International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.05, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

A REVIEW ON UPCOMING SOLAR TECHNOLOGY: SOLAR PAINTS

Utkarsh Singh[1], Vaishnavi Gupta[2], Nitish Jha[3], Pranav Singh[4]

[1,2,3,4] Department of Electronic and Communication Engineering

IIMT College of Engineering, Greater Noida 201308, India

ABSTRACT

The world is in the addiction of the energy. For energy we need a continuous, ecofriendly, clean and renewable source of electric power generation source. The average residential solar panel can convert about 18% of all the sunlight that hits a panel into usable electricity. A new sector in solar power harvesting is emerging commonly known as Solar paints. Solar paint is mostly stuck in the single digits – between 3% and 11% depending on the technology used.

Keywords: Solar Energy, Solar Paints, Energy conservation, Cost Effective

I INTRODUCTION

The world is in the addiction of the energy i.e. electricity for its daily needs like from running the machines in the industries, to filling the juices in electronic and electric automobiles for their working, for washing your clothes, drawing water from the tub wells, to cooking your food from microwave. This all activities of we humans are powered by the electric producing power plants may the power is produced by nuclear, solar, Natural Gas, coal, Diesel, hydroelectric and other fossil fuels which produce one or another byproducts may it be nuclear waste, water vapor, Carbon contained toxic gasses and other gasses dangerous gasses which not only damages our healthy environment but also misbalances our ecosystem and effects the working of nature. Someday or another we are going to reach a moment where we would consume even the last drop and chunk of our naturel resources. Sun is a big nuclear reactor which continuous emit trillion and quad trillion watts of energy on the earth which just need to be harvest anyhow to meet the needs for earth. For energy we need a continuous, ecofriendly, clean and renewable source of electric power generation source. Today we are completely dependent on the photo voltaic cells for harvesting the energy from the sun. Which are hard boards, which consists of the layer of PV cells. These type PV cells have main disadvantages like they occupies a very large space, they are very expensive, the production enrolls a very large variety of chemical which effects the health of man power enrolling in manufacturing off the PV cells which in turn contributes in the pollution.

The average residential solar panel can convert about 18% of all the sunlight that hits a panel into usable electricity. This might not seem like much, but it's actually taken researchers quite a long time to get to that efficiency level. It took 77 years to go from the 1% efficiency of the first solar panel ever

invented to the creation of a 14% efficiency panel in 1960. A new sector in solar power harvesting is emerging commonly known as Solar paints which have many techniques and working principle some of them are mentioned below. Solar paint is mostly stuck in the single digits – between 3% and 11% depending on the technology used.

II LITERATURE REVIEW

1) Electrolyte less Solar phase:

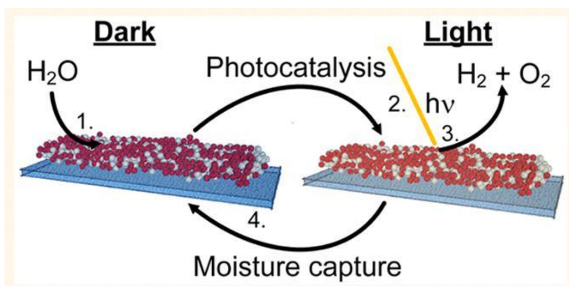

Fig. 1 Electrolyte less Solar phase technology

This technology (Fig. 1) is being developed by RMIT University in Melbourne, southern Australia, the research team [1] has developed a unique paint containing a newly developed compound that acts like silica gel — that's the stuff used in those little sachets that absorb moisture to keep things like food, medicines, and electronics in good shape. It enrolls the technique of Surface Water Dependent Properties of SulfurRich Molybdenum Sulfides: Electrolyt less Gas Phase Water Splitting. Sulfur-rich molybdenum sulfides are an emerging class of inorganic coordination polymers that are predominantly utilized for their superior catalytic properties. They investigated surface water dependent properties of sulfur-rich MoSx (x =32/3) and its interaction with water vapor.

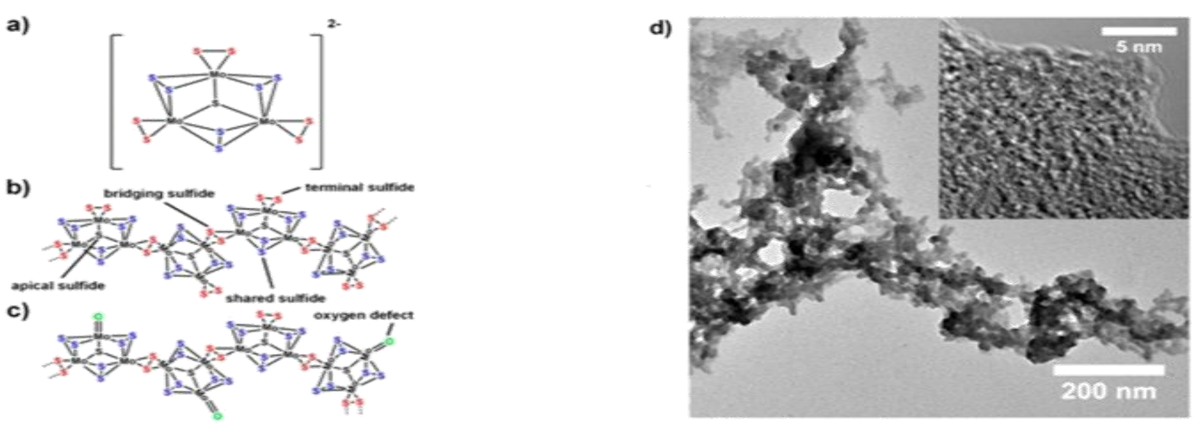

Fig: 2 a-c) Chemical Structure and Morphology, d) Spectrometric polymerized $MoS_{32/3}$

They report that MoSx (Fig. 2) is a highly hygroscopic semiconductor, which can reversibly bind up to 0.9 H_2O molecule per Mo. The presence of surface water is found to have a profound influence on the semiconductor's properties, modulating the material's photoluminescence by over 1 order of magnitude, in transition from dry to moist ambient. Furthermore, the conductivity of a MoSx-based moisture sensor is modulated in excess of 2 orders of magnitude for 30% increase in humidity. As the core application, we utilize the discovered properties of MoSx to develop an electrolyteless water splitting photocatalyst that relies entirely on the hygroscopic nature of MoSx as the water source. The catalyst is formulated as an ink that can be coated onto insulating substrates, such as glass, leading to efficient hydrogen and oxygen evolution from water vapor. The concept has the potential to be widely adopted for future solar fuel production.

The following are the method. It was demonstrated the synthesis of highly porous sulfur-rich MoS32/3 utilizing a facile and scalable acidification−polymerization route, employing a cationic templating agent. They proceeded to characterize the interactions between this inorganic polymer and moist air. It was discovered that MoS32/3 can reversibly bind up to 7% water by weight (0.9 H2O per Mo center) in ambient conditions, which can be released at low temperatures in dry atmospheres. This effect may be utilized to design low-energy dehumidification devices. Low - field NMR studies revealed that the moisture is adsorbed as weakly bound surface water, likely utilizing van der Waals forces and hydrogen bonding. Raman spectroscopy studies revealed that the reversible binding of water molecules likely occurs at the shared and bridging disulfide ligands that link the individual Mo centers within the porous and branched structure. They furthermore observed that the binding of the water molecules had a profound impact on the optical and electronic properties of MoS32/3. When stored under nitrogen, intense luminescence in the near-infrared region is observed, while a distinct hypsochromic shift and PL quenching occur upon exposure to atmospheric moisture. The observed quenching of PL was attributed to charge transfer processes due to van der Waals interactions and hydrogen bonding. The material was found to be insulating when exposed to dry conditions, while the adsorption of surface water resulted in markedly reduced impedance, which was attributed to proton conduction. This observation was utilized to design moisture sensors, featuring high sensitivity and selectivity to H2O at room temperature. While these observations are highly relevant on their own, they also have significant implications to the field of hydrogen evolution catalysis, which is one of the most prominent applications of amorphous molybdenum sulfides. The observed affinity of the bridging and shared disulfide ligands toward water molecules implicates their significance to the overall water splitting process. Furthermore, the observed dependence of the electronic and optical properties on the amount of surface-adsorbed water molecules should be considered when characterizing this material in the future. Finally they developed a photocatalytically active ink based on sulfur-rich MoS32/3 combined with TiO2 nanoparticles, which function as a photosensitizer and cocatalyst. Printed films of this composite were found to be catalytically active in moist atmospheres, without the need for any electrolytes or external power sources. While the overall hydrogen production efficiency is lower than what is typically observed when using catalysts suspended in electrolytes, the process is surprisingly efficient considering that it relies entirely on the here discovered hygroscopic nature of MoS32/3 as a water source. A hydrogen evolution rate of 11.09 mmol g^{-1} h^{-1} could be achieved under optimized conditions, which also resulted in a much higher efficiency than any previously reported photocatalytic gas phase water splitting system. Pending future improvements of the process efficiency, electrolyteless photocatalytic water splitting may become an attractive alternative approach due to its unique features and simplicity, and hence our findings are expected to stimulate further work within the field.

2) Nano crystal based solar paint

The basic idea behind this method is that they [2] dissolved these Nano photosensitive crystals into a solvent to create an ink or paint. That can be painted or applied on any surface. A grid of thin conductor is engraved in the painted layer for the movement of electrons.

3) Colloidal Quantum dots

The researchers [3] in University of Toronto developed a solar paints made up of tiny dots known as colloidal quantum dots. The university found a fast and cheaper technique than the classic traditional assembly line system. These dots are simply printed by spraying layer by layer, atom by atom.

4) CIGS Based solar paints

The team of researchers [4] from University of Texas at Austin development a different type of solar paint, which consists of a mixture of metals, know as CIGS. Metals like copper, iridium, gallium, selenide are mixed in solvent to create a paint or ink which can be applied on any surface. The efficiency last recorded in the year of 2011 was 3% and is some of the last rank holder in the efficiency list.

III CONCLUSION

With this review paper, it is concluded that solar paints are upcoming technology, which is ecofriendly and having a low cost material. The average residential solar panel can convert about 18% of all the sunlight that hits a panel into usable electricity. The currently developed paints have efficiency less than 10% but till they are cheaper and cleaner than the currently used PV cells panels. Considering the cost per efficiency of the solar paint is higher than the PV cells panels thus the commercial use and advantages have a very better and bright future.

REFERENCES

1)T. Daeneke, et. all "Surface Water Dependent Properties of Sulfur-Rich Molybdenum Sulfides: Electrolyteless Gas Phase Water Splitting", ACS Nano, 2017. 2)https://understandsolar.com/solar-paint/
3)https://www.sciencedaily.com/releases/2017/06/170614091833.htm
4)https://www.google.co.in/amp/s/www.digitaltrends.com/cool-tech/solar-paint-clean-energy/amp/