PHOTOVOLTAIC EFFECTS AND THEIR EFFECTIVE USE

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Abstract: This article provides an in-depth study of the photovoltaic effect and its practical applications. The author discusses the basic principles of the photovoltaic effect, including the conversion of light into electricity, as well as its importance in renewable energy production. The article also focuses on the efficient use of photovoltaic technology, its potential to mitigate climate change and reduce dependence on non-renewable energy sources. Overall, this comprehensive and informative piece provides valuable insights into the photovoltaic effect and its role in sustainable energy solutions. With the widespread use of renewable energy, **solar energy systems, which** have become increasingly popular, have begun to be focused on how solar energy systems are produced and how solar energy is converted into electricity. In our content, you can access the information you want to learn about both this subject and the photovoltaic system in detail.

Key words: photovoltaic effect, photovoltaic batteries, photovoltaic cables, photovoltaic module, solar energy

Photovoltaics is a method of generating electricity from the sun using solar cells or solar panels. Solar cells convert the sunlight (photon) that falls on them into a direct current. It uses materials known as semiconductors such as gallium, cadmium and arsenide to conduct current [1-5]. When looking at what solar photovoltaics are, we need to look at the details of a solar energy system. Solar cells work based on the effect of creating an electrical voltage at their ends when light hits them, known as the photovoltaic phenomenon or principle. There are two different types of systems in solar energy systems. One of them is On-Grid systems. No need to save in this system. There is a direct exchange with the network. You sell the electricity you generate at the power plant directly to the grid, and if you need more, you supply the electricity you need from the grid. Here, the elimination of charging and battery costs can be considered an advantage. When asked what a photovoltaic panel is, it means a different system, but it actually means the same thing as a solar panel. Photovoltaic panels or solar panels are materials that capture solar energy and convert it into

electricity [6-10]. Panels consist of small cells. These cells are made of semiconductor materials. It can be said that silicone is preferred in their production. If you know what a solar energy system is, that means you have the answer to the question of what a photovoltaic system is. If you want to learn about what a solar energy system is and how it works, check out What is Solar Energy? You can check out our article. However, to give general information, we can say that the systems that collect several solar panels and generate energy from the sun with the help of an inverter and some electronic materials are called photovoltaic systems [11-18].

Photovoltaic batteries are batteries that allow you to store solar energy. In this way, you can use electricity even when there is no sunlight. After answering the question of what is a photovoltaic battery, we can talk about the types of batteries. Battery types can be checked within 4 different technologies. These 4 technologies are called crystal technology, thin film technology, composite technology and nanotechnology. Types of photovoltaic batteries are as follows:

1. Inorganic Batteries
2. Two Layer Inorganic Batteries
3. Single Crystal Silicon Batteries
4. Multi-Crystalline Silicon Batteries
5. Thin Film Batteries
6. Amorphous Silicon Batteries
7. Polycrystalline Thin Film Batteries
8. Thin Film Chalgonite Batteries
9. Cadmium Telluride Batteries (CdTe)
10. Copper Indium Diseleneide Batteries
11. Copper Indium Gallium Diseleneide Batteries (CIGS)
12. Flexible CIGS Batteries
13. Multi-Joint Batteries
14. Nanophotovoltaic Batteries (NanoPV)
15. Quantum Dot Batteries
16. Dye Sensitive Batteries

The process of producing a voltage or electric current within a cell by exposure to sunlight is the answer to the question of what is the photovoltaic effect. Edmond Becquerel first discovered the effect in 1839. In his experiments with wet cells, Becquerel found that the voltage in the cell increased when the silver plates were exposed to sunlight. We can explain the process as follows;

The first, the photovoltaic effect, occurs in solar cells. These solar cells use two semiconductors that are joined together to form a pn junction. (One is p-type and the other is n-type [19-22].

When these two different types of semiconductors are combined, the electrons are transferred to the positive (p) side. Holes go to the negative (n) side. In this way, an electric field is created in the connection area.

This field allows negatively charged particles to move in one direction and positively charged particles to move in another direction.

Light is made up of photons, which are small beams of electromagnetic radiation or energy. These photons can be absorbed by cells. When the right amount of light arrives, the cells transfer the energy from the photon to the electrons in the semiconductor material in the pn junction [23-25].

Thus, the electrons move to a higher energy region known as the conduction band. This leaves a gap in the valence band through which the electron can jump. This movement of the electron creates two charge carriers and a pair of electron holes as a result of the added energy.

If the electrons do not move, they hold the semiconductor material together through the bonds they form with the surrounding atoms, and no movement occurs. Electrons in the excited state in the conduction band move freely through the material. Electrons and holes move in opposite directions in the electric field generated by the pn junction. Free electrons try to go to the n side, not the p side. This movement of the electron creates an electric current in the cell [26-28].

As we mentioned earlier, when an electron moves, it leaves a space (hole) behind. It can move in the hole, but this movement is in the opposite direction.

This is the process that creates the current in the cell.

The definition above under the heading "What is a Solar Panel" is "What is a Photovoltaic Module?" It also includes the answer to the question. In other words, a structure consisting of series and/or parallel connected solar cells mounted on two plastic films is called a photovoltaic module. The glass part on the front protects the interior from mechanical damage. In thin-film solar modules, the photoactive layer is placed directly on the glass and then laser-cut into lines and connected in series. It is a building material that provides protection due to its robust structure and enables the production of electricity from solar energy. It can be said that the cost of this material, which is called building-mounted photovoltaic (BIPV) and can be applied to the roof, skylights or facades of certain buildings, is not significantly different when viewed in parallel. building materials. BIPV modules, a rapidly growing part

of solar energy systems that have recently become popular as a result of investment and awareness of renewable energy, can also be applied to older buildings. We can summarize what a photovoltaic window is. Since the principle of operation of solar systems is the same, you can find out how they produce electricity under the Photovoltaic effect or what is a system sections above. Photovoltaic thermal systems, more commonly known as solar thermal systems, use heat from sunlight. Sun rays are absorbed and concentrated through reflectors, and the fluid is heated through a heat exchanger. Water vapor is produced by the heated fluid. This water vapor is used to move turbines and generators, like the system in conventional power plants. It can be said that the definition of power plants that produce energy with water vapor heated by sunlight is the short answer to the question of what photovoltaic thermal systems are.

Photovoltaic cables are cables produced for use in the connections of photovoltaic system elements in all photovoltaic systems and solar panels. They are generally produced technically resistant to UV, ozone or weather conditions. The technical specifications of the cable are determined by the requirements of your system. Even if you have knowledge of what photovoltaic cable is, it will not be possible to have a general idea about which type to use without the necessary technical analysis, without deciding on the structural elements of your solar power system. The suitability of the cable used for the system is an important factor in terms of production efficiency.

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