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The Future Aspect of Photo-Voltaic Power System: A Critical Review

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Abstract— Solar energy are being increasingly used in electric power supply as well as other source of energy because it is a good potential alternatives of energy. The two main restrictions for using solar energy are the high initial cost and a very low PV cell conversion efficiency. Solar power is a free power. Solar power only for 8hrs free power we can do it 24hrs also by using the new techniques like Bionic leave, 3D printed solar powered trees, peroveskites, thin film solar, carbon based solar cell, colored solar panels, polymer solar cell, solar concentration technology. This paper is the review of new technologies of improving the efficiency of solar cell in the whole world.

Index Terms— Bionic Leave, 3D Printed Solar Powered Trees, Peroveskites, Thin Film Solar.

I. INTRODUCTION

Energy demand is significantly increases there consumption is one of the major problem in the world. Therefore the searching of alternative source of energy and there is sustainable without any pollution. Solar energy is a good alternative source of energy and there is sustainable without any pollution. Solar technologies use the sun's energy to provide electricity, heat, light, hot water and even cooling for homes, business and industries. In a rural area were the underground water is drown using tube wells running through the electricity but there is so many problem regarding electricity so at that type of area standalone DC supply is better choice. This would be also able water pumping in the day time without storage batteries [2]. It is also suggested in urban area there are so many applications of solar power. It has been used extensively for water pumping and air conditioning in remote and isolated area. The efficiency of conversion is low.

The research behind solar energy is booming, too. Scientists are discovering new ways to decrease costs and increase efficiency of solar panels and coming up with creative, impressive ways to generate power from bionic leave, 3D printed solar powered trees, perovskites, thin film solar, carbon-based solar cells, colored solar panels, polymer solar cells and solar concentration technology [5].

II. TYPES OF SOLAR CELL

1. BIONIC LEAVE

Recently Harvard scientist created a bionic leave as shown in figure1 which is used as a catalyst to make sunlight split water in hydrogen and oxygen and then through bacteria engineering it will convert carbon dioxide and hydrogen into liquid fuel and it is called isopropanol [4]. They have almost a 1% efficiency rate of turning the sunlight into the fuel. They found the way to recreate the efficiency of photosynthesis [1].

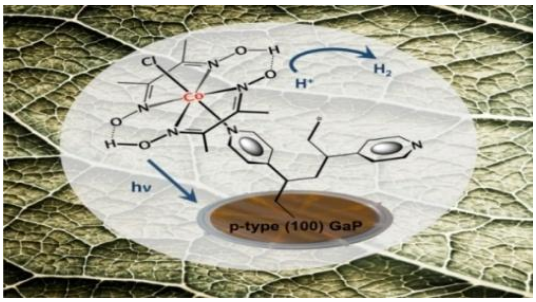

Figure 1: Bionic Leave [1].

2. 3D PRINTED SOLAR POWERED TREES

VTT technical research Centre of fine land researcher's created a solar powered electric forest with 3D printed trees. They developed some very decorative prototype energy harvesting trees [6]. These leaves stored energy and there power is used for small appliances and mobile devices. Each solar panel leaves is 0.2 mm thick and it consist of electrodes and polymer layers [3]. There surface area of each cell is 0.0144sq meter. In case of a sunny diameter are square meter of leaves can generate 10.4 watts.

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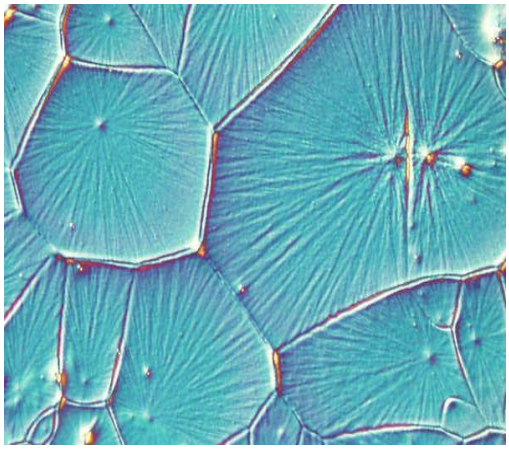

Figure 2: Researchers created solar powered leaves on 3D printed trees trunk, making a mini electric forest Image VTT

***HOW DO THE WORK**

The leaves are made up of flexible organic solar cells mass production techniques are used in the printing. Each leaves has a separate power converter. It is also collect energy from variety of sources like solar, wind, and heat temperature. Energy harvesting is increases by increasing the number of solar panels in the trees. The 3D leaves work only couple of years and then they need to replace. [7].

3. PEROVSKITES

Standford university researchers found a material with a specific crystalline structure known as perovskites as shown in figure 2 [8]. It is made by using lead, ammonia and iodine. They could make it cheaper and it is more efficient than silicon so the idea is to using them as a supplement rather than replace silicon. Efficiency of silicon solar cell is 11.4% perovskites increases is to 17%. Perovskites may also play an important role in next generation electric vehicle batteries. According to some maneuvers recently undertaken by Volkswagen.

Figure 3: Crystalline structure of perovskites

4. THIN LAYER SOLAR CELL

The thin layer solar cell is a second generation solar cell. There thickness is few nanometer (nm) to tens of micrometer (µm). These thin-films is cheaper but less efficient than conventional c-si technology. New research from cornell, scientist are made better solar cell by changing the chemistry of material. Researchers have studied organic and inorganic metal halide pervoskites. [9]. They make a new solar cell in which liquid source and simple coating is used which can make it appealing for more commercial uses as shown in figure 4.

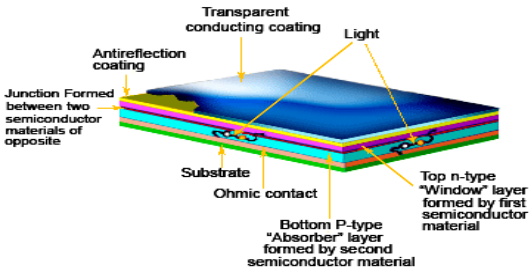

Figure 4: The structure and functioning of thin film solar cells are almost same as that of normal silicon wafer cells.

5. CARBON BASED SOLAR CELL

Carbon based solar cell is the another cheap alternative of silicon carbon used in the solar cell in the form of graphene (similar to graphite found in the pencil lead) which is absorb a wide range of light frequency. There efficiency is still low as compared to the other materials pervoskites popularity is due to the increasing the efficiency and reducing the cost. So the carbon based is also looking like the contender as shown in figure 5 [10].

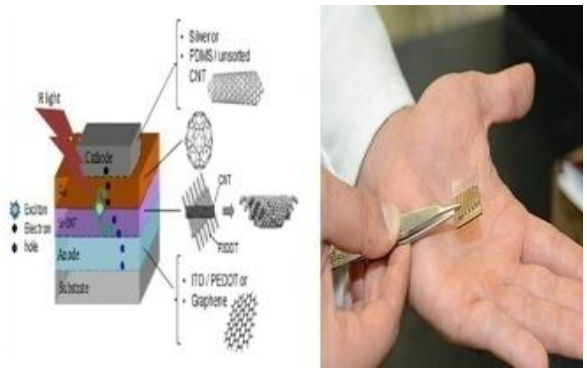

Figure 5: Stanford scientists build the first all-carbon solar cell

6. COLOURED SOLAR PANEL

The researchers found a way to make solar panels a little more aesthetically pleasing. They used silicon dioxide layered and often glass, optical fibers and titanium dioxide, used to absorbed UV rays. To make it photonic crystals structure that can be absorb sunlight. Solar panel used 80% less silicon than the traditional solar cell. The efficiency of green solar panel is larger then the other color black solar panel reaches up to 9% and blue is 6% only. Figure 6 indicate the solar panels. [12]

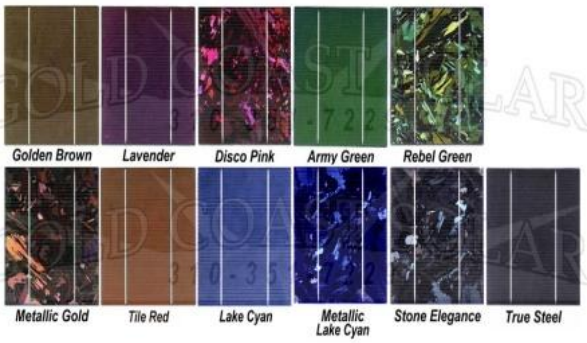

Figure 6: Solar color panel

7. POLYMER SOLAR CELLS

The polymer solar cells called PID2.this research comes from Chicago university chemistry department, the institute of molecular engineering, and Argonne national laboratory. The polymer breaks easily and allows to flow electron faster. The researchers said it increases cell efficiency 15%. The polymer solar cell shown in figure7. [11]

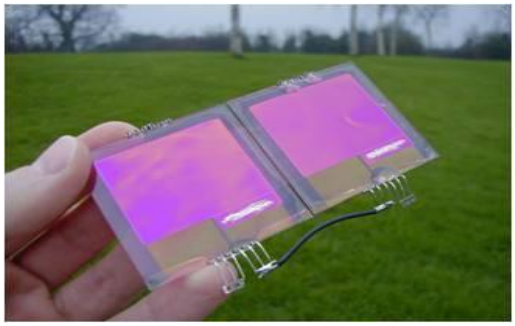

Figure 7: Polymer solar cell

8. SOLAR CONCENTRATION TECHNOLOGY

Concentrating photovoltaic (cpv) is a system which is giant and has to be angled very accurately to get the right amount of solar energy in the day time. Its works great but they are not ideal for roofs. So the team of researchers is working on the high efficiency technology for the rooftop. Photovoltaic system by built it miniaturized, gallium arsenide pv cells also using 3D printed plastic lens arrays as shown in figure 8 [13].

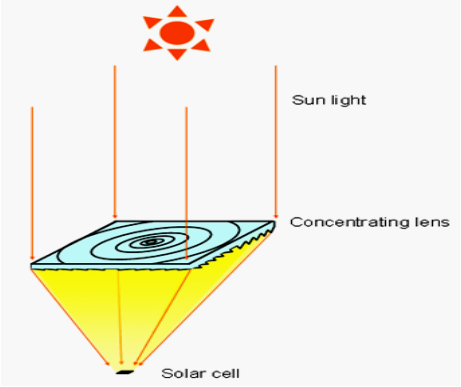

Figure 8: Solar light concentrated by a lens is irradiated into a high-performance solar cell

VI. CONCLUSION

As we seen above, the cost of conventional energy is very high and it is only for the few years. At that condition solar is the best alternative source of energy. But there efficiency is very low. In this paper we reviewing the latest researches in the field of solar cell energy system, which helps to increases the solar panel efficiency and reduces their cost.

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