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## TITLE: TRANSPARENT SOLAR PANEL

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### Abstract

Today's world is suffering from energy crisis, which has been threatening the human at a point. Energy is essential for economic development and growth of any country in a view to derive and expand the economy society demand more electricity. In order for solar energy to work efficiently and supply energy to a building, a very large amount of space is required, in the form of rooftops or land, in order to install solar panel; these solar panel space requirements are a large impediment to practical usage. This drawback drove researches to come up with transparent solar cells, which solves the problem by turning any sheet of glass into a photovoltaic solar cell. This cell provide power by absorbing and utilising unwanted light energy through window in buildings and automobiles, which leads to an efficient use of architectural space. So it's a time the world should switch to the alternative power generation. Instead of using the fuel such as coal, oil or gas which causes high amount of pollution and as it is a non-renewable resources, the solar energy is one of the best mean of alternative is available. Solar energy is the most prolific method of energy capture in nature. In these Transparent Solar Panels consist organic salt that absorb specific invisible wavelength of light i.e. ultraviolet and infrared light which is invisible to the human sight. This light transfers to material present in the edges of panels, where photovoltaic solar cells convert this light energy into electricity. The economic drive to make solar cell more cost effective and efficient has driven development in many different deposition technology, including dipping, plating, thick film deposition and thin film deposition. The main objective of this review paper is to state the latest report on TSP. This includes the principle, application, design, merits and demerits from a performance, aesthetic and financial perspective. In short, this paper provides a crucial review on the latest development in the TSP.

***Index Terms: Non-Renewable, Transparent Solar Panel, Photovoltaic Solar Cells***

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### 1. INTRODUCTION

Imagine the world were the electricity is easily generated using the glass roof of our office building, window surface, on car's sun roof, even on our smartphones also. It's like a far dream and now its n a way where our dream going to be a reality and that is possible only because of 'Transparent Solar Panel'. In this type of solar panel, electricity generated which is totally pollution free as it is a form of solar energy and no need of space occupancy as it works by means of windows or roof. It plays a major role in green design world also.



**Fig. Transparent Solar Panel**

In the recent years, the floodgates of research focusing on clean renewable energy have been opened by scientists who consider solar energy to be most abundant source of energy

that can satisfy society demands, which stem from continual economic development. Solar energy is at least utilized in four different ways in our daily lives, and this ranges from heating water to producing electricity. Photovoltaic (PV) technology are the top of the list of application that use solar power, and forecast report for the world solar photovoltaic electricity supplies state that in the next 12 years, PV technology will deliver approx.. 345GW and 1081GW by 2020 and 2030 effectively. A photovoltaic cell us a device that convert sunlight into electricity using semiconductor material. Semiconductor material enables electron flow when protons from sunlight are absorbed and eject electrons, living a hole i.e. filled by surrounding electrons.

### 1.1 Need of Transparent Solar Panel

Needs of TSP are as follows:

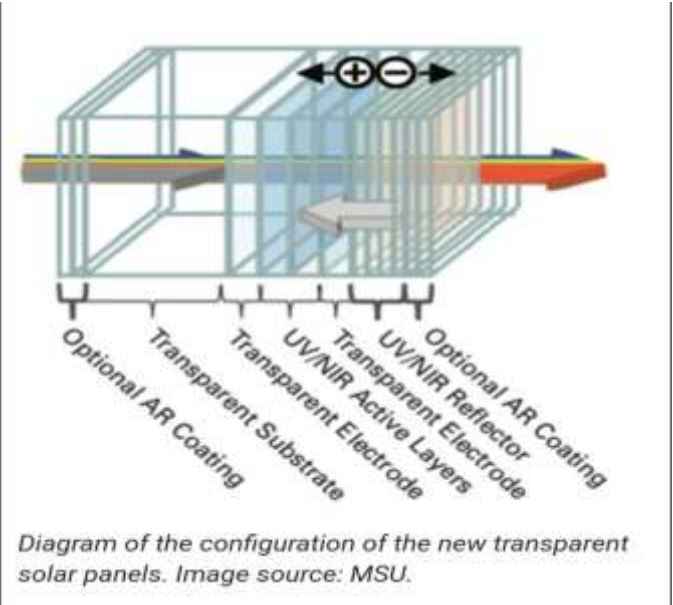
1. Increasing need of energy.
2. Transparent Solar Panel can be placed or used as windows panel, etc. so energy product in less land wastage.
3. Other Solar application needs large space on installation.
4. Touchscreen smartphone requires its own charging batteries handy.
5. Use of renewable free sources to optimize the non-renewable energy sources i.e. coal, oil and gases etc.
6. Requirement of clean environment.
7. For decoration purpose for attractive appearances.

## 2. PRINCIPLE

Transparent solar panel concentrate or luminescent solar concentrate all the solar radiation from the large surface to smaller area on the panel by squeezing the light and increasing the power density to improve the effectiveness of the solar cell which can ultimately produce electricity.

### 2.1 Design of Photovoltaic cell

The thickest layer is the glass, plastic or other transparent substrate being quoted. Multiple layer of the PV is in the right side. There are two active layers of the core coating which are the absorptive semiconductor material that gets excited by sunlight and interact and creating electric field that causes electric flow. Those layers are connected to external circuit with the help of electrodes on the both sides of layer. This external circuit carries the current out of the devices.

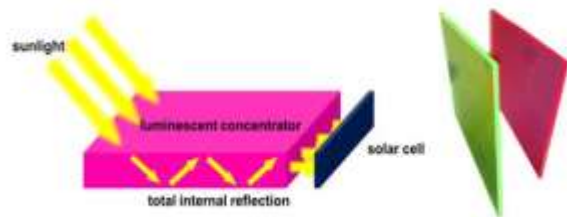


### 2.2 Mechanism

The manufacturing process of TSP is consist of simply sandwiching of two transparent glasses with active materials between it that is the organic salt, and photovoltaic cells in the edges of the glass. The active material transfer the light energy which incident on the transparent glass, forms the P-N junction gives rise to depletion region in which the photons gets converted to the electron. This electrons are highly excited and when attached with an electrical equipment such as light, fans etc., the electrons approaches towards the anode and cathode and in this way the electric flow occurs.

### 2.3 Methodology

The transparent solar cell is nothing but transparent luminescent solar concentrator and not the transparent glass. It consists of organic salt which are complex cyanine derivative fused with the glass.



**Fig. Working of TSP**

Particular salt derivation of cyanine dye which are precipitated by its reaction with the base used to absorb the infrared and ultra violet wavelength and allow the visible light to pass through it. The absorbed energy in different frequency is passes towards the edges of the glass where the conventional photo voltaic solar cell converts it into electricity.

## 2.4 Applications of TSP

The applications of TSP are as follows:

1. TSP is used as transparent windows in offices, houses in building.
2. It is used on the roof of building to generate electricity
3. It is used on the screen of the smartphones for charging the batteries
4. It is used on the railway station and even on bus stops
5. It is used as standard and customized solar panels, with various sizes and shapes.

## 2.5 Merits of TSP

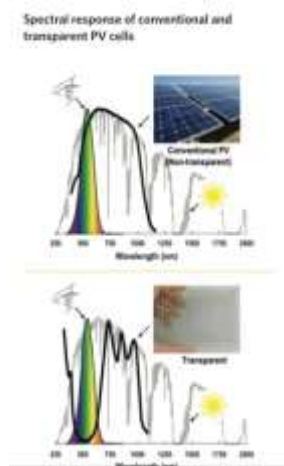
Merits are as follows:

1. Aesthetically transparent solar panel gives pleasing look.
2. It is profitable as it can be laid on readily available structure.
3. Cell phones will be able to self-charge its battery.
4. It consumes less land usage.
5. It reduces the consumption of electricity from available power plants.
6. It reduces the usage of natural gas, oil and coal and prevents them from vanishing.

## 2.6 Demerits of TSP

Demerits are as follows:

1. Currently it is very costly, but prices may be drop in future.
2. As it is a current research it has low efficiency but scientist and engineers are working on it to increase its efficiency



*Fig. A typical human eye will respond to the wavelength from about 380 to 740 nm, the wavelength is absorbed viz. invisible to human eye*

## 3. CONCLUSION

Transparent solar cells are very challenging devices to fabricate and have the potential to be used for large number of applications. Currently TSP has 1% efficiency therefore it requires useful addition. Lunt believes that it could be brought up to 10% before used in building for power generation they replace the glass windows. Currently they can using it up to 5% and working for higher efficiency by adding various layers in glass to absorb all the light energy and prevent from leakage of energy.

Further development in this technology reduce the fossil fuel, prevention from UV rays which may causes harmful effects on us, replace display screen of smart phones etc.

Keeping in mind that these are currently an innovation, it is quiet inspiring concept. This concept has to do lots of research on increasing its efficiency so that it can be a wide spread solar adoption.

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