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Photovoltaic Hydrogen Fuel Generator

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ABSTRACT
This article talks about the photovoltaic hydrogen fuel generator, and how to use photovoltaic electricity and solar energy and convert solar radiation into electricity.

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Until recently, natural gas was traditionally the main source of hydrogen production. But since 2003, its shortage has been identified as appropriate, and sources such as nuclear, wind, bio and solar energy have begun to be considered. Advances in photovoltaics over the past 25 years have doubled the conversion efficiency of crystalline silicon solar cells, nearly quadrupled the efficiency of SE using thin films, and achieved 29% of the energy conversion of incident photons into electrical energy with concentrated solar radiation—economically The basis for optimal generation of photovoltaic electricity.

The main part.

Work in this direction is traditionally carried out in two ways. It is the use of solar energy to directly photolyze water and convert the solar radiation into electricity, then use it in an electrolysis cell. Despite the fact that the cost of hydrogen obtained by methane conversion is about 3^4 times lower than water obtained by electrolysis, the combination of fuel cells with SB-based power plants is becoming increasingly attractive. At the same time, an interesting and almost essential feature is to combine the sb with an energy distribution scheme and a hydrogen production device, allowing consumers to be supplied with electricity for 24 hours, i.e. in the dark. In this system, hydrogen from excess electricity is collected in the drive, and then used to produce electricity in hydrogen electrochemical generators when needed during cloudy days and night hours. Such a hybrid system can be the basis for future autonomous electric power, because it is more suitable for direct use of energy at the production site and minimizes costs. In addition, such an installation is environmentally friendly. , the output of the heating element is distilled water, which can be recycled into potable water.

In a standard industrial electrolyzer, the use of electricity produced by the SB instead of the grid power allows the AC to be bypassed directly from the DC converter, but this requires large areas of the SB to ensure optimal performance. does. in addition, the operation of the hydrogen device directly depends on the size of the photostand, so several electrochemical cells require a load at the same time and work with large losses in such a system.

One of the ways to solve the problem of reducing the cost of primary energy and the product, that is, hydrogen, and optimizing the design is the idea of combining the SB and the electrolyzer in one working unit. At the same time, the reduction of the specific flow of SE, which can be provided by the use of CSI, is an important condition. One of the difficult problems in the design of solar photovoltaic concentrator converters is the heat transfer from the SE. For the cooling of Sb, we proposed for the first time to use a directly working body, i.e. Degradable electrolyte passing through an electrochemical cell with SB. Features of the proposed FGV design includes:

1. SB Hub is switched from SE and provides the necessary and sufficient voltage for the electrolysis process at the operating point.
2. SB is equipped with macroscopic current pickup contacts typical for SE with high current concentrator.
3. The SB is installed directly in the electrochemical cell, which is made with a front wall of transparent material for sunlight.
4. The electrochemical cell is made in the form of a closed volume systematically separated by a barrier, SB is installed in its body, the front side is turned to a transparent wall, the electrical connection of the current-dividing contacts on the front and back sides of it is in contact with the electrolyte and the above-mentioned provided with working electrodes separated by the part.
5. SB surfaces, as well as current contacts in it, are equipped with a transparent coating for chemical resistance and sunlight.
6. The electrochemical cell with the installed SB is structurally located in the center of the solar concentrator. At the same time, as can be seen from the calculations, the electric load on the SB, dressed in the form of electrolyte by KSI, can easily be provided with the optimum, that is, conditions can be created for the production of maximum power.
7. The disintegrating electrolyte flow is used directly to cool the sb. For this, the body of the electrochemical cell is equipped not only with pipes for releasing gases from the volumes formed by the compartment and, accordingly, surrounding the front and rear sides of the SB, but also with pipes for organizing the electrolyte channel through the cell. For this, holes are made in the septum, and the cell volumes separated by the septum are interconnected vessels.
8. In addition to standard, alkaline electrolytes to reduce costs, to reduce the cost of the overall system and the final product (H2), aqueous acids or alkalis formed during the surface treatment of metals and semiconductors from chemical and electronic production wastes in the organization of the electrolyte channel it is suggested to use in the form of solutions. It is possible to use livestock wastes that have been specially treated, purified from a number of organic compounds and transferred to a liquid state as the basis of electrolytes.
9. Inert the electrochemical cell to ensure that the FTGV can work in cloudy weather, with little insolation in the evening and in the morning, and to ensure that the synthesis of hydrogen is parallel to the reaction type of silicon and alkali solution in the electrolysis and chemical method. It is proposed to supply along with the electrodes. Electrolyte, as well as consumable electrodes made of silicon-containing materials. Thus, it is proposed to use electrodes made from non-renewable wastes of mono-, poly- and technical silicon, including VLPK

production wastes, specially alloyed up to the limit of solubility, with small donor or acceptor impurities, as well as with nickel and iron. Electrode until ferrosilicon inclusions form in the body.

Thus, the developed FTGV combines traditional water electrolysis processes with photolysis methods. The design scheme is selected based on the type of electrochemical photovoltaic cells, and the primary energy source is used by KSI for the first time. This allows, a priori, to reduce the consumption of expensive SE, which goes to the production of SB, in proportion to the radiation concentration, at the same time to ensure high photocurrent values in the system and, therefore, to ensure high performance of the generator. In particular, the calculated level of KSI in the FTGV model was 75.8 krat, which was 74 krat without taking into account the ideality of the shape of the center reflecting surface. The short-circuit current of the silicon solar cell manufactured on the basis of autoepitaxial structures with a diffusion p-p transition was 5.3^ 5.5 A, and ir \ U003d 2.2 V ~ 5 A at the operating point.

Based on FTGV tests, its design was further developed:

- placing sb in a separate sealed cell with a transparent wall filled with a liquid with a higher refractive index than the electrolyte;
- making a consumable silicon electrode as a whole, which made it difficult to give it a complex shape, but it was formed from the same silicon-containing materials, but in powder form;
- using not a single SE, but matrix or dial elements of the "photovoltaic" type, including an original design with transparent contact layers between discrete elements of viscosity, as a KSI SB converter.

The practical importance and feasibility of organizing small-scale production of components and its silicon components in the Central Asian region. The equipment for the production of products from silicon waste available at LKRM (P.G.T. Choyruh-Dayron) and similar materials and working with concentrated sunlight related to experience.

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