteshwaran, T.) [1] ; Steffy, JP (Steffy, J. P.) [2] ; Janani, B (Janani, B.) [3] ; Syed, A (Syed, Asad) [4] ; Elgorban, AM (Elgorban, Abdallah M.) [5] ; Abid, I (Abid, Islem) [5] ; Wong, LS (Wong, Ling Shing) [6] ; Khan, SS (Khan, S. Sudheer) [2] (provided by Clarivate) **Source** JOURNAL OF WATER ROCESS ENGINEERING Volume 71 DOI 10.1016/j.jwpe.2025.107336 **Article Number** 107336 **Published** MAR 2025 **Early Access** MAR 2025 **Indexed** 2025-03-14 **Document Type** Article

Abstract

Water contamination is considered as one of the greatest threats to the aquatic and human health. In this study, we focused on the fabrication of carbon quantum dots (CQDs) deposited Co2VO4 nano-hexagon sheets for visible light driven catalysis of ciprofloxacin (CIP) surging peroxymonosulphate (PMS) activation. The prepared nanocomposite (NCs) Co2VO4 base @CQDs (CVB/CQDs) achieved an exceptionally high CIP degradation (99.4 %) in presence of PMS, as well as the prepared counterparts Co2VO4 acid @CQDs (CVA/CQDs), Co2VO4 base, and Co2VO4 acid showed an appreciable photocatalytic performance against CIP. The rate of the reaction (k) of CVB/ CQDs is 0.372 min(-1) which was 3 times greater than CVB (0.105 min(-1)) and CVA/CQDs exhibit 0.119 min(-1) which was 2.6 times greater than CVA (0.0451 min(-1)). The prepared NCs was characterized by using FE-SEM, HR-TEM, XRD, XPS, RAMAN, EIS, UV-vis DRS and PL techniques. From the scavenging and radical trapping experiments it was confirmed that the production of center dot OH and SO4 center dot- are key radicals which participated in the photocatalytic degradation of CIP. The mechanism of degradation was proposed based on the results obtained from scavenging assays and DRS. The degradation pathway was predicted based on the GC-MS results and the intermediate's toxicity was analysed using ECOSAR program. The NCs showed exceptional stability and reusability after six consecutive cycles. This current study provides a new strategy for Co2VO4 based catalysis and PMS activation as a promising candidate in water remediation and removal of contaminants from water.

Keywords
Author Keywords
CQD deposited Co2VO4 catalystPMS activationCiprofloxacinIntermediate toxicity

Keywords Plus
HYDROGEN-PRODUCTIONENHANCEMENT

Photocatalysis

14-Recent progress on S-scheme heterojunction strategy enabling polymer carbon nitrides C 3 N 4 and C 3 N 5 enhanced photocatalysis in energy conversion and environmental remediation

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By Zhang, JL (Zhang, Junlei) [1] ; Yu, GJ (Yu, Guojia) [1] ; Yang, CY (Yang, Chaoyang) [1] ; Li, SJ (Li, Shijie) [2] (provided by Clarivate) **Source CURRENT OPINION IN CHEMICAL ENGINEERING Volume 45 DOI 10.1016/j.coche.2024.101040 Article Number 101040 Published SEP 2024 Early Access JUL 2024 Indexed 2024-07-18 Document Type Review**

Abstract

Polymer carbon nitrides, such as C 3 N 4 and C 3 N 5 , have considerable promise in photocatalysis because of their unusual thermostability, nontoxicity, and high solar energy usage efficiency. The S-scheme charge transfer mechanism can strengthen the whole photoactivity of a heterojunction by facilitating effective charge separation and maximizing redox capabilities. We outline the evolution from classic C 3 N 4 to current C 3 N 5 , as well as the advanced S-scheme heterojunction technique for further photocatalysis advancement in energy conversion and environmental remediation. Furthermore, an outlook on future challenges and prospects for C 3 N 4- and C 3 N 5-based S-scheme heterojunction photocatalysts is presented.