Performance Analysis of Single Mono-Crystalline Photovoltaic Cell using Ultra- Violet Glass

Soobia Saeed, Muhammad Mansoor Alam, Syed Mehmood Raza Naqvi

***Abstract*—PVC (photovoltaic cell) is a semiconductor device. It is commonly known as PN-type semiconductor. PVC performs an essential role in the process of electricity creation. There are different types of PVC such as organic, inorganic and hybrid majority. Generally, consumers complain that their PVC is not producing electricity efficiently. Another problem is connected between the PVC is not as long or less load visibility sunshine during the day. The particular objective of this study is to focus the issues related to PVC. Our team suggests that two main solutions in this regard in order to improve and consumed more photon emission rate with the help of sunlight. One is the use of ultra-glass violet (UV- glass) on the solar cell to the focus of sunlight and reduces the light of reflection and the second is the convex lens plane of UV- glass that concentrates the sunlight from the upper and lower surface that will help to get the photon emission rate. It exceeds then describes the establishment of solar energy frameworks renovation and implementation. Furthermore issued a few forecasts about the future energy created altered.**

***Keywords*—Photovoltaic cell, Solar cell, Photon, ultra-violet, glass**

I.INTRODUCTION

The radiation constantly coming from the Sun at the Earth's surface is called arrange daylight radiation.

The measure of scattered radiation beginning from each other guideline is called diffuse solar radiation. Photovoltaic (PV) or solar cells as they are frequently called semiconductor gadgets that change over daylight into direct present (DC) power.

Photovoltaic is the immediate change of light into ability at the nuclear level. Several materials display a property known as the photoelectric impact that causes those to consume photons of light and release electrons. At the idea when these free electrons are trapped, electric energy results that may be utilized as electricity.

Manuscript Received July 12, 2016; accepted 20th October, 2016; date of current version December 2016

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The fundamental goal of the entire photovoltaic (PV) solar cell progressive work is to decrease the cost of PV cells and modules to an event which will be extremely with traditional options for producing power. One approach to accomplish this is to build the transformation productivity of PV materials and devices altogether. Significant advances have been made lately in boosting the proficiency of nearly all the key PV materials and gadgets. Essentially, there are two ways to deal with expanding the effectiveness of solar cell: (1) selecting the semiconductor materials with suitable energy gaps to coordinate the solar spectrum and the improving their optical, electrical, and basic properties; and (2) creative gadget building, which empower more successful charge gathering and also better use of the solar spectrum through single and multi-intersection approaches. In spite of the fact that, there is no acknowledged meaning of what constitutes a high effectiveness gadget it is especially an element of a given technology and how it impacts the general cost structure [1].

Photovoltaic cell is a semiconductor to varying during the radiant energy into electrical energy. This requires the valence electrons to go to the conduction band. Electron exchange is possible if shown that light is also important to or equal to the width interval between the valence band and the conduction realistic (band gap).The initial periods of the photovoltaic cells are the absorption of light installed in the useful solar spectrum. The reflected light cannot be consumed for the photovoltaic cell [2].

This technique extends the contact surface with the beam and decreased reflectance. Reflected incident beams can be reabsorbed by immediate space. Losses from side to side reflectances are and also minimized by covering the surface with an anti-reflective covering. If an aluminum wrapper is incorporated the back of the cell, transmitted photons may be reflected again in the region where they can be ingested. The adequacy of various treatments can be studied by deciding reflectance, transmittance and absorbance for photovoltaic cells [3].

Solar energy is the core essential to life on Earth. Solar radiation is the direct resource for the right to build thermal, frostiness and force. Change in the use of PV tracking (photovoltaic) energy is the solar radiation's effect is slow. On the off chance that solar radiation flow in the semiconductor substance, the accumulation of an Incriminate transporter will increase when contrasted with the situation without luminance. The incident exchanged photons and electrons excited atoms are openings and create a hole, which can be used for the current diffusion. It is very important that the electric field is in

 ISSN-2409-6520

semiconductors, electrons and openings disconnect from each other [4-5].

This type of field is called PN intersection. PN intersection might be utilization of this effect is known as a photovoltaic cell (solar cell). These procedures can change the solar radiation into direct current (DC). Photovoltaic cell is a semiconductor diode. It consists in the PN junction silicon thin slices of some complexity beneath the plane of the metal connecting associated with both sides [6]. In a position where solar radiation through the solar cell, free electrons and hole openings happen.

PN junction of electric field electron of the N - layer, which turns into a negative axis of the cell and the holes in the P- layer, which becomes the positive side [7]. The gap is almost like the expansion of the water and other free electron band available. Since the free electrons contraptions running side "P" for the PN junction.

PN junction is the result of electrons or current of electricity flows will release. Gallium arsenides (GaAs) as a part of the industry scale that PVC assortment, high capacity greater than 30%. Although both sides gallium arsenide electrically N-type (As) has an abundance of electron and p-sort (Ga) openings overabundance gripping these pieces together to make the PN junction interface, subsequently in the electric field [8-10].

There are three sorts of PVC (I) Mono-crystalline it the cut from single significant gem (II) Poly-crystalline or Multi-crystalline it is a cut from a bit of silicon and (III) Amorphous cell it is made by putting a thin film of the nebulous (non-crystalline) onto white choice of surfaces [11]. Another some unique sorts of photovoltaic cell which can be used by means of infrared (IR) or bright (UV) radiation [12].

The point at which these polymers absorb a photon, the electron leaves the excited state its position, and this gap is to attract other free electrons [12]. We are currently utilizing as a part of the inorganic photovoltaic cell and ultraviolet (UV) glass to consume more energy with the help of sunlight.

Photovoltaic (PV) devices don't interact with photons of all wavelengths (λ) with similar outside quantum effectiveness (EQE). The outer quantum proficiency of all financially delivered photovoltaic modules is altogether lower for the ultra-violet (UV) for longer obvious wavelengths [13]. Photons in the scope of three hundred NM < λ < 400 NM, co-operate unequivocally with front side levels of PV gadgets, because of their high energy content. Photovoltaic (PV) devices specifically, get their short- λ response decreased by various particular systems: (i) freeloading consumption and reflection due to silicon nitride hostile to bright covering; and (ii) quick recombination rates in the intensely doped emitter. Furthermore, for typifying modules, assist misfortunes happen at the front side (iii) consumption and reflection from the front side glass; and (iv) retention of the exemplification materials [14-15].

There two layers above PVC which is UV-glass over solar cell to get the solid light from the upper surface and lower surface and the second one is Plano convex lens is a smooth surface on the UV-glass in a sunlight focus on a day that will improve the rate of emission of photons. UV-glass essentially applied on PVC to enhance the rate of the steady flow of photons [16-17]. This method is cheap and easily install in PVC. PVC is a strong state of semiconductor device that supplies power or electricity. At the point when an incident photon is consumed by the solar cell, which eliminate an electron from the molecule and leaves the gap [18-19]. The hole looks like a water bubble and attracts others free electron. As the free electrons move at the "P" side of the PN intersection, the result of the PN intersection is the flow of electrons or the free flow of electricity [20-21]. An organic solar cell (OSC) or plastic solar cell is a type of electronic component refers to conductive polymer or long chain natural polymers.OSC by particular procedure called molecule engineering means making a polymer-ISO useful energy is delivered proper hole, which updates retention photons in a natural OSC atom[22-24].

There are a few different types of photovoltaic cells that can be changed via infrared (IR) or ultraviolet (ultra violet) radiation into electricity. From the point when these polymers retain a photon, an excited state where electron leaves its position, they will attract other distance becomes free electrons [25].

Has UV-glass reduced the reflection of sunlight using upper surface and lower side with the help of Plano convex lens?

II. PROBLEM STATEMENT

Sun light or solar energy is very useful for a part of a photovoltaic cell. Normally PVC plays a vital role in the electricity creation. The problem associated with the PVC is not too much efficient and less charging time. Another problem is also associated PVC is that they are useless at night vision.

III. SCOPE OF CURRENT RESEARCH

Has UV-glass reduced the reflection of sunlight using upper surface and lower side with the help of Plano convex lens?

As we know that sunlight is constantly coming from the surface of the earth and easily implement to the solar cell. The issue relevant with solar cell is less efficient, so we try to provide the solution with respect to solar cell is using one of the noble techniques is Plano-convex lens to focus the solar energy and the second one is UV-glass to reduce the reflection of sunlight with the implementation of UV-glass from the upper and lower side.

IV. METHODOLOGY

The aim of this study is to develop an efficient inorganic solar panel using two different technologies one is UV-glass and other one is Plano-convex lens. There are two layers above PVC which is UV-glass and Plano-convex lens. UV-glass reinforce the light signal (we are applying UV-glass over the Plano convex lens in the upper and lower side to focus the sunlight and reduce the reflection of light that will create a strong signal of light) whereas lens collects the light from its coverage area. In other words, it is a concentrated source of energy, which enhances the photon rate of emission. The mathematical relationship of open circuit voltage is as follows.

$$V_0 = \frac{K}{q} \ln\left(\frac{I_L}{I_0}\right)$$

 ISSN-2409-6520

Whereas: K is Boltzmann constant which is K=1.38e

1. T is total temperature which is T=300K
2. IL is Current supplied by solar cell, our readings
3. I0 = the reverse saturation current

V. WORKING OF ULTRA VIOLET GLASS

a. Analysis about the solar Cell in the presence of sunshine without Plano Convex Lens

We are applying daylight on photovoltaic cell without Plano convex lens (without UV- glass) and obtain the interpretations with the help of millimeters for current and voltage which are given below:

Table.1: Analysis about the UV-glass on Solar Cell in the presence of sunshine without Plano convex lens

(Without UV- glass) for Mono-crystalline cell)

S.NO	CURRENT	VOLTAGE
1	0.091	18.50
2	0.090	18.48
3	0.089	18.45
4	0.087	18.49
5	0.085	18.42

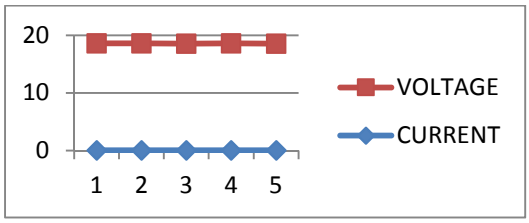

Figure.1: Graph about the solar cell without using Plano-convex lens (without UV-glass)

b. Analysis about the solar Cell in the presence of sunshine with Plano Convex Lens

We are applying the daylight in photovoltaic cell with Plano convex lens (without UV-glass) and obtain the interpretations with the help of a millimeter for current and voltage that is given below:

Table.2: Analysis about the UV-glass above the solar cell in the presence of sunshine with Plano- convex lens (without UV- glass) for Mono-crystalline cell

S.NO	CURRENT	VOLTAGE
1	0.094	18.52
2	0.092	18.50
3	0.091	18.51
4	0.088	18.49
5	0.087	18.40

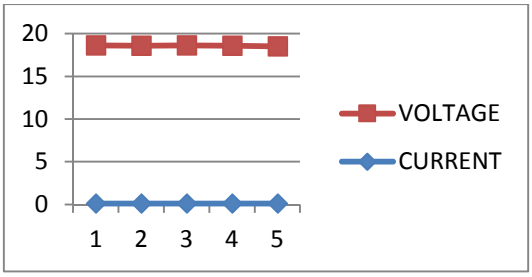

Figure.2: Graph about the solar cell with usage of Plano-convex lens (without UV-glass)

c. Analysis about the UV-glass on the upper surface of Plano convex lens above the solar cell in the presence of sunshine with the UV-glass

We are applying the UV-glass (not shown 100% reflection) on photovoltaic cell using upper surface with the Plano-convex lens in the daylight and obtain the interpretations with the help of a multimeter for current and voltage that is given below:

d. Analysis about the UV-glass on the upper surface of Plano convex lens above the solar cell in the presence of sunshine with the UV-glass

We are applying the UV-glass (not shown 100% reflection) on photovoltaic cell using upper surface with the Plano-convex lens in the daylight and obtain the interpretations with the help of a multimeter for current and voltage that is given below:

Table.3: Analysis about the UV-glass from the upper surface on solar cell in the presence of sunshine with Plano- convex lens for Mono-crystalline cell

S.NO	CURRENT	VOLTAGE
1	0.088	18.52
2	0.084	18.50
3	0.083	18.48
4	0.080	18.45
5	0.078	18.44

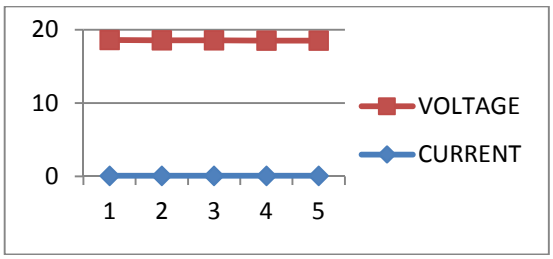

Figure.3: Graph about the UV-glass from the upper surface on solar cell using Plano-convex lens

ISSN-2409-6520

d. Analysis about the UV-glass on the lower surface of Plano convex lens above the solar cell in the presence of sunshine

We are applying the UV-glass (not shown 100% reflection) above the photovoltaic cell using the lower surface of a Plano-convex lens in the sunshine and obtain the interpretations with the help of a multimeter for current and voltage that is given below:

Table.4: Analysis about the UV-glass from the lower surface above the solar cell in the presence of sunshine with Plano- convex lens.

S.NO	CURRENT	VOLTAGE
1	0.094	18.52
2	0.092	18.50
3	0.091	18.51
4	0.088	18.49
5	0.087	18.40

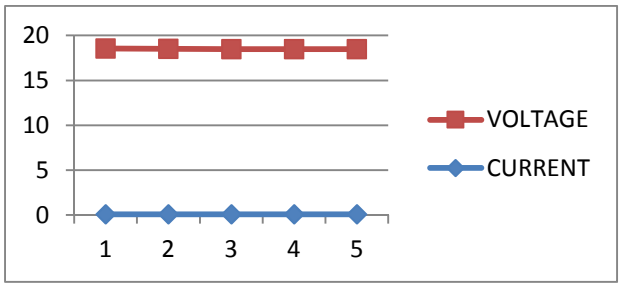

Figure.4: Graph about the UV-glass from the lower surface above the solar cell using Plano-convex lens

VI. RESULT AND DISCUSSION

To check the strength of PVC our team calculates the current and voltage then we are applying the Interpolation method to enhance the photon rate of emission. The Interpolation system is as follows:

a. Analysis about the UV-glass above the solar cell for sunshine without Plano convex lens (without UV-glass) for current:

Time	mille amp
1	0.091
	-0.001
2	0.090
	0
	-0.001
	-0.001
3	0.089
	-0.001
	0.002
	-0.002
	0.001
4	0.087
	0
	-0.002
5	0.085

b. Analysis about the UV-glass above the solar cell for sunshine without Plano convex lens (without UV- glass) for voltage:

Time	mille amp
1	18.50
	-0.02
2	18.48
	-0.01
	-0.03
	0.08
3	18.45
	0.07
	-0.026
	0.04
	-0.18
4	-18.49
	-0.11
	-0.07
5	18.42

c. Analysis about the UV-glass above the solar cell for sunshine with Plano convex lens (without UV-glass) for current:

Time	mille amp
1	0.094
	-0.002
2	0.092
	0.001
	-0.001
	-0.003
3	0.091
	-0.002
	0.007
	-0.003
	0.004
4	0.088
	0.002
	-0.001
5	0.087

d. Analysis about the UV-glass above the solar cell for sunshine with Plano convex lens (without UV-glass) for voltage:

Time	mille amp
1	18.52
	-0.02
2	18.50
	0.03
	0.01
	-0.06
3	18.51
	-0.03
	0.02
	-0.02
	-0.04
4	18.49
	-0.07
	-0.09
5	18.40

ISSN-2409-6520

Photon rate of emission: The interpolation difference of these systems is [current: 0.005] and [voltage: 0.046]. The mathematical relationship is as follows. Conventional PVC minus proposed PVC for the current is: Ñ I= [0.007 - 0.002] = 0.005and voltage is Ñ I= [0.02- (-0.026)] =0. 046

e. Interpretation about the UV-glass above the solar cell for sunshine from the upper surface with Plano convex lens for current

Time	mille amp			
1	0.088			
		-0.003		
2	0.084		0.002	
		-0.001		-0.004
3	0.083		-0.002	
				0.007
		-0.003		0.003
4	0.080		0.001	
		-0.002		
5	0.078			

f. Analysis about the UV-glass above the solar cell for sunshine from the upper surface with Plano convex lens for voltage:

Time	mille amp			
1	18.52			
		-0.02		
2	18.50		0	
		-0.02		-0.01
3	18.48		-0.01	
				0.04
		-0.03		0.03
4	18.45		0.02	
		-0.01		
5	18.44			

g. Analysis about the UV-glass above the solar cell for sunshine from the lower surface with Plano convex lens for current:

Time	mille amp			
1	0.090			
		-0.002		
2	0.088		0.001	
		-0.001		-0.002
3	0.087		-0.001	
				0.001
		-0.002		-0.001
4	0.085		-0.002	
		-0.004		
5	0.081			

h. Analysis about the UV-glass above the solar cell for sunshine from the lower surface with Plano convex lens for voltage:

Time	mille amp			
1	18.44			
		-0.03		
2	18.41		0.02	
		-0.01		-0.02
3	18.40		0	
				0.02
		-0.01		0
4	18.39		0	
		-0.01		
5	18.38			

VII. CONCLUSION

This study investigates the value of concentrated UV-glass over Photovoltaic cell PVC. PVC really helps to consume more photons per unit time and consumed more electric energy. Our expected system is easy and cheap to introduce at any possible PVC; it will be a key point of the success of our research. The analysis reveals that the result of interpolation for the UV-glass from the upper surface [Current: 0.007 and voltage: 0.04] and lower surface [Current: 0.001 and voltage: 0.02]. The reason behind this action concentrates on the light; in fact, the absorption of photons by over PV cells using UV-glass. Further experiments are underway in brief of our group will create an effective inorganic photovoltaic unit, we exceed our proposed PVC.

ISSN-2409-6520

ACKNOWLEDGEMENTS

Authors are grateful to the Department of Computer Science and Information Technology, Institute of Business & Technology-IBT & Institute of Business Management-IOBM, Karachi, Pakistan to carry out this work.

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