Decolorization

1-Metal-organic framework heterojunctions for photocatalysis

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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

Decolorization

2-Bioremediation of azo dye: A review on strategies, toxicity assessment, mechanisms, bottlenecks and prospects

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Abstract

The synthetic azo dyes are widely used in the textile industries for their excellent dyeing properties. They may be classified into many classes based on their structure and application, including direct, reactive, dispersive, acidic, basic, and others. The continuous discharge of wastewater from a large number of textile industries without prior treatment poses detrimental effects on the environment and human health. Azo dyes and their degradation products are extremely poisonous for their carcinogenic, teratogenic and mutagenic nature. Moreover, exposure to synthetic azo dyes can cause genetic changes, skin inflammation, hypersensitivity responses, and skin irritations in persons, which may ultimately result in other profound issues including the deterioration of water quality. This review discusses these dyes in details along with their detrimental effects on aquatic and terrestrial flora and fauna including human beings. Azo dyes degrade the water bodies by increasing biochemical and chemical oxygen demand. Therefore, dye-containing wastewater should be effectively treated using eco-friendly and cost-effective technologies to avoid negative impact on the environment. This article extensively reviews on physical, chemical and biological treatment with their benefits and challenges. Biological-based treatment with higher hydraulic retention time (HRT) is economical, consumes less energy, produces less sludge and environmentally friendly. Whereas the physical and chemical methods with less hydraulic retention time is costly, produces large sludge, requires high dissolved oxygen and ecologically inefficient. Since, biological treatment is more advantageous over physical and chemical methods, researchers are concentrating on bioremediation for eliminating harmful azo dye pollutants from nature. This article provides a thorough analysis of the state-of-the-art biological treatment technologies with their developments and effectiveness in the removal of azo dyes. The mechanism by which genes encoding azoreductase enzymes (azoG, and azoK) enable the natural degradation of azo dyes by bacteria and convert them into less harmful compounds is also extensively examined. Therefore, this review also focuses on the use of genetically modified microorganisms and nano-technological approaches for bioremediation of azo dyes.

Keywords

Author Keywords

Azo dyesBioremediationMicroorganismsTextile dye effluentWaste water treatment

Keywords Plus

TEXTILE WASTE-WATERREACTIVE BLACK 5CONGO RED-DYEAZURE-B DYEBIOLOGICAL TREATMENTMETHYL-ORANGEBIOTRANSFORMATION ENZYMESMICROBIAL DECOLORIZATIONAEROMONAS-HYDROPHILARECENT ADVANCEMENTS