

PRINCIPLES OF OPERATION AND STRUCTURE OF SOLAR PANELS

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Анотація

В даній дослідницькій роботі описуються принципи роботи і структура сонячних панелей, а також їх ресурси та фактори, що впливають на їхню продуктивність. Робота досліджує генерацію електроенергії з сонячних панелей, підкреслюючи роль кристалічних фотоелементів, струмопровідних доріжок, захисних діодів та інших важливих компонентів. Мета роботи полягає в тому, щоб зрозуміти, як працюють сонячні батареї та їх важливість як альтернативних джерел енергії.

Ключові слова: сонячні панелі, фотоелементи, генерація електроенергії, альтернативні джерела енергії, конструктивні елементи.

Abstract

This research work focuses on the principles and structure of solar panels, as well as their resource and factors affecting their performance. The study explores the generation of electric energy from solar panels, highlighting the role of crystalline photocells, current-carrying tracks, protective diodes, and other essential components. The aim is to provide insights into how solar panels work and their importance as alternative energy sources.

Keywords: solar panels, photovoltaic cells, electric energy generation, alternative energy sources, component structure.

Introduction

Today, with the growth of electricity consumption, the question of alternative energy sources is becoming very relevant. One of these sources is solar energy, which can be converted into electrical energy with the help of solar stations.

The purpose of the work is to study how exactly solar panels work, what components they are made of, and factors affecting solar panels.

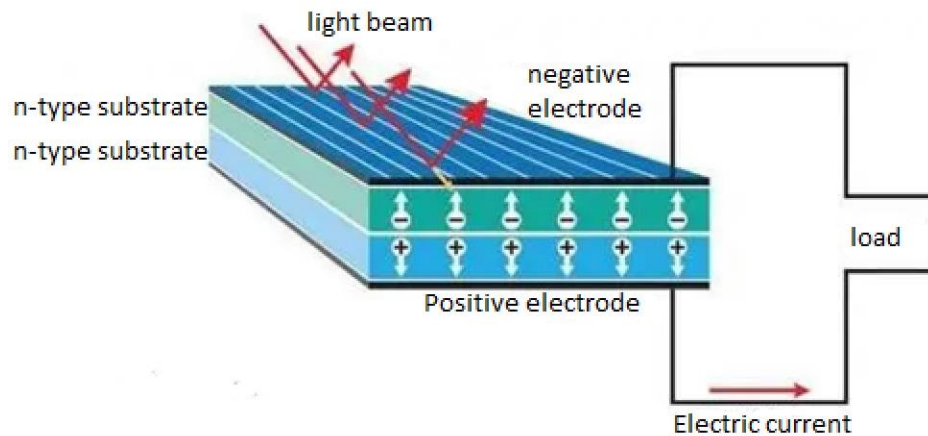
Results

As you know, the basis of the solar panel is formed by a crystalline photocell – an active part that, when the sun's rays fall on it, turns it into an electric current. This photocell is divided into monocrystal and polycrystal.

In addition to the photocell, the solar panel includes current-carrying tracks that carry the generated current from the photomodule to the junction box. This box is equipped with protective Schottky diodes that protect it from shading and overheating. The photocell, for current isolation, is laminated with a special EVA layer, which seals the panel elements, protects them from corrosion and environmental influences. Tempered glass adds strength to the structure and performs a protective function. All this is fixed by an aluminium frame designed for fastening several panels into one general structure.

The image (Figure 1) shows that sunlight can be converted into electricity, stored and used thanks to the operation of semiconductors.

If we briefly characterize this process, then it happens as follows: the sun's rays fall on the surface of the pn-layer of the conductor and knock out electrons from it. After that, these electrons with a certain charge move around the circuit, which allows powering the electrical consumer connected to this circuit.



Drawing 1 – structure of the solar element

It is believed that the ideal solar cell has close to 20% efficiency. However, in practice and according to experts, it is approximately equal to only 10%.

An important classification of quality is the permissible error of nominal power, efficiency or efficiency of operation, temperature coefficient of photocells. Therefore, manufacturers are divided into 3 classes Tier-1, Tier-2, Tier-3.

Conclusion

Solar stations are an alternative power source that uses the sun's energy. The principle of operation is based on the phenomenon of the photoeffect – an electrical phenomenon that occurs when a substance is illuminated, namely: the release of electrons from metals. Of course, the main components of a solar panel are an aluminum frame, tempered glass, an encapsulator, photomodule, distribution box and substrate.

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