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HIGH EFFICIENCY PHOTOCELLS FOR SOLAR BATTERIES

The operation of a solar photovoltaic cell is based on the photovoltaic effect, which consists in the emergence of an electromotive force at the boundary of the p-n junction under the influence of solar radiation. The main part of a classic panel consists of an interconnected closely spaced photovoltaic cells, usually made of silicon. The use of silicon is dominant in the solar energy market, with an estimated 80% share. Monocrystalline and polycrys-

talline silicon are used in the manufacturing technology of photocells. In such panels, the efficiency ratio is 15...22%.

In 2022, the Fraunhofer Institute for Solar Energy Systems developed a panel with a record 47,6% efficiency as one of the steps of its “50 percent” project. The upper tandem solar cell is made of gallium - indium phosphide (GaInP) and aluminum - gallium arsenide (AlGaAs), which were connected by company «Soitec» to the lower tandem solar cell made of arsenide - gallium - indium phosphide (GaInAsP) and gallium - indium arsenide (GaInAs). With such combination of substances, the solar panel cells are able to absorb light in a wide range from 300 to 1780 nm. This range includes both visible and infrared light. Conventional solar cells made of silicon absorb sunlight with wavelengths up to 1200 nm [1].

Using four different layers of III-V complex semiconductors deposited on a silicon panel, improving the contact of the layers and applying a 4-layer anti-reflective coating, which reduced resistance losses and reflections on the front side of the device, made it possible to obtain 47,6% efficiency. Experimentally this percentage is achieved when concentrated sunlight of 665 solar powers is directed on miniature solar batteries with an area of only a few square millimeters [1].

Thus, the development of the technology for the production of multi-layer photovoltaic cells can be considered the most promising for the development of solar batteries.

REFERENCES

1. Panel with a record efficiency of 47,6% Fraunhofer ISE article [Electronic resource]. – Access to the resource: <https://www.ise.fraunhofer.de/en/press-media/press-releases/2022/fraunhofer-ise-develops-the-worlds-most-efficient-solar-cell-with-47-comma-6-percent-efficiency.html>