ADVANTAGES OF SOLAR ENERGY AND HOW IMPORTANT IT IS FOR FUTURE ENERGY

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Annotation
We know that people are developing renewable energy by leaps and bounds. They are the ones that do not pollute the environment and allow you to get an unlimited source of energy. Among renewable energy, solar energy has been of great importance in recent decades and is becoming more and more popular all over the world. And their number has many advantages over other types of renewable sources of solar energy. In this article, we will tell you about the benefits of solar energy and how important it is for future energy.

Keywords: solar, physics, energy, heat, solar cells, photovoltaic conversion, solar mass.

Introduction

The Sun is an extraordinarily large plasma sphere composed mainly of hydrogen atoms. Our star is about 1.4 million kilometers in diameter, but compared to other stars in the universe, it turns out to be an average-sized ordinary star. The sun radiates a very, very large amount of energy to the Universe at every moment, continuously. The Sun's mass is gradually converted into energy, and the Sun gradually "loses weight." Every second, the Sun loses about 4 million tons of its mass.

Since the creation of the Earth, the Sun has provided the amount of energy needed for the formation and sustainable development of life on our planet. It may seem strange to you, but the most important source of energy for life on our planet - the secret of how the Sun itself processes and in return for producing such a huge amount of energy - is the most mind-boggling for its scholars, too, it remained a mystery until the 1920s. It was not until the 1920s, when quantum physics began to take shape, that the nature of solar energy was understood.

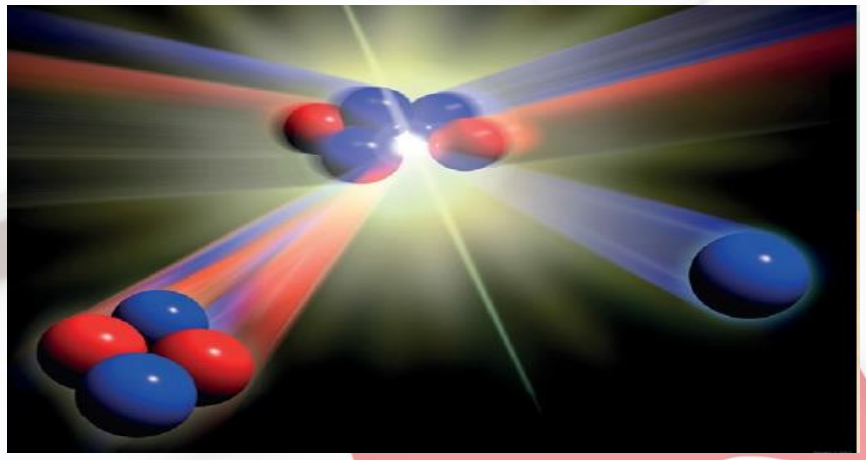
It is known from experiments conducted by Isaac Newton in the 1670s that sunlight contains the full spectrum of colors found in nature and therefore the light of sunlight appears in white. In 1800, the famous astronomer William Gershel repeated Newton's optical experiments with the spectrum of light. Gershel measured the temperature of a specific color area by placing a symbolic thermometer in the region of the color that appeared in the spectrum (symbolic thermometers had not yet been invented in Newton's time). Gershel was surprised to find that near the red area of the colors we could see in the light spectrum, but not exactly on the red, but a little farther away, the temperature would rise faster and be the highest. The implication is that the heat from the Sun (actually heat from any other source) is transmitted by infrared radiation in a range that the human eye cannot see. The term “infrared” means “away from red” and it refers to an area away from the red area in the spectrum.

According to the laws of thermodynamics, heat energy always flows from an object with a higher temperature to an object with a lower temperature. Simply put, heat always moves from a boiling body to a cold body, and never the opposite happens. Therefore, (obviously without it) the Sun is a very, very hot body. In the 1850s, the scientific community was dominated by some misconceptions about the structure of the Sun. at the time, scientists thought the sun was a sphere of boiling liquids that was very hot.

In particular, Lord Kelvin, the most advanced scientist in thermodynamics at the time, believed that the radiance of the Sun was due to the huge gravitational energy of those fluids being converted into light and heat.

By the beginning of the 20th century, Ernest Rutherford, a great physicist originally from New Zealand, had come up with a completely new, advanced scientific idea. Physicists jokingly praise Rutherford as "the godfather of nuclear physics." Rutherford hypothesized that the Sun's heat source was due to radioactive processes occurring in its depths. By the 1920s, Arthur Eddington had joined the debate. Eddington became famous for proving Einstein's theory of relativity in practice during the 1919 solar eclipse.

According to Eddington, the atoms inside the Sun are in such a complex state that their outer electrons are released from the atomic nucleus and fly rapidly to the Sun's surface to form plasma. But both Rutherford and Eddington were wrong.



Model of thermonuclear fusion process. Two hydrogen atoms collide to form a helium atom, and energy is released in the process

The Sun's vast source of thermal energy has been the extraordinary, intense, very powerful thermonuclear fusion reactions that take place continuously and uninterruptedly in the depths of the Sun. In the fusion of the sun, a violent collision of hydrogen atoms results in the formation of a helium atom and the release of large amounts of energy in the process. Hydrogen atoms are the simplest atoms in nature. A hydrogen atom consists of a positively charged proton in its nucleus and a negatively charged electron orbiting it. In the plasma of the Sun (and any star in general), the hydrogen atoms collide with each other with such force that the protons and electrons in the nucleus separate. Under normal conditions, positively charged protons are pushed away from each other. However, when hydrogen atoms collide in the depths of a star, the protons in their nuclei join together, even though the charge sign is the same. Because the collision force is so big.

In this way, the two protons combine to form a completely different chemical element, the helium atom. However, in the process of forming a helium atom from hydrogen atoms, several intermediate steps must be taken. In this process, protons combine with neutrons. Neutrons are particles that are similar in size to protons, but have no neutron charge (physicists call them "neutral charged particles"). The combination of protons with neutrons results in the formation of heavy isotopes of hydrogen - deuterium and tritium. It is from the collision of such heavy isotopes that a new chemical element, the helium atom, is formed.

A helium atom has two protons and two neutrons. So where do neutrons come from in this process? Where do neutrons come from? The fact is that when two proton nuclei collide and merge, one of them loses its charge, that is, one of the two protons turns into a neutron. A very small and unusual particle, a neutrino, flies out of the proton, which has lost its charge and is now a neutron. These particles are scattered throughout the Universe. And it is almost impossible to catch them.

Animated model of the process of thermonuclear fusion. Two hydrogen atoms collide to form a helium atom, and energy is released in the process

Helium is the lightest gas in the periodic table after hydrogen. The discovery of helium on the surface of the sun could actually shed light on many things. But for some reason, scientists before Eddington did not pay much attention to the connection between helium and hydrogen. Until Rutherford's experiments, there was not even enough knowledge about fusion. It was then that Eddington's brain came up with the idea of hydrogen-helium thermonuclear fusion. Eddington was the first to propose the idea that heat and light are released during the conversion of hydrogen in the sun to helium. But at the time, most physicists were not in favor of Eddington's idea. Because spectroscopic data showed that the Sun and stars had more metallic elements. This is because spectral analysis clearly showed the lines of metallic elements in the stellar spectrum. In 1925, U.S. astronomer Cecilia Helena Payne (1900-1979) proved that hydrogen and helium are much more abundant in metals than in stars, including the Sun. In 1939, the German physicist Hans Byote (1906-2005) described step by step all the stages of the nuclear fusion reaction in the process of helium formation from hydrogen.

The formation of helium from hydrogen and the release of tremendous amounts of energy in the process proved that the sun and stars are the main sources of energy. Only in the depths of the stars, including the Sun, does it exist in its central nucleus, with a large enough pressure for this thermonuclear fusion reaction to take place and for it to be stable and uninterrupted. The energy of this fusion formed in the nucleus did not radiate immediately. Instead, it travels in all directions through dense plasma particles along the inner layers of the Sun. It takes thousands of years for the energy generated in the nucleus to reach the convective region and pass from there to the surface of the Sun through a stream of plasma. Only then will the energy of the Sun's thermonuclear fusion spread throughout the Universe in the form of heat and light rays. And in 8 minutes it will reach the Earth.

To know the benefits of solar energy, we need to know what it is and what types of solar energy are available. Knowing first what is a renewable energy source obtained from the sun

and can produce heat and electricity for any use. Although it is a sustainable resource, it should be noted that it not only lacks its shortcomings, but also affects its scale and use.

It is caused by light, heat, or ultraviolet radiation that comes directly from the sun to our planet. There are different types of solar energy depending on what it is.

As the name suggests, it is a type of renewable and clean energy that consists of using solar energy to generate electricity. In photovoltaic energy, unlike solar panels, which are used to generate electricity from light photons in solar radiation, this energy uses this radiation to heat the liquid.

When sunlight hits a liquid, it heats it up and this hot liquid can be used for a variety of purposes. To get a good idea, a hospital, hotel or house has to use hot water for 20% of its energy consumption. With the help of solar heat energy, we can heat water with solar energy and use it, so we don't have to use fossil or other energy in this energy field.

Solar thermal energy contributes significantly to cost reduction, resulting in energy savings and a reduction in CO2 emissions leading to global warming and climate change.

Photothermal energy.

It uses heat because of solar collectors that receive sunlight and transfer it to the working fluid. It is used to heat buildings and water, move turbines, dry grain, or dispose of waste.

Photovoltaic solar energy.

To generate photovoltaic energy, it is necessary to take photons of light that sunlight contains and convert it into electricity for use. This can be achieved through the use of a photovoltaic conversion process solar panel.

A solar cell is a photovoltaic cell with a solvent. It is a semiconductor material (e.g. made of silicon) that does not require moving parts, fuel, or noise.

When this photoelectric cell is constantly exposed to light, it absorbs the energy contained in the light photons and helps to generate energy by moving the electrons trapped in the internal electric field. When this happens, the electrons accumulated on the surface of the photoelectric cell form a constant electric current.

Advantages of solar energy.

As we learn about the different types of solar energy, we will look at what are the advantages of using this type of energy:

• This absolutely clean energy helps to significantly reduce the carbon footprint. Due to its use, we avoid the formation of greenhouse gases and do not pollute it during production or use. There are only minor harmful substances in the creation of solar panels.

• It is a renewable and sustainable energy source over time.

• Unlike other renewable energies, this energy can heat things up.

• It does not require any kind of continuous extraction of materials for its operation. This makes it much cheaper energy, making it easier to recover its initial investment over the years. True, one of the main problems it has faced since the advent of renewable energy was its initial investment and its level of profitability, although this is no longer the case due to the development of technology. Solar panels can have an excellent 40-year lifespan.

• There is a lot of sunlight and it is available so using solar panels is a suitable option. Almost any geographical point on the planet can use solar energy. It should be noted that one of the biggest advantages of solar energy is that it does not require wires. This helps to install such wires in places where they are difficult to install.

• Another advantage of solar energy is that it reduces the need to use fossil fuels so it helps to save natural resources and reduce environmental pollution.

- Just as solar has some advantages, we also have disadvantages. Let's see what they are:
- There is a relatively low efficiency when converting solar energy into electricity. This efficiency is around 25%. Technological development is aimed at increasing this efficiency.
- Although this may be an obstacle in the long run, the initial cost is high and it is not open to everyone.
- Installation space is needed to be able to generate more electricity. It should be noted that solar panels are more difficult to install given the lack of space if more energy is needed.
- It is a type of non-constant energy. It changes during the day and is not available at night. It fluctuates throughout the day due to the sunlight it receives.

- The performance of the panels decreases under certain atmospheric conditions during prolonged heat and humidity or with clouds and fog.
- Pollution is also a problem for solar energy. And in cities with high levels of air pollution, the figure is much lower.
- The production of solar panels emits large amounts of greenhouse gases and toxic waste. This is a drawback that can be eliminated during later use as it helps to significantly reduce the carbon footprint.

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