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The Change of Solar Cells Performance Due to the Change of Light Wave Length

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Abstract
The effect of changing light wave lengths on the solar cell performance was studied using wave lengths, 450,550, 600, 850, 900 and 1000nm, which are exposed to the cell. It was found that the maximum produced current and the cell efficiency decrease upon increasing the wave length. These results conform with the theoretical relation, which shows that increasing the wave length, increases photon energy which in turn increases the current which increases the cell efficiency.
Key words*: wave length, solar cell, maximum current, photon, efficiency.*

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I. Introduction

Solar cell is the most popular transducer that convert solar energy to electrical energy. The importance of electrical energy comes from the fact that it is come from the fact that it is the most desirable preferable energy from[1]. This is since it can be convert to easily to light, heat, mechanical energy [2]. This requires search for stumble to people the most suitable available source is the solar radiation. One just needs audible convert to convert it to suitable energy form,the most popular form is electricity. Thus the suitable converter is the solar cell which converts radiation to electrical energy[3]. The earliest attempts certain use silicon crystals doped with certain special material.[4]. Attempts based on nano science tries to used cheap low cost materials [5]. There is big hope that this new trend succeeded in fabricating low cost efficient solar cell. Thus the researchers aim is to solve two main problems the first one is the efficiency problem and the second is the cost problem [6]. Many papers have been published to see how to improve cell performances. One of them to see the effect of energy gap and absorption coefficient on the cell efficiency [7]. Some papers are also can corned with the effect of doping or changing polymer type on the cellperformance. Most of these works shows that the doping changing energy gap and absorption coefficient which in turn changes the efficiency [8]. To see how the wave lengths range affect solar efficiency [9]. This may enable introducing and depositing nano materials that can modify the wave lengths to be in the active range [10].

This paper is concerned with studying the effect of changing visible light wave lengths with the solar efficiency so as to that gives maximum efficiency. Materials and Methods are presented in section 2. Section 3, 4, and 5 are devoted for results, discussion and conclusion.

II. Materials and Methods

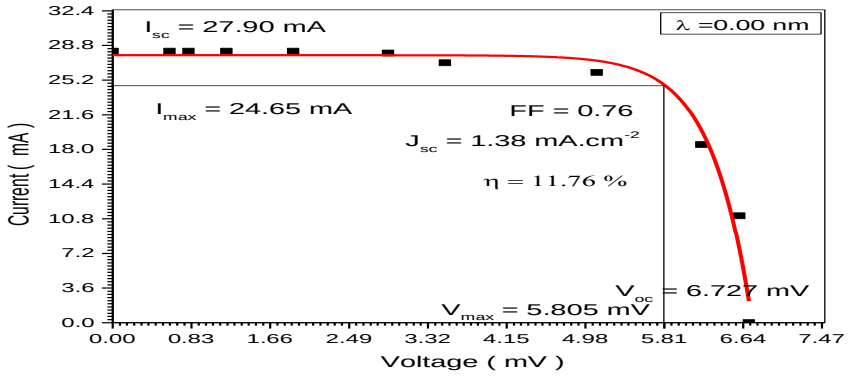
To perform this experiment are, light filters, Purple, Blue, Red, Green and Yellow and Solar Panel model of 36wppower capacity its size was also found2.0m by7.5m.Sunlight contain energy and when sunlight touches an object, it can be transformed into a different type of energy, the system consist of moon crystalline solar module of 36w power capacity mounted on stand that can be adjusted for optimum title and exposure to light Different colors of light have different wavelengths and light that we can see is called the visible spectrum, colored filter it means it exposed to alight of specified wave length shorter for green and longer for red, the photovoltaic solar module was covered with different color filters and changes in panel voltage and current out puts measured and recorded Seven color filters of different transmittance were used red, yellow, orange, white, green, blue,and violet light. Usingad ammeterandDCvoltmeter, $\boldsymbol{V_{oc}}$ and $\boldsymbol{I_{oc}}$solar paneled is measured as series.

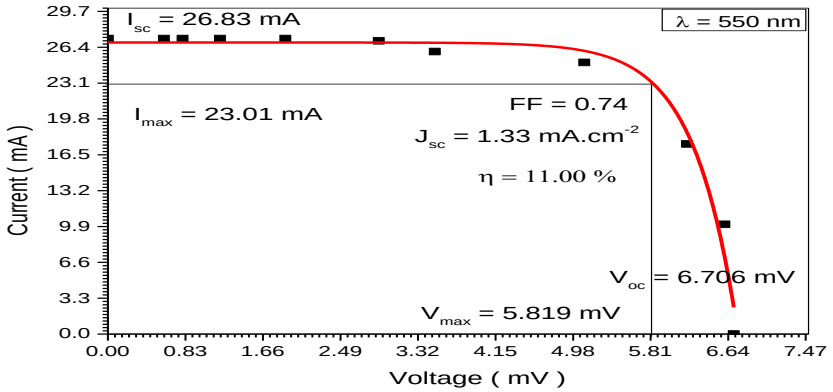
III. Results and Discussion

The result has been given in table 1 and figuer5.1 therefore, it is better not to has been used colored solar lights.

Table 1: wave lengths, 450,550, 600, 850, 900 and 1000nm

Voltage (mV)	Current (mA) Without Filter	λ = 450 (nm)	λ = 550 (nm)	λ = 600 (nm)	λ = 850 (nm)	λ = 450 (nm)	λ = 450 (nm)
0.0	28.2	27.7	27.2	26.7	26.2	25.7	25.3
0.6	28.2	27.7	27.2	26.7	26.2	25.7	25.3
0.8	28.2	27.7	27.2	26.7	26.2	25.7	25.3
1.2	28.2	27.7	27.2	26.7	26.2	25.7	25.3
1.9	28.2	27.7	27.2	26.7	26.2	25.7	25.3
2.9	28.0	27.5	27.0	26.5	26.0	25.5	25.0
3.5	27.0	26.5	26.0	25.5	25.0	24.5	24.0
5.1	26.0	25.5	25.0	24.5	24.0	23.4	23.0
6.2	18.5	18.0	17.5	17.0	16.5	16.0	15.5
6.6	11.1	10.6	10.1	09.6	09.1	08.6	08.1





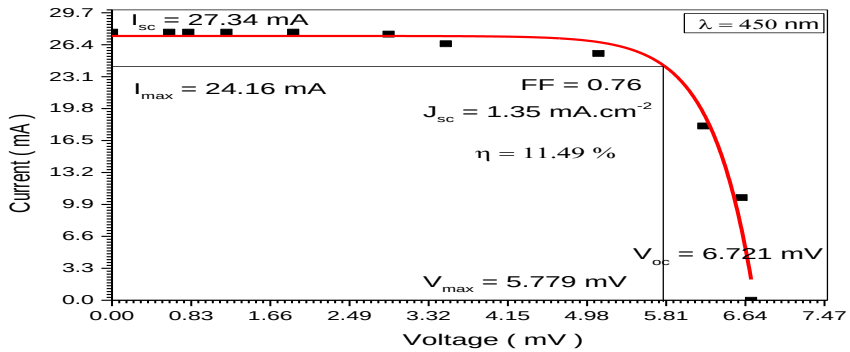
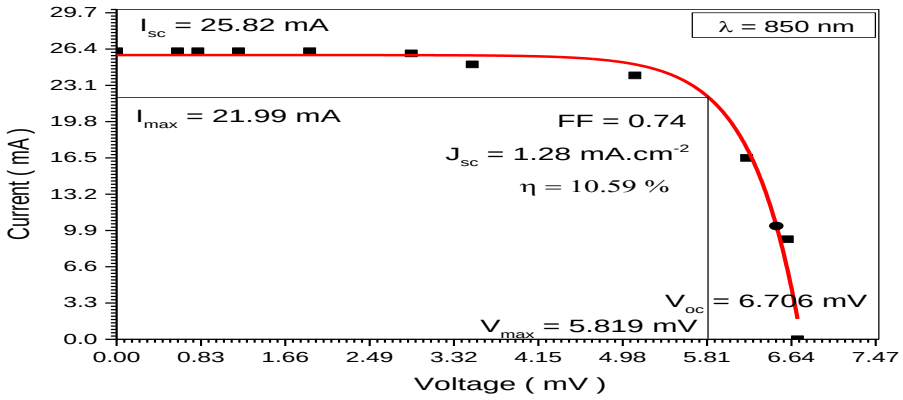
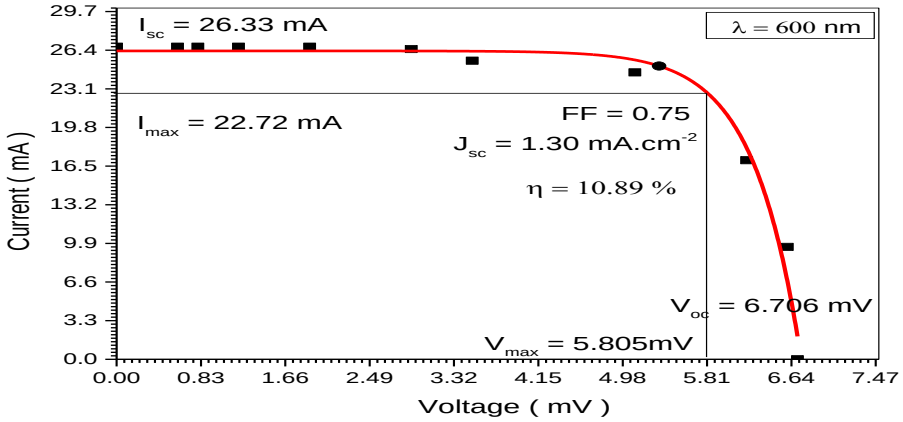
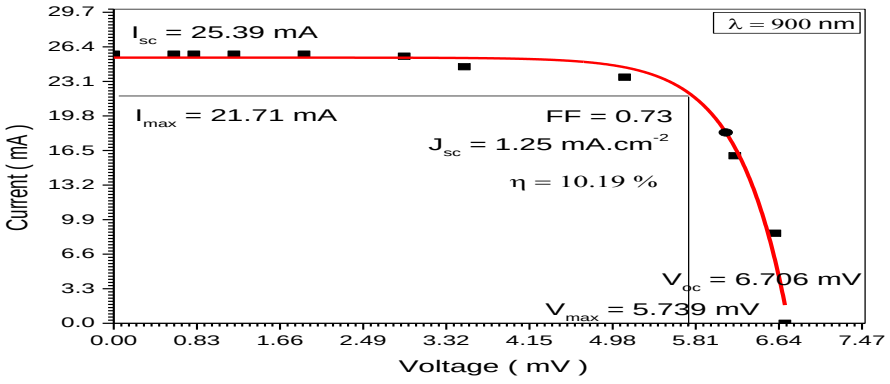


Figure 1, 2 and 3: Wave lengths 0.00 nm, 450 nm and 550 nm







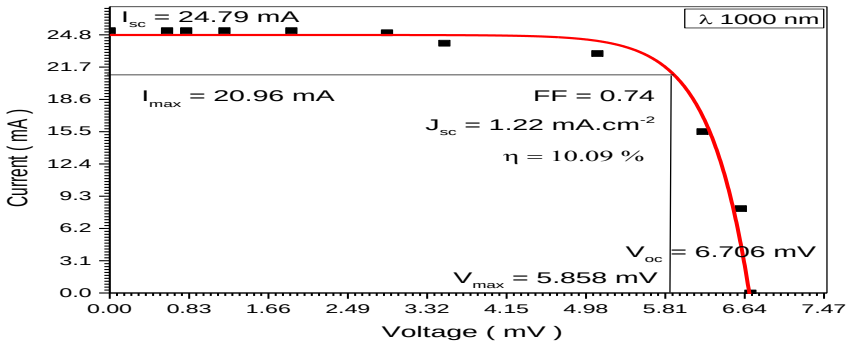


Figure 4, 5, 6 and 7: Wave lengths 600 nm, 850 nm, 950 and 1000 nm

According to table(1)it clear that increasing light wave length decreases maximum generated current. This is related to the theoretical relation, where increasing wave lengthdecreasing I_{m}. The short circuit currentI_{sc}approximately equals the photo generated current according to the photo generated current relations. Itis clear from table (2) that increasing light wave length decreasing I_{sc} . This is since increasing wave length decreases photon energy andliberated electron kinetic energy which is proportional to the electron speed. This in turn decreases the maximum generated current the cell efficiency decreases as for as the maximum current increases. This is since the efficiency is proportional to the maximum current of change of cell performance with wave length.

Table 2: Results

Wave length	I_{sc} **(mA)**	I_{max} **(mA)**	V_{max} **(mV)**	V_{oc} **(mV)**	**FF**	J_{sc} **(mA/cm^2)**	**η %**
0	27.90	24.65	5.779	6.727	0.76	1.38	11.76
450	27.34	24.16	5.779	6.779	0.76	1.35	11.49
550	26.83	23.1	5.819	6.706	0.74	1.33	11.02
600	21.30	22.72	5.80	6.706	0.75	1.30	10.89
850	25.82	21.99	5.81	6.706	0.74	1.28	1o.59
900	25.39	21.71	5.739	6.706	0.73	1.25	10.19
1000	24.79	20.96	5.80	6.706	0.74	1.22	10.09

IV. Conclusion

Thework done indicates that the change of wave length change the solar cell efficiency provided that the number of photons are nearly the same for all wave lengths.Italso affects the output current.increasing wave length decreases efficiency and current at maximum power.

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