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Hydrogen Efficiency (STH); 2.4.2 Faradaic Efficiency
2.4.3 Applied-Bias-Compensated Solar-to-Hydrogen (AB-STH) Efficiency2.4.4 Hypothetical Half-Cell Solar-to-Hydrogen (HCSTH) Efficiency; 2.4.5 Quantum Yield; 2.5 Role of Photocatalyst; 2.5.1 Principle; 2.5.2 Semiconductor-Liquid Interface; 2.5.3 Z-Scheme Reaction: Innovative Approach; 2.6 Water Oxidation; 2.6.1 General; 2.6.2 Innovative Techniques: Photocatalysts in Water Oxidation; 2.6.2.1 Water Oxidation on TiO2 Surface; 2.6.2.2 Cu2O: A Visible Light Irradiation Photocatalyst; 2.6.2.3 BiVO4; 2.6.2.4 Biologically Templated Nanostructures; 2.7 Photoelectrochemical Cell; 2.7.1 Principle
2.7.2 Working of Semiconductor Photoelectrochemical Cell2.7.3 Fabrication of Semiconductor Photoelectrode; 2.7.4 Metal Oxide-Based Photoelectrochemical Cell; 2.7.5 Dye-Sensitized Photoelectrochemical Cell; 2.7.6 CuWO4-WO3 Composite Electrode in the Presence of [Fe(CN)6]3-; 2.8 Summary; References; Chapter 3: Heteropolyacid-Based Heterogeneous Photocatalysts for Environmental Application; 3.1 Introduction; 3.2 HPA-Based Heterogeneous Photocatalysts: HPA Immobilized on Different Supports Which Are Not Activated Under Irradiation; 3.2.1 HPAs Immobilized on SiO2-Based Materials
3.2.2 HPAs on Zeolites3.2.3 HPAs Immobilized on Carbon Nanotubes; 3.3 HPA Immobilized on TiO2; 3.4 HPA on ZnO, ZrO2 and Ta2O5; 3.5 HPA Supported on C3N4, CdS and BiVO4; 3.6 HPA-Based Materials with HPA Associated to Inorganic, Organic or Organometallic Moieties; 3.7 Conclusions; References; Chapter 4: Alternative Materials to TiO2; 4.1 Overview and Basic Concepts; 4.2 Simple Oxides and Derivatives; 4.2.1 d0 Oxides; 4.2.2 d10 Metal Oxides; 4.2.3 Other Transition Metal Oxides; 4.3 Perovskites; 4.4 Sulphides and Nitrides; 4.4.1 Sulphides; 4.4.2 Nitrides; 4.5 Zeolites and MOFs; 4.5.1 Zeolites
4.5.2 Metal-Organic Frameworks (MOFs)

Sommario/riassunto

The book explains the principles and fundamentals of photocatalysis and highlights the current developments and future potential of the green-chemistry-oriented applications of various inorganic, organic, and hybrid photocatalysts. The book consists of eleven chapters, including the principles and fundamentals of heterogeneous photocatalysis; the mechanisms and dynamics of surface photocatalysis; research on TiO2-based composites with unique nanostructures; the latest developments and advances in exploiting photocatalyst alternatives to TiO2; and photocatalytic materials for applications other than the traditional degradation of pollutants, such as carbon dioxide reduction, water oxidation, a complete spectrum of selective organic transformations and water splitting by photocatalytic reduction. In addition, heterogeneized polyoxometalate materials for photocatalytic purposes and the proper design of photocatalytic reactors and modeling of light are also discussed. This book appeals to a wide readership of the academic and industrial researchers and it can also be used in the classroom for undergraduate and graduate students focusing on heterogeneous photocatalysis, sustainable chemistry, energy conversion and storage, nanotechnology, chemical engineering, environmental protection, optoelectronics, sensors, and surface and interface scienc e. Juan Carlos Colmenares is a Professor at the Institute of Physical Chemistry, Polish Academy of Sciences, Poland. Yi-Jun Xu is a Professor at the State Key Laboratory of Photocatalysis on Energy and Environment, College of Chemistry, Fuzhou University, China.