

“INFRARED PLASTIC SOLAR CELL”

Dr. Gaurav Srivastava

Assistant Professor

Poornima college of engineering, Jaipur

Dr. Gaurav Srivastava -- “Infrared Plastic Solar Cell” -- Palarch’s Journal Of Archaeology Of Egypt/Egyptology 18(4). ISSN 1567-214x –

Keywords:-Si,Bulk hetro junction,Fill Factor,Short circuit Current

ABSTRACT

Everything which is smaller than 100 nanometers are consider in Nanotechnology with novel properties. Now a days, the demands for such resources which are eco-friendly are increasing because the available energy resources are diminishing day by day. So, Nanotechnology can provide best and everlasting energy resources.

Solar Energy is the most useful and efficient form of such energy. As such solar energy is very useful. But on cloudy days, the conventional cells for solar energy conversion from solar to electrical become difficult and less efficient. These cells are not much useful for large applications To overcome these kind of problems and to increase the efficiency of the solar cells, Nano technology gives a great opportunity as it reduces the drawbacks of conventional cells. Nanotechnology is the most efficient method to form plastic cells with greater efficiency.

On nanometer scale, nanotechnology is a very much in use in lots of latest devices with new designs. These nano devices reduced the use of other kind of devices and this latest technology is used in latest designed electric devices to reduce the complicated integrated circuits in this present century. Now a days, Nano technology is used in approximately each and every society or areas. Nanotechnology also plays a important role in almost every industries. It offers better construct, safer, longer lasting and smarter products for the industries, for medicine, for home and for ammunition for ages. Such Nanotechnology properties are used in forming the solar cells. Sun is giving energy to universe and in future it will do the same for further millions of years. All researchers and scientists are working to grab this unlimited and continuous energy and focusing on utilizing it efficiently as well. From the last 100 years, we are using fossil fuels continuously on large-scale and we can't deny that fossil fuels are limited and will be no more available after 50years.

Keywords:-Si,Bulk hetro junction,Fill Factor,Short circuit Current.

INTRODUCTION

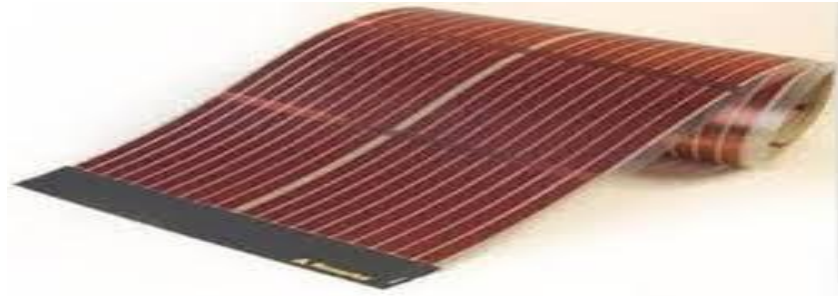
A **photovoltaic cell (Solar Cell)** is a device that works on the principle of Photovoltaic Effect which converts energy of sunlight directly into the electrical energy. This Photovoltaic Effect is the physical and chemical phenomenon. When these cells are exposed to sunlight then their electrical properties such as resistance, voltage and current are vary. Solar panels are formed by combining the number of solar cells by making electrical building blocks of photovoltaic structures. The single junction common silicon plastic solar cell can produce a maximum 0.5 to 0.6 volts (approx.) open-circuit voltage.

The three basic attributes required for the operation of a PV cell:

- Generating electron -hole pairs and light absorption process.
- The process to separate opposite types charge carriers.
- Those extracted charge carriers are placed into external circuit.

1.1 INFRARED SOLAR CELL:

On normal days and even on cloudy days plastic solar cells are very efficient and can easily converts the sun light into the electrical power. These plastic solar cells uses a plastic material which contains 1st generation cells and uses nanotechnology which can uses the visible sunlight as well as the invisible infrared rays which are not visible with our naked eyes. The combination of Nano Particles (which are also known as Quantum Dots) and a particular type of polymer makes a plastic which can detect the infrared rays from sun and uses its energy by converting this energy into electrical energy. In future there is a huge scope of nano particles in the field of solar energy because one day it becomes 5 times more efficient than the current solar technology. There interesting and unusual properties are enhanced due to their light weight and small size. This nanotechnology can make the future very secure and more developed. But this nanotechnology is little expensive or costly which is its only major drawback but this drawback can also be reduce in upcoming future by using different type of plastic polymer for the solar cells whose efficiency is increased with less cost.



1.5 Infrared Plastic Solar Cell

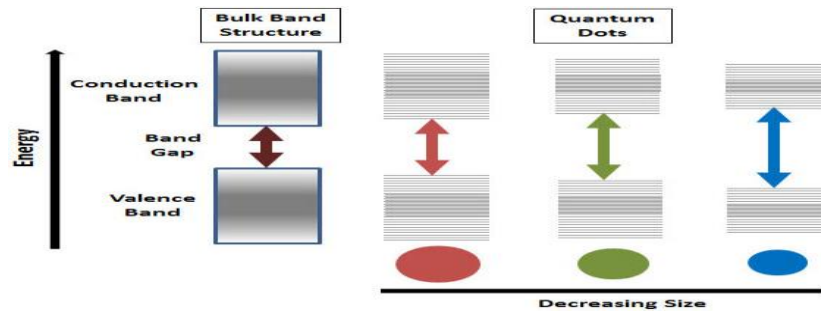
2: THEORETICAL ASPECTS

Infrared plastic solar cell are made by using plastic means polymer having double bond which helps in electron motion through cells. For power PLUG IN requirements are reduced.

2.1 Principle:

Plastic is the material made by using polymers- large molecules formed by repeated combination of smaller molecules in the form of chains. Generally plastic is a non conductive material. Use of nanotechnology in plastic solar cells which contains first generation solar cells help them to utilise even sun's infrared rays which are invisible. To convert the energy into infrared rays plastic cells are made by combining polymer with nano particles (Quantum Dots). As they are made by using plastic, they are thin and can be rolled into sheets.

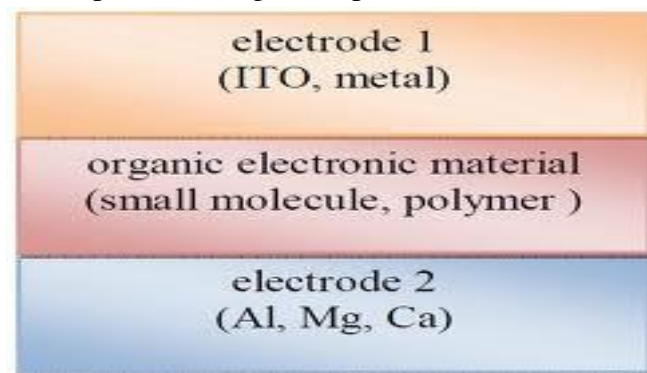
When the dimensions of a potential well or box concerned with the particle or reduced to the order of De-broglie wavelength of electron (within few ten's of nanometres) then energy levels of electron change. This is called Quantum confinement. In atoms, band gap increases as material size decreases.



2.1 Quantum Confinement

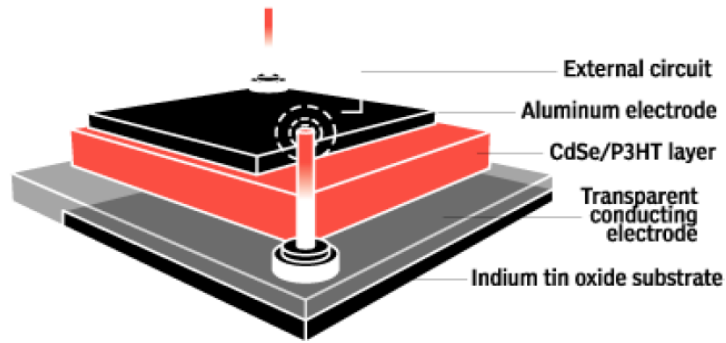
2.2 Working:

- A 200nm thick layer between electrodes is sandwiched.
- At present 0.7V can produce.
- In the photoactive layer Semiconducting acceptor and donor material absorbs the sunlight which passes through transparent electrode.



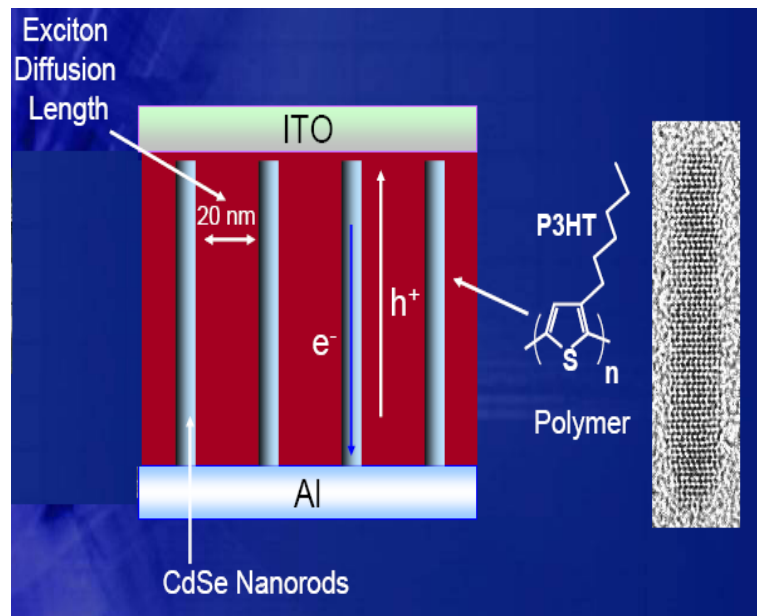
2.2 Block Diagram of Infrared Plastic Solar Cell

- These cells requires nano rods of semiconductors.(7 nm by 60nm).
- In semiconducting polymer, Nano rods (200-nm thick) are embedded. These embedded nano rods are the heart of a plastic solar cell.
- Plastic Cells consists of Nano rods made of Cadmium Selenite (CdSe) and these cells are blended with Poly-3hexylthiophene (P3HT).



2.3 Basic Structure of Plastic Solar Cell

- Coating of Aluminum can play a role of Back Electrode.
- An electron and an hole are generated when these rods absorb light.
- Aluminum Electrode collects the electrons.
- To creating a current, the hole is conveyed to the electrode after transferring to plastic.



2.4 Structural Diagram of Plastic Solar Cell

2.3 Advantages:

Plastic cells are very efficient and very useful in the upcoming future because these cells have a lot of advantages and some of those important advantages are :

- Solar plastic cells are more efficient (up to 30%) in comparison with other solar cells.
- When we talk about application purposes, plastic cells are more practical and efficient.
- Plastic cells are not very compact when used in making solar panels and they form light structure which is easily manageable. Conventional cells are used for large applications which have a huge budget package. Whereas plastic cells can have vast applications due to its feasibility as they can be sewn into fabric.

2.4 Limitations:

- Plastic cells are more expensive than other kind of solar cells.
- As exposed in front of the sunlight, the life span of plastic cells becomes relatively short.
- The main requirements of plastic solar cells are continue and constant monitoring and also requires high maintenance which is difficult to handle.

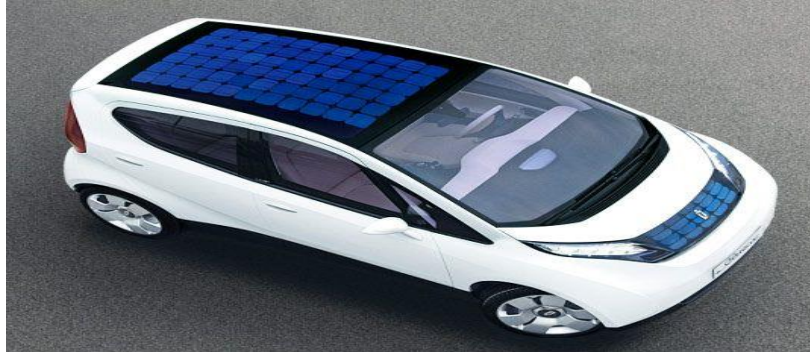
2.5 Improvements:

- Light Collection can be improved in plastic cells and concentration level can also be enhanced.
- Nano rods can transfer electrons to the electrolyte more quickly and directly as they are closely packed. So this can also be improved.
- Improvement in absorption rate of nano rods of different colors to span sunlight spectrum.

2.6 Applications:

1. In remote areas, we require lots of electricity so we can use plastic cells as a part of power solar panel by connecting number of cells.
2. These cells can also be used in portable devices by spraying it on those devices as a paint.
3. Solar plastic solar cells can also be used in mobile phones or other wireless devices.

4. Solar plastic cells can also be used in charging electrical hydrogen cars by placing plastic cells with proper connections on the top of those cars.



2.5 Hydrogen Powered Car with Plastic Solar Cells on top

5. Plastic cells can also be used in Light House for ocean navigation.



2.6 Ocean Navigation with Plastic Solar Cells

3: CONCLUSION AND FUTURE SCOPE

3.1 Conclusion:

The usage of energy is growing with increasing population and this cannot be satisfied by the existing energy resources. . It is said that we use one by ten thousand times of the solar energy only that reaches on the earth. Due to some disadvantages of Conventional solar cells their is being limited. But plastic solar cell helps in converting sun's infrared radiation and can produce electricity even on cloudy days have lead to overcome few disadvantages of

conventional solar cells. At present though they are cost effective we can reduce the drawback in future. If we are able use of surface of earth up to 0.1% with solar forms then I can remove all other kind of energies and can use solar energy, thus providing electricity even to the remote areas.

- Infrared radiations can be exploit with help of solar plastic cells.
- Solar plastics cells are more effective than the conventional solar cells.
- On cloudy days also these plastic cells can work.
- In future, cost of plastic cells can be reduced with the help of upcoming upgraded technology.

REFERENCES

[1] Charles P Poole and Frank J Ovens, “Introduction to Nano Technology”, 2003

[2] Ryan C. Chiechi, Remco W.A. Havenith and Jan C. Hummelen “Modern plastic solar cells: materials, mechanisms and modeling”, *Materials Today*, Volume 16, Issues 7–8, pp. 281- 289, July–August, 2013.

[3] Alex C. Mayer, Shawn R. Scully and Michael D. McGehee, “Polymer-based solar Cells”, *Materials Today*, volume 10, No 11, pp. 28-33, November 2007

[4] Oleg D. Neikov and Nikolay A. Yefimov, “Handbook of Non-Ferrous Metal Powders (Second Edition)-Nano Powders”, 2019

[5] Shraddha R. Jogdhanka and Channappa Bhyri, “A review on infrared plastic solar cells”, *Krishi sanskriti, Impending Power Demand and Innovative Energy Paths* - ISBN: 978-93- 83083-84-8, pp. 333-340, 2012,

[6] Prabhat Gupta and Vaishali Srivastava “Comparison between Solar cell and Infrared Plastic Solar Cell” *IJIRCCE journal*, Vol. 6, Issue 3, pp. 2476-2480, March 2018.

[7] Jay patel and Prerna Goswami “Infrared Organic Photovoltaic: A review”, *Research Journal Engineering and Tech.*, Vol:8, Issue 2, pp. 159-164, 2017