What is the "Grand Challenge" of photochemical conversion of solar energy?

This Review starts with a brief description of the mechanism at the basis of the natural photosynthesis and,then,reports the results obtained so far in the field of photochemical conversion of solar energy. The "grand challenge" for chemists is to find a convenient means for artificial conversion of solar energy into fuels.

Is solar-to-chemical energy conversion a viable solution?

Nature Reviews Materials 6,168-190 (2021) Cite this article Solar-to-chemical energy conversion for the generation of high-energy chemicals is one of the most viable solutionsto the quest for sustainable energy resources.

Why do photovoltaic solar cells lose energy?

All photovoltaic solar cells transmit photons with energies below the absorption threshold(bandgap) of the absorber material,which are therefore usually lost for the purpose of solar energy conversion.

What is the process of electron and energy conversion in DSSC?

The process of electron and energy conversion in DSSC is the dynamic of photoinduced charge transfer(separation and recombination) between the semiconductor,electrolyte,and dye. The TA spectroscopic technique has been employed to detect the transient signals from charged semiconductor nanoparticles and the electronic TA of ionized molecules. 88

What are photochemical and photophysical processes in photoinduced reactions?

Here, the fundamental principles of photochemical and photophysical processes in photoinduced reactions, in which the fundamental charge carrier dynamic processes include interfacial electron transfer, singlet excitons, triplet excitons, excitons fission, and recombination, are reviewed.

Why do solar cells need UC units?

This higher energy photon is radiated back towards the solar cell, thus expanding the utilization of the solar spectrum. Key requirements for UC units are a broad absorption and high UC quantum yield under low-intensity incoherent illumination, as relevant to solar energy conversion devices, as well as long term photostability.

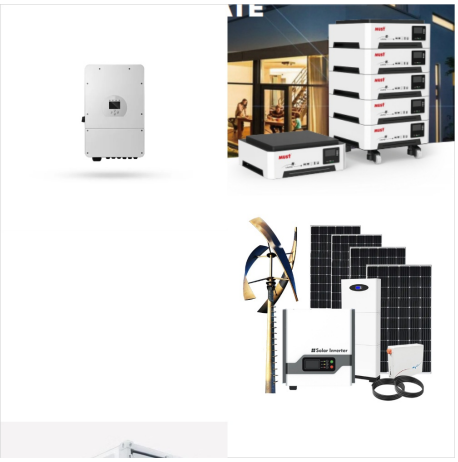
PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

The general principles and limitations of converting solar energy via photochemical reactions to electrical or chemical energy are described. Photosynthesis is concluded to be the only reliable and efficient system, suggesting that research efforts should aim at mimicking the photosynthesis process and modifying it to produce other fuel sources, such as hydrogen or ammonia, or ???

Photocatalysis and photovoltaic devices have attracted broad interests since they are promising applications for solving the energy crisis by using solar energy. 21 The mounting investigations of organic and inorganic semiconductors on the applications of solar energy conversion include transforming or storing photon energy into chemical bonds

The natural process of photochemical solar energy storage, namely, photosynthesis, is analyzed and it is found that the maximum solar energy storage efficiency of photosynthesis is 9.5 ? 0.8%. Kinetic and thermodynamic limitations on a photochemical energy storage process are identified and it is shown that the desirable production of hydrogen

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY



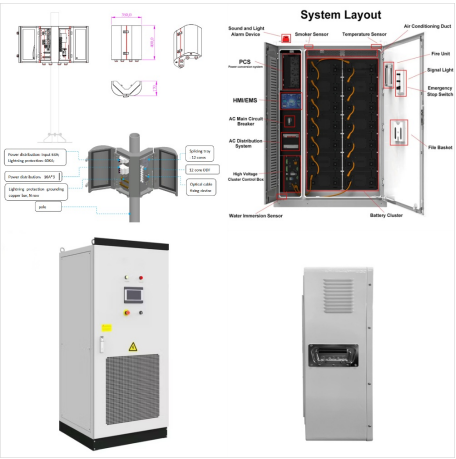
Photochemical Conversion and Storage of Solar Energy Charles Kutal University of Georgia, Athens. GA 30602 Rising prices and sporadic shortages of fossil fuels in the 1970's provided the impetus for the present worldwide effort to develop ???

Solar energy has been converted into electrical energy using an eosin???mannose system in a photogalvanic cell. The system uses solutions of sufficiently low concentration to be commercially viable. The photopotential and photocurrent generated by the system were 758.0 mV and 170.0 ? 1/4 A, respectively, while the maximum power and power point were 128.86 and ???

Photochemical conversion of solar photons is one of the most promising and sought after solutions to the current global energy problem. It combines the advantages of an abundant and widespread source of energy, the Sun, and Earth-abundant and environmentally benign materials, to produce other usable forms of energy such as electricity and fuels, without the ???

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

Photochemical isomerization of trans-azobenzene to cis-isomer, and its inverse cis-trans isomerization were investigated for the purpose of constructing a thermal energy storage system by conversion of solar light energy. Trans-cis photoisomerization of azobenzene in the cyclohexane solution proceeded with or without photosensitizers over a wide range of light in ???



Photochemical upconversion of light with photon energy below the silicon bandgap has remained elusive, but the feat has now been demonstrated using PbS semiconductor nanocrystals and violanthrone.

Photochemical conversion and storage of solar energy, in particular by valence photoisomerizations of organic molecules, has recently aroused the interest of various laboratories around the world (Jones et al., 1979; Hautala et al., 1977; Laird, 1978; Scharf et al., 1979; Lane et al., 1977). Several reviews of the subject have been presented

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

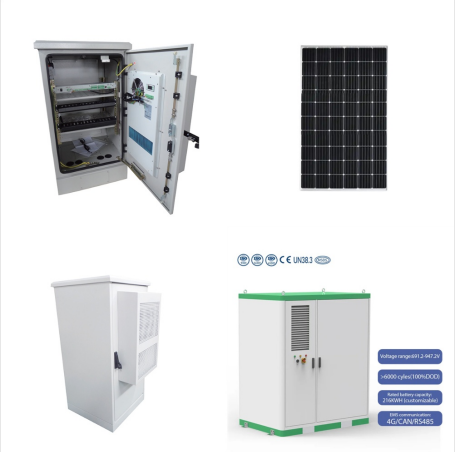
Fortunately, monitoring of the progress in the area of photochemical solar energy conversion is facilitated by the appearance of several review articles (Calvin, 1983a,b; Fox, 1983; Gratzel, 1983a; Harriman, 1983; Kutal, 1983; Gurevich and Pleskov, 1983; Zamarev and Parmon, 1983) and monographs (Claesson and Holmstrom, 1982; Gratzel, 1983b).

Upconversion by triplet???triplet annihilation (TTA) in organic chromophores has proven to fulfil the first two basic requirements, and first proof-of-concept applications in photovoltaic conversion ???

The International Conference Series on The Photochemical Conversion and Storage of Solar Energy (IPS) is surveyed from an historical perspective over all the conferences (including IPS-0) extending back to 1974. Each of nine themes is explored as it has developed (or not developed) and discussed in the context of possible applications to solar energy ???

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

The photochemical system, which utilizes only solar energy and H2O/CO2 to produce hydrogen/carbon-based fuels, is considered a promising approach to reduce CO2 emissions and achieve the goal of carbon neutrality. To date, numerous photochemical systems have been developed to obtain a viable solar-to-fuel production system with sufficient energy ???



In this article, the author considers the use of inorganic photochemical reactions for the conversion and storage of solar energy. The primary emphasis is on reactions occurring in a homogeneous solution. From the State-of-the-Art Symposium: Inorganic Photochemistry, held at the ACS meeting, Seattle, 1983.

The "grand challenge" for chemists is to find a convenient means for artificial conversion of solar energy into fuels, if chemists succeed to create an artificial photosynthetic process, as the Italian scientist Giacomo Ciamician forecast almost one hundred years ago. Energy is the most important issue of the 21st century. About 85% of our energy comes from ???

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

UNESCO ??? EOLSS SAMPLE CHAPTERS SOLAR ENERGY CONVERSION AND PHOTOENERGY SYSTEMS ??? Vol. II - Photochemical Conversion of Solar Energy - S. Malato Rodr?guez and J. Blanco G?lvez (C)Encyclopedia of Life Support Systems (EOLSS) Therefore, an overview of the principal parameters affecting the solar photon flux and

Photoelectric sensors have made remarkable research progress, while photothermal conversion-based photosensors still have a long way to go. One of the challenges is the insufficient density of photosensitive arrays and slow response speed.

Photochemical Energy Storage and Electrochemically Triggered Energy Release in the Norbornadiene???Quadricyclane System: UV Photochemistry and IR Spectroelectrochemistry in a Combined Experiment. Hybrid chromophore/template nanostructures: A customizable platform material for solar energy storage and conversion. The Journal of Chemical

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

The book collects the lectures and the status reports delivered during the "Eighth International Conference on Photochemical Conversion and Storage of Solar Energy", IPS-8, held in Palermo (Italy) from 15th to 20th of July 1990.

Fortunately, monitoring of the progress in the area of photochemical solar energy conversion is facilitated by the appearance of several review articles (Calvin, 1983a,b; Fox, 1983; Gratzel, 1983a; Harriman, 1983; Kutal, 1983; Gurevich ???

In this paper, current research results on the photochemical conversion of solar energy in aquatic environments and on soil and metal oxide surfaces are presented. Rate equations and products for selected homogeneous and heterogeneous photoreactions that occur in these systems are described. Data are presented for direct and sensitized

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

ABSTRACT: Photochemical conversion and storage of solar energy, in which the energy conversion process is initiated by the capture of photons and the subsequent energy delivery, is a sustainable way to partially cover future human energy needs. Diverse arti???cial light-harvesting techniques have been realized and applied in solar

The possibilities for the photochemical storage of solar energy are examined from the standpoint of maximum efficiency and mechanism. Loss factors are considered for a general endergonic photochemical reaction and it is concluded that a realistic maximum solar energy storage efficiency for any photochemical system is 15???16%.

Topics covered include photosynthetic quantum conversion; biomimetic systems for solar energy conversion; and photochemical electron transfer reactions in homogeneous solutions. This volume is comprised of 11 chapters and begins by describing an artificial photosynthetic system that can capture solar quanta and convert them into a stable

PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY

International Conference on Photochemical Conversion and Storage of Solar En- ergy will have contributed to the evolution of this new field. The success o thif s symposium was due to the efforts of many people.