

## **Plastic Solar Cell for Solar Energy Conversion and Storage**

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### **ABSTRACT**

Nanotechnology is the network of sciences and an engineering of minute machines which is an ability that is projected to build up the things from the scratch or the lowest level by the use of different techniques and tools and these tools and techniques are developed to construct complete and highly advanced products. In this process anything which is smaller than hundred nano meters and have the new properties are included. The demand of “everlasting” and “eco friendly” resources is increasing every day because of the reason that the pool of available resources is draining day by day. Solar energy is an example of this kind whose arrival is there to solve all the issues. The energy from the sun (Solar energy) itself is very valuable but the traditional “solar cells” that were initially there to collect and control the solar energy are not efficient. These solar cells are not able to function in proper manner in the days when it is cloudy. An opportunity is created by nanotechnology which is used in the “solar cells” to solve this issue where the nanotechnology increases the efficiency of the solar cells. The present paper is dealing with the results and outcomes of the advancements in the field of “nanotechnology” along with its execution in the “solar cells.” The paper also focuses on the advantages and benefits of use of nanotechnology in the solar cells over the traditional commercial solar cells.

**Keywords:** Photovoltaic cells, LED

### **INTRODUCTION**

The search of “Nanotechnology” includes a broad range of disciplines such as “Chemistry,” “Physics,” “Mechanical Engineering,” “Material Science,” “Molecular Biology,” and “Computer Science.” So as to trim the incorporated circuits properly in today’s century it is possible that the latest designs for the devices can replace the nano scales or the designs of nano electronic devices that take the advantages of “Quantum Mechanical Effects” that dominates on the smallest “nanometer scale”.

Usually, “nanotechnology” is said to be a “General Purpose Technology” because nanotechnology will have a noteworthy impact on majority of industry and on nearly all the sectors of the society in its matured form. The technology offers an improved built up, life long, much clean, more safe and smart household products and can be used for “ammunition,” “medicines,” and “industries” for longer period of time. The properties of nanotechnology are used to make the solar cells. Solar energy is a rich source which can be renewed and is free of pollution and has huge range of applications from small items of household, calculators, two wheelers, cars and many more. The solar cells are used to convert the solar energy into any other form of required energy.

## **WORKING OF CONVENTIONAL SOLAR CELL**

The Photo voltaic (PV) cells that are conventional type of solar cells are basically made up of semi conductor (Silicon) which is a special material and is usually used these days. Fundamentally, a certain amount of light is absorbed in the material of semi conductor when it strikes the solar cell and this shows that the “energy of the light” which is absorbed is passed to the semi conductor. The loosed electrons are knocked by the energy that allows them to flow freely. There is more than one electric field in Photo Voltaic Cells that forces the electrons that are unchained by the process of absorption of light to move in a particular path. This electron flow is a kind of current that can be drawn for some external purpose (to power a calculator) by putting a piece of metal on the top and the base of the Photo Voltaic Cell. This combination of current and the voltage of the cells (product of integral “electric field” or “fields”) define the “power” or “wattage” that is produced by the “solar cells.” The traditional or typical semi conductor solar cells are made up of poly crystalline silicon and the efficient solar cells are made up of gallium arsenide.

It is seen that only thirty percent of entire sun energy can be used in sensible manner by this type of solar cells and since it does not favors on the cloudy day which is a major drawback and leading to the consideration of development of a novel kind of “solar cell” by the use of nanotechnology. The process is same as earlier but in there is a difference in the absorption of wave length of light from the sun.

**Developments in this field are discussed below:**

## **PLASTIC SOLAR CELL**

Plastic solar cell is invented by the scientists and it is capable of converting the power of the sun into electrical energy on the cloudy days also. The “plastic solar cells” are not new but the material that is present today is not able to collect and convert the visible light of the sun when the half part of the power of the sun fall in the spectrum which is visible and the other part fall in the “infrared spectrum.” The plastic compound that is used as a new material has the ability of harnessing the portion that fall in the infrared region. It is the fact that the heat is emitted by all the warm bodies and the heat is also emitted by the humans and the animals also even when there is dark. The plastic material takes the help of nanotechnology and includes the first generation “solar cells” that has the ability of harnessing the invisible infrared rays of the sun. It is expected that this new invention of “plastic solar cell” will work more efficiently in the future as compared to the “solar cell” of today. The specially designed nano particles that are known as “quantum dots” are combined by the researchers with a polymer so as to create a plastic that has the ability to detect the energy in the infrared region also. In future, the advancements in the “plastic solar cell” will be able to harness up to thirty percent of the radiant energy of the sun which is only sic percent at present. The solar farms are able to harness a huge amount of sun energy that can be used to fulfill all our requirements of the energy. It has the potential to replace

the other sources that produce electrical energy by which coal is produced which is a green house gas.

The solar energy that reaches to the earth is hundred times more than our consumption. If one percent of the earth is covered by the solar farms then it is possible to substitute all the energy practices with the power source which is clean and can be renewed. The efficiency of current standard commercial photo voltaic cell, which is considered to be the best “solar cell”, is attained by the first basic “solar cell” and these are semi conductor protectors that has the of converting thirty percent of the sun energy to the electrical energy.

### **WORKING OF PLASTIC SOLAR CELL**

In reality, the “solar cell” is a fusion of very small nano rods that is dispersed in an “organic polymer” or “plastic”. At present, nearly seven volts can be produced by sandwiching a layer of polymer of only two hundred nanometer thickness between the electrodes. If the layers of electrode and the layers of polymer or nano rods are used as separately as the coats it can make the process of production easy. The “plastic solar cell” can be made by a solution taken in a container and the clean room and vacuum chamber is also not required as in case of photo voltaic device which is based on the semi conductors.

The benefits of latest advancements in nanotechnology are taken by the technologies particularly in the production of nano crystal and nano rod. These chemical clusters comprised of 100 to 100000 atoms that have extraordinary dimension and size and also have attractive features which are ruled by the “quantum mechanics” like the absorption of different colors of light that depends on their size. Nano rods were made up of dependable size of “cadmium selenide” which is material with semi conducting properties in a container to form the rods that has the width of seven nano meters for the absorption of maximum amount of sunlight and length of about sixty nano meters. These rods are them fused with a plastic semi conductor known as “p3ht- poly (3 hexythiophene)”. An electrode which is transparent is the layered with this combination. The two hundred nano meter thickness is a 1000<sup>th</sup> the thickness of the women’s hair is a factor of ten less than the micron thickness of the semi conductor “solar cells.” The device is completed by an electrode which is present at the back and coated by the aluminum. The nono rod works as the wires that absorbs the light of a particular wave length and generates an electron. An electron hole is a place in the crystal that flows all over such as an electron. The electron flows all over the rod’s length till aluminum electrode collects it and this hole is transferred to the plastic and is called “hole carrier” and is communicated to the electrode by creating a current.

### **IMPROVEMENTS**

There are certain genuine improvements which includes compilation and absorption of better light which is there in the commercial “solar cells”. Important improvement can be done in the mixture of plastic nano rod in which they can be packed closely and at right angles to the “electrodes” by the help of small amount of polymer or no polymer. In the first generation of

“solar cells”, the nano rod may transfers the “electrons” directly to the “electrode”. Them nano rods when get jumble with the polymer leads to the loss of current through the recombination of “electron hole” and this lowers the effectiveness. The nano rods are tuned for absorbing different colors from the spectrum of sun light and eventually the “solar cell” becomes three layered. EA is made up nano rod that absorbs different wave length.

## **APPLICATIONS**

1. There are some nano scale characteristic features possessed by silicon which is being used to develop a solar panel poster which is very thin and can be easily disposed; this silicon can be used by the residents of rural areas as a substitute for power source on the lower cost. The people that live in the remote areas are not able to get the facilities from “National Electricity Grid” and make use of batteries and generator for their electricity needs had a requirement of solar panels and this can be made by stacking six to ten sheets together and create a poster. This poster can be used by mounting behind the window or attaching to a cabinet to fulfill the needs of power supply.
2. Portable electricity can be made by spraying the paint like compound on any other material.
3. The phones or any other device that do not have wire can be powered by any chip if it is coated in the material.
4. A car that is powered by the hydrogen and is painted with the film has the potential of converting energy in to electrical energy and this energy can keep on charging the batteries of the car.
5. The solar farm that has plastic material can be set in the deserts for the generation of clear energy and this has the potential to fulfill the power requirements of entire planet.

## **4. ADVANTAGES**

There is a wide use of “plastic solar cells” in the time ahead as it has so many benefits like:

1. As compared to traditional “solar cell” these are 30 percent more capable and effective.
2. There applications are more effective and practical.
3. The “plastic solar cells” are very compressed as compared to traditional “solar cells” which are very large.
4. The traditional “solar cells” are used in big budgeted huge applications whereas “plastic solar cells” are more practicable and has wide range of uses.
5. The “solar cells” that has flexible rollers have the capability of converting solar energy into a continuous source of energy which is green and clean.

## **5. LIMITATIONS**

1. The major issue is the cost efficiency but it is changeable with the use of any other material. This issues is solved by the scientists as they have got the solution of making “plastic solar cells” and flexible to such an extent that can be painted on any surface. This will have the potential to offer electricity for electronics that are wearing and devices that requires low power.
2. When exposed to sun light for longer time it shows short life span.
3. High maintenance and continuous monitoring is required.

## **6. CONCLUSION**

The radiations of infrared that comes from sun rays are exploited by the help of “plastic solar cells”. In comparison to traditional “solar cells” these are more efficient. The most important benefit is that it works in cloudy day; these are more compact as compared to conventional one. It has one drawback of cost effectiveness and this has to solve in the upcoming time.

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