# SOLAR PHOTOVOLTAIC DEVICES

**B.I.Ganiboev, Y.Mamasadikov**
Fergana Polytechnic Institute

## ABSTRACT

Solar energy has been used to heat homes since ancient Greece. The solar collector for heating water was first constructed in the 19th century. The formation of modern "solar" energy (solar energy) took place already in mid-twentieth century.

***Keywords:*** *Solar energy, photovoltaic devices, photovoltaic conversion, electrical connections, energy, generator.*

## INTRODUCTION

Solar energy technologies convert the Sun's electromagnetic radiation into usable forms of heat and electricity. Solar energy can be used in human activities including: drying, cooking, distillation/desalination, pool heating, water heating, heating, cooling and power generation[1].

Solar energy can be used through three main technologies:

• solar collectors (used to heat water or air);

• photovoltaic (PV) (PV) technologies allow converting solar radiation into electricity;

• Concentrated solar energy technology, in which solar heat is used to generate steam, through which turbines produce electricity.

The solar constant, equal to approximately 1360 W / m2 (Fig. 1), is the amount of energy that enters the upper atmosphere. When sunlight passes through the earth's atmosphere, three processes occur: solar radiation passes through the atmosphere, is scattered, or absorbed.

Solar collectors absorb sunlight for space and water heating as well as cooling. There are three main types of solar collectors:

• Solar air collectors, which heat the air for space heating in a building

• Flat plate solar collectors, which are of a conventional design and are used to heat water

• Vacuum solar collectors, which are more efficient and more expensive than flat plate solar collectors[2].

The photovoltaic effect is a process that generates voltage or electric current in a photovoltaic cell when it is exposed to sunlight. These solar cells are composed of two different types of semiconductors—a p-type and an n-type—that are joined together to create a p-n junction. By joining these two types of semiconductors, an electric field is formed in the region of the junction as electrons move to the positive p-side and holes move to the negative n-side. This field causes negatively charged particles to move in one direction and positively charged particles in the other direction. Light is composed of photons, which are simply small bundles of electromagnetic radiation or energy. When light of a suitable wavelength is incident on these cells, energy from the photon is transferred to an electron of the semiconducting material, causing it to jump to a higher energy state known as the conduction band. In their excited state in the conduction band, these electrons are free to move through the material, and it is this motion of the electron that creates an electric current in the cell[3].

To convert solar energy into electrical energy, photovoltaic technologies, which are technically performed on semiconductors, are effectively used. The smallest semiconductors that are created to produce solar energy are called "solar cells". Individual photovoltaic cells are combined into photovoltaic modules, which, in turn, can be connected to form a photovoltaic "battery". Thanks to the modularity of photovoltaic systems, it is possible to produce a gradation of FE depending on different methods of use.

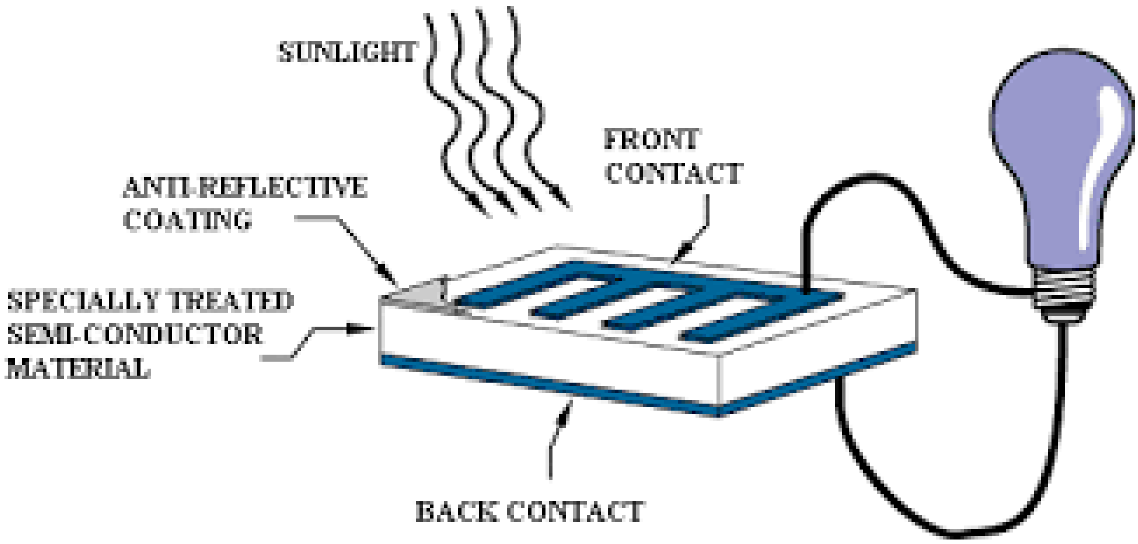


Fig. 1. The basic operation of a PV cell[4].

Autonomous and overhead FE systems have historically dominated the market[5]. More recently, integrated systems have begun to spread due to the general opinion that FE systems are well suited for construction in urban conditions. The principles of the integrated system are almost the same as the principles of photovoltaic technologies, except that the module and components of the "balance system" were made of various materials used in the construction industry.

## A NEW WAY TO CONVERT SOLAR ENERGY

Researchers at the University of Michigan have made a discovery that could forever change the technology of converting solar energy into electricity[6]. Reflecting on the fact that light has not only an electrical component, but also a magnetic one, Stephen Rand, professor of electrical engineering, physics and applied physics, together with William Fisher, a doctoral student of applied physics, turned their eyes to the magnetic nature of light.

The researchers found that light of a certain intensity passing through non-conductive materials, such as glass, although it does not lead to the appearance of electric currents in them, but creates magnetic fields that turned out to be 100 times stronger than was commonly believed. As a result, the magnetic field is strong enough to create an electromotive force (EDS).

The discovery may lead to the creation of "optical" solar cells, which will not need semiconductors to generate electricity from the energy of the sun, but will only need lenses to focus light. The advantage of this type of battery will be a low thermal load, since the lenses will heat up much less than semiconductors, and all the energy of the sun will be converted into a magnetic moment. The greater the intensity of the light incident on the "optical battery", the more electricity it will generate[7].

An additional advantage of "optical" batteries is the fact that there are quite a lot of glass factories that could produce lenses for them, and transparent solar panels could also be used, for example, as windows in houses. And, of course, the researchers claim that their batteries will cost less.

However, manufacturers of "traditional" semiconductor solar cells have nothing to worry about yet: in order to create a working "optical battery" today it is necessary that the light intensity per 1 square centimeter reaches 10 million watts. Naturally, sunlight has a much lower intensity, so at the moment work is underway to find materials that work at lower light intensity values[8] As part of this research work, the following researchers were working[10, 11, 12, 13, 14, 15].

## CONCLUSION

Solar energy opens up wide prospects for our country. It is profitable to use renewable energy sources in the republic both from a commercial and environmental point of view — solar installations can reduce carbon dioxide emissions into the atmosphere.

## REFERENCES:

1. Андреев С.В. Солнечные электростанции – М.:Наука, 2002.
2. Rehman S, Bader Maher A, Al-Moallem Said A. Cost of solar energy generated using PV panels. Renewable and Sustainable Energy Reviews 2007;11:1843–57.
3. Muneer T, Asif M, Kubie J. Generation and transmission prospects for solar electricity: UK and global markets. Energy Conversion and Management 2003;44:35–52
4. Gong, J., Li, C., & Wasielewski, M. R. (2019). Advances in solar energy conversion. *Chemical Society Reviews*, *48*(7), 1862-1864.
5. Granqvist, C. G. (2003). Solar energy materials. *Advanced Materials*, *15*(21), 1789-1803.
6. Flaksman, A. S. (2022). Development of non-traditional renewable energy sources in Russia: prospects and problems. *Вестник университета*, 67.
7. Умаралиев, Н., & Матбабаев, М. М. (2019). Установка для калибровки оптоэлектронных датчиков влажности воздуха. Научно-технический журнал, 23.
8. Умаралиев, Н., Матбобоев, М. М., & Эргашов, К. М. (2020). Лабораторная установка для изучения оптоэлектронного датчика влажности воздуха. Научно-Технический журнал Ферганского Политехнического Института, 24(2), 199-204.
9. Рахимов Рустам Хакимович, Умаралиев Нурмамат, & Джалилов Ммаматиса Латибджанович (2018). Колебания двухслойных пластин постоянной толщины. Computational nanotechnology, (2), 52-67.
10. Рахимов Рустам Хакимович, Умаралиев Нурмамат, Джалилов Ммаматиса Латибджанович, & Максудов Асад Урманович (2018). Регрессионные модели для прогнозирования землетрясений. Computational nanotechnology, (2), 40-45.
11. Kuchkarov Akmaljon Axmadaliyevich, Holov Sharifboy Ruzimatovich, Abdumuminov Abdumaruf, & Abdurakhmanov Abdujabbar (2017). Calculation of optical-geometrical characteristics of parabolic-cylindrical mirror concentrating systems. European science review, (1-2), 201-203.
12. Абдурахманов, А. А., Кучкаров, А. А., Маматкосимов, М. А., & Ахадов, Ж. З. (2014). Оптимизация оптико-геометрических характеристик зеркально-концентрирующих систем. Гелиотехника, 4, 44.

13. Зокиров Санжар Икромжон Угли, & Обиджонов Зафаржон Одилжон Угли (2021). ГИБРИДНАЯ ФОТО-ТЕРМОЭЛЕКТРИЧЕСКАЯ СИСТЕМА СЕЛЕКТИВНОГО ИЗЛУЧЕНИЯ С ЗАЩИТНЫМ БЛОКОМ. Universum: технические науки, (3-4 (84)), 12-17.
14. Мамасадиков Юсупжон, & Мамасадикова Зулфия Юсупжановна (2021). РАЗРАБОТКА ПРИНЦИПИАЛЬНОЙ СХЕМЫ ОПТОЭЛЕКТРОННОГО УСТРОЙСТВА ДЛЯ КОНТРОЛЯ КОНЦЕНТРАЦИИ УГЛЕВОДОРОДОВ В ВОЗДУХЕ. Universum: технические науки, (11-2 (92)), 42-45.
15. Mamasadikov, Y. (2022). PRINCIPAL SCHEMA OF OPTOELECTRONIC DEVICE FOR MONITORING THE CONCENTRATION HYDROCARBONS IN AIR WITH EXPONENTIAL SCAN. Scientific-technical journal, 5(1), 21-24.