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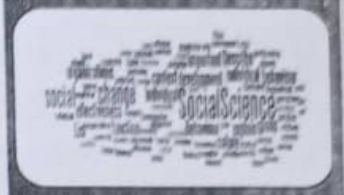

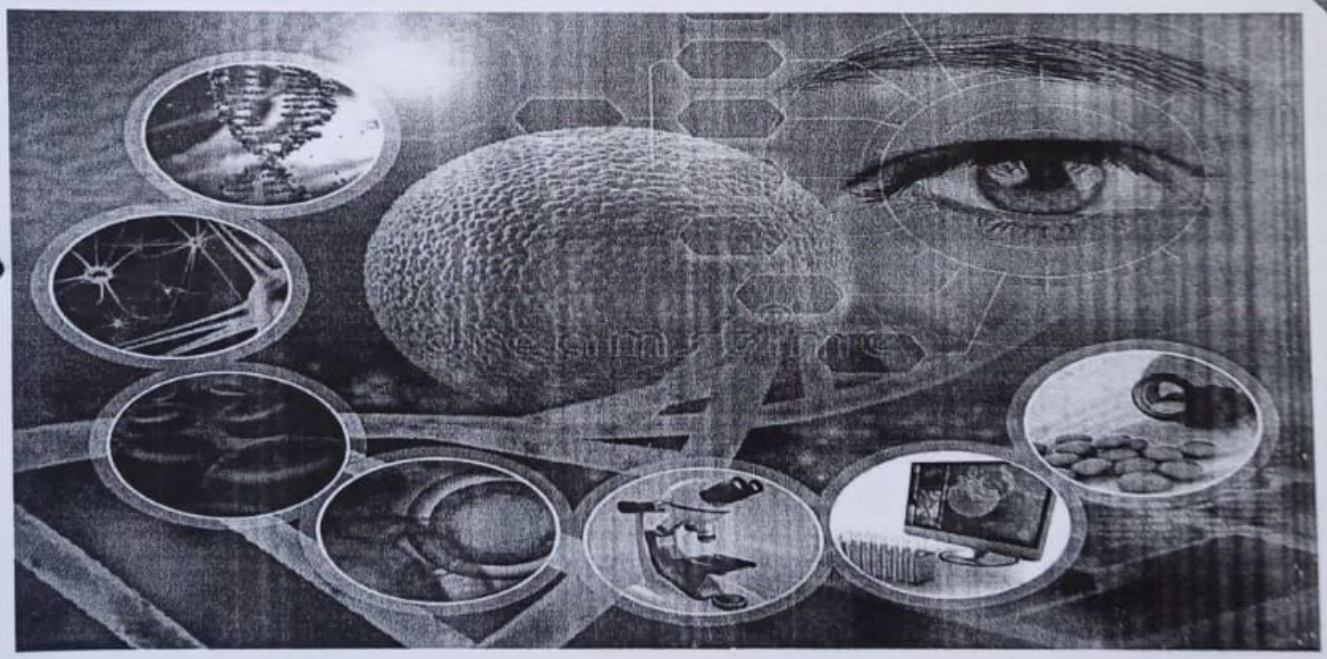

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Hanuman Shikshan Prasarak Mandal's

LATE RAMESH WARPUDKAR ARTS, COMMERCE AND SCIENCE COLLEGE,

Sonpeth, Dist. Parbhani (MS) India

Jointly organized

One Day International Multi disciplinary Conference (Blended Mode)

on

"Recent Advancements in Commerce & Management, Innovation & Entrepreneurship, Science & Technology, Pharmacy & Health, Humanities & Social Sciences, Education & Environment"

Date: 20 April, 2022

Certificate of Participation

This is to certify that, Prof./Dr./~~Mr./Mrs./Miss~~ C. J. Kadam

of Maharashtra Mahavidhyalaya, Nilanga Has actively participated in One Day International Multidisciplinary Blended conference on, "Recent Advancements in Commerce & Management, innovation & Entrepreneurship, Science & Technology, Pharmacy & Health, Humanities & Social Sciences, Education & Environment" in Online/Offline mode and presented his/her research paper entitled as "Study of Variation of Sunlight Intensity with Time".

Hence certified.

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Assistant Professor & Convener, Maharashtra Mahavidyalaya, Nilanga	Assistant Professor & Convener, Maharashtra Mahavidyalaya, Nilanga	Professor & Convener, Late Ramesh Warpudkar ACS College, Sonpeth, Dist. Parbhani	Principal & Organizing Secretary, Late Ramesh Warpudkar ACS College, Sonpeth, Dist. Parbhani	Principal & Organizing Secretary, Maharashtra Mahavidyalaya, Nilanga

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Table No.2

Sr. No.	11:00 am			12:00 pm			1:00 pm		
	Voltage V(Volts)	Current I (mA)	Power Max	Voltage V(Volts)	Current I (mA)	Power Max	Voltage V(Volts)	Current I (mA)	Power Max
1	2	232	464	2	254	508	2	241	482
2	4	217	868	4	227	908	4	203	812
3	6	198	1188	6	193	1158	6	171	1026
4	8	92	736	8	72	576	8	63	504
5	10	68	680	10	45	450	10	37	370
6	12	56	672	12	18	216	12	27	324

Figure 2: V-I characteristics of solar panels in the time range from 11:00 am to 1:00 pm.

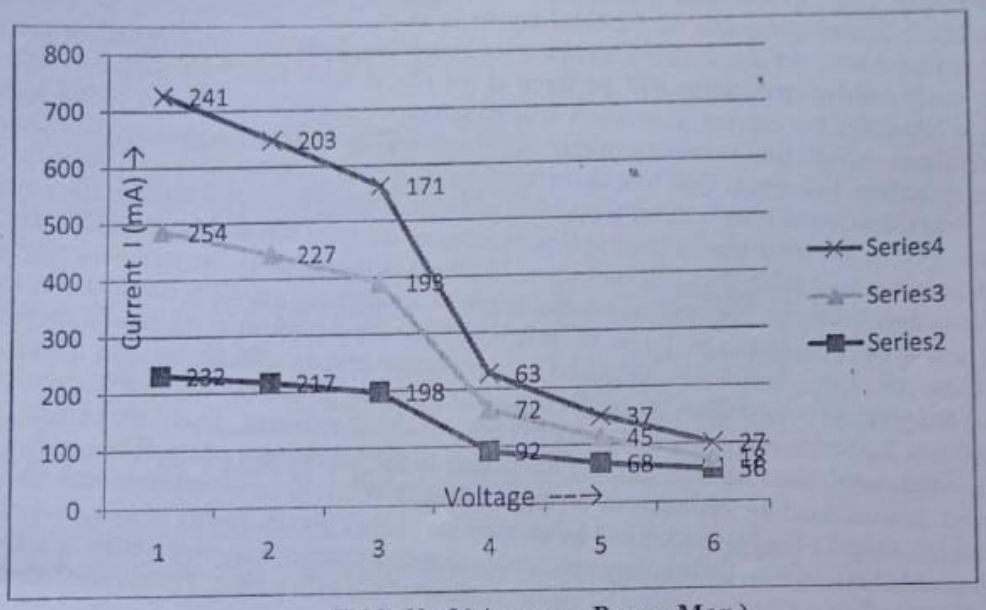
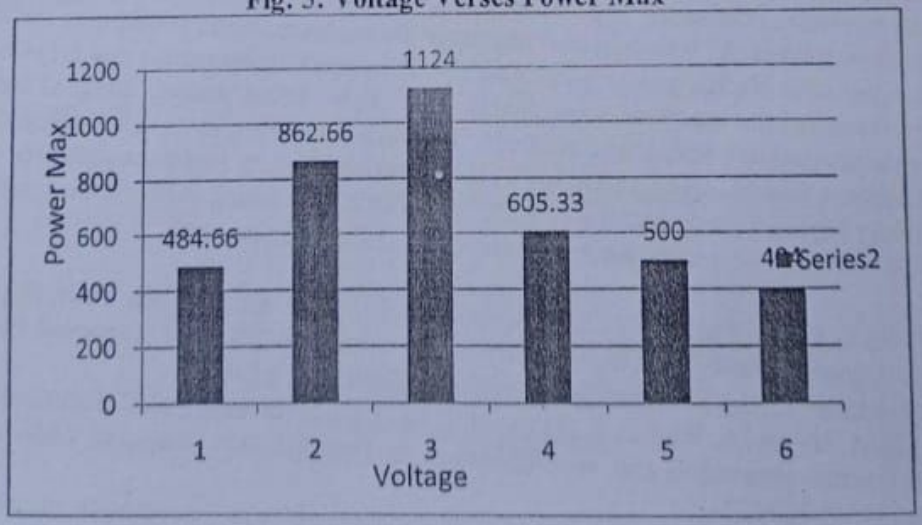


Table No.3(Average Power Max)

Sr. No.	Time(hrs)	Voltage V(Volts)	Power Max(mW)
1	11:00 am	2	484.66
2		4	862.66
3		6	1124
4		8	605.33
5		10	500
6		12	404

Fig: 3: Voltage Verses Power Max



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Study Of Variation Of Sunlight Intensity With Time

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Abstract: Investigation on the sunlight intensity impact & ambient temperature on the inorganic so panels in summer season , 18th Feb-2020 at Latur city , Maharashtra state , India was carried out. It w noticed that the max power (P_{max}) point is shifting up (increased) by the proceeding of time from 08:00 a To- 5:00 pm. Beyond 12 pm the intensity of sunlight showed a non-monotonic behavior, because of chan of sun position and the direction at which the surface of the panel is illuminated. The effect of sunlig intensity on the electrical parameters of the solar panels is elaborated. V_{oc} (Open circuit voltage) remai unchanged where as I_{sc}(Short circuit current) shows increment of its value because of the fact that char carriers acquire enough kinetic energy to move towards their electrodes before they replace or recombi together. Efficiency decreases with the increase of temperature so that, Fill Factor showed a reverse trend increment with the increase of temperature.

Keywords:Sunlight intensity, ambient temperature , fill factor, inorganic solar panels,Short-circuit curre ,Open-circuit voltage , Monotonic.

Introduction:

Solar power is amazing. On average, every square meter of Earth's surface receives 163 watts solar energy.A gigantic power station in the sky up above us, sending out clean, non-stop energy for free. T Sun, a seething ball of nuclear power, has enough fuel onboard to drive our Solar System for another fi billion years—and solar panels can turn this energy into an endless, convenient supply of electricity.T energy the Sun sends out arrives on Earth as a mixture of light and heat. Both of these are incredibl important—the light makes plants grow, providing us with food, while the heat keeps us warm enough survive—but we can't use either the Sun's light or heat directly to run a television or a car. We have to fi some way of converting solar energy into other forms of energy we can use more easily, such as electrici And that's exactly what solar cells do.A solar cell is an electronic device that catches sunlight and turns directly into electricity. It's about the size of an adult's palm, octagonal in shape, and colored bluish bla Solar cells are often bundled together to make larger units called solar modules, themselves coupled into ev bigger units known as solar panels. The cells in a solar panel are designed to generate electricity. A so panel's cells generate power by capturing sunlight. They are sometimes called photovoltaic (PV) cells becau they use sunlight ("photo" comes from the Greek word for light) to make electricity (the word "voltaic" i reference to Italian electricity pioneer Alessandro Volta, 1745–1827).Most cells convert about 10–20 perc of the energy they receive into electricity. A typical, single-junction silicon solar cell has a theoreti maximum efficiency of about 30 percent, known as the **Shockley-Queisser limit**. That's essentially becau sunlight contains a broad mixture of photons of different wavelengths and energies and any single-junct solar cell will be optimized to catch photons only within a certain frequency band, wasting the rest. Some the photons striking a solar cell don't have *enough* energy to knock out electrons, so they're effectiv wasted, while some have too much energy, and the excess is also wasted. The very best, cutting-ed laboratory cells can manage just under 50 percent efficiency in absolutely perfect conditions using multi junctions to catch photons of different energies. When we place a layer of n-type silicon on a layer of p-ty silicon, a barrier is created at the **junction** of the two materials. If we shine light onto the sandwich, phot enter our sandwich, they give up their energy to the atoms in the silicon. The incoming energy knoc electrons out of the lower, p-type layer so they jump across the barrier to the n-type layer above and flow around the circuit. The more light that shines, the more electrons jump up and the more current flows.This what we mean by photovoltaic—light making voltage.The inorganic semiconductor materials used to ma photovoltaic cells include crystalline, multicrystalline, amorphous, and microcrystalline Si, the III compounds and alloys, CdTe, and the chalcopyrite compound, copper indium gallium diselenide (CIGS). Inorganic photovoltaic cells utilize crystalline elements as a light absorber, organic photovoltaic cells util molecules or polymers to convert sunlight into electricity.

There are 3 types of solar panels primarily used in the solar industry:

1. Monocrystalline solar panels.
2. Polycrystalline solar panels.
3. Thin film (amorphous) solar panels.

A typical organic solar cell consists of two semiconducting layers made of plastic polymers and other flexible materials. The cell generates electricity by absorbing particles of light, or photons. This continuous movement of electrons from hole to hole produces an electric current.Solar panels available in the market are made from inorganic semiconductor materials, of them approximately 85% are based on crystalline silicon]. Silicon can offer many advantages like high crystal quality, stability, non-pollutant, and ideal band gap g=1.11 eV) for solar energy absorption [1]. If the light intensity and temperature of the environment anges, the solar cells performance will be affected. i.e. , the response of the absorbent layer in solar cells is anged in terms of charge carrier generation and recombination[2].when it is subjected to the variation of ht intensity and temperature. Light intensity is changed daily due to the rotation of the earth around its own is, and seasonally due to the rotation of the earth around the sun [3]. Solar panels are made from regularly anged arrays of solar cells interconnected together according to the required voltage and current. Little ention has been paid on the practical investigation of inorganic solar panels under different sunlight nsities and temperatures in outdoor situations. Therefore, in this research work we investigate the effect of light intensity and ambient temperature on the electrical performance of inorganic solar panels based on icon. The solar panels are installed in an outdoor condition in Latur city, located in Maharashtra state, dia.

ethodology:

Two small silicon based solar panels (Leybold Didactic GMBH) with dimension of 25×25 cm2 nected in series were installed on the roof of a home building specified for the investigations. The panels e inclined 36 degrees due south and a light meter was used to measure the light intensity, accordingly. o digital multimeters were utilized to measure the current and voltage produced by the panels, while a iable resistor (1 Ω to 100 kΩ) was connected as a load and a thermometer was used to measure the ient temperature. The maximum power (Pmax) delivered from the solar panels and the fill factor (FF) e calculated by the following equations:

$P_{max} = V_{mp} \times I_{mp}$(1)

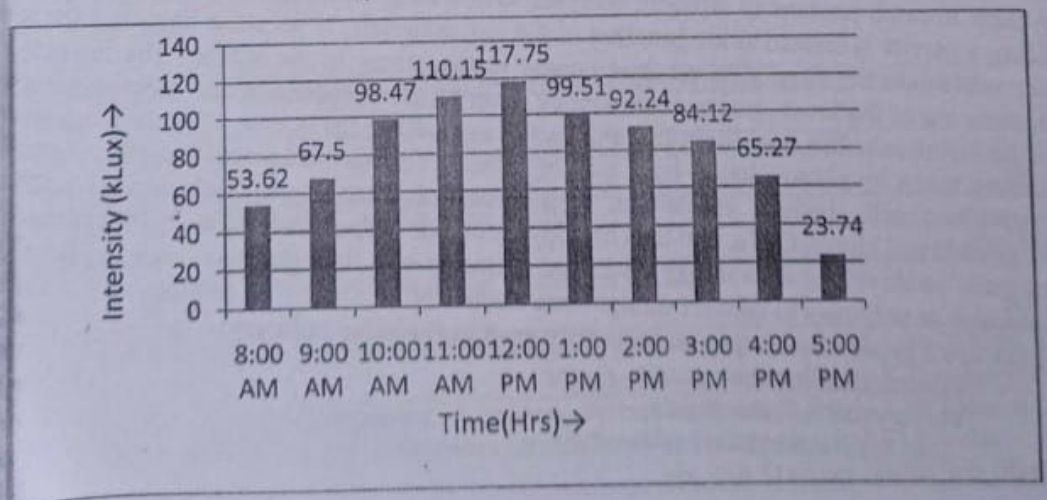
$FF = P_{max} / (V_{oc} \times I_{sc})$ (2)

Where, Isc and Voc are short-circuit current and open-circuit voltage of the solar panels, pectively.

Table No.1

Sr. No.	Time(hrs)	Intensity(kLux)
1	08:00 am	53.62
2	09:00 am	67.5
3	10:00 am	98.47
4	11:00 am	110.15
5	12:00 pm	117.75
6	01:00 pm	99.51
7	02:00 pm	92.24
8	03:00 pm	84.12
9	04:00 pm	65.27
10	05:00 pm	23.74

Figure 1: The intensity of sunlight versus time from 8:00 am to 5:00 am.



s And Discussion:

Graph is plotted between intensity of sunlight and time from 8:00 am –to-5:00 pm recorded on 18th 020. Bar graphs shows that as the time increases from morning 8:00 am to noon 12:00 pm, sunlight ity is continuously increasing and the highest peak is obtained at 12:00 pm i.e. the maximum sunlight ity is obtained as 117.75 kLux. Further after past meridian it is seen that the intensity goes on sing making the intensity spectra to show a non-monotonic change behavior. This is because of the tion of the sun , position of the sun and the direction at which the surface of the solar panel is nated. [4]. From this we can predict that the quality of electrical power generated by the solar panel will h/good ,iff , the solar intensity is high/good.Voltage verses current characteristics are drawn in the fig.2 e solar panel in the Fig.2 , of the solar panel under investigation at three different times on 18th Feb- It is found that the current generated by the solar panels at 12:00 pm was increased by the preceding 11:00 am(before noon). As the sunlight intensity increases the photo electron generations are also sed[5] , and hence current generation will be large at the output load. After past meridian with the se in sunlight intensity, the current generation also decreases. The shape of the V-I curves at three nt irradiation times defines the inherent property of bilayer solar cells where a knee position on each is definitely presented [6]. From this V-I characteristics it is seen that the production of maximum point (P_{max}) at the external load is exactly matched with the internal resistance of the solar panel [7]. e power generated by the solar panels used in this experiment for three different times is recorded. It is that the maximum power point (P_{max}) at mid noon 12:00 pm is increased by the preceding time 11:00 meridian time 1:00 pm. The highest reachable power for the solar panels is considered to be mid pm), and it was counted to be 1.124 W. It is noted that the increment in the maximum power is and there are some deviations compared to the regular change of time because of secondary mbient temperature acting upon the performance of the solar panels.The electrical parameters V_{oc} voltage), I_{sc}(Short circuit current) and FF(Fill Factor) are studied. Study shows that the V_{oc} tively unchanged, because it is directly correlated to the energy gap of the P-N junction active is very less affected by variation of sunlight intensity.Whereas I_{sc} increases towards its value , e charge carriers (Free electrons and holes)acquire enough kinetic energy to move towards their ng electrodes effectively before they recombine together.Surrounding temperature is also one of hich shows effect on the generation of electric power of the solar panels. Temperature changes are morning and evening because of the wind , cloud and sun position.Fill Factor is the ratio of btainable power to the product of V_{oc}&I_{sc} . Higher the value of fill factor , better is the of solar panel. It was found that there are no any changes seen in the fill factor (FF) for the perature 10^0C to 36^0C . FF also shows increment in its value , for the increase in the ambient

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e study of variation of sunlight intensity and ambient temperature effect with the inorganic solar Latur city , Maharashtra state, India , was carried out on 18th Feb-2020. Maximum sunlight s attained at mid noon (12:00 pm) and then it is decreased showing non monotonic behavior after he maximum sunlight intensity was recorded as 117kLuxat 12:00 pm. This can be ascribed with of sun position , orientation and its directionat which the surface of the panel is illuminated. As intensity is increased , which in turn increases the photoelectrons , resulting in the increased load maximum solar electric power generated b y the inorganic solar panels was 1.124W at 12:00 pm. l parameters of the inorganic solar panels V_{oc} ,I_{sc}& FFare studied. Study of these parameters V_{oc} remains relatively unchanged whereas I_{sc} shows increment in its value which can be ascribed ge carriers (free electrons and holes) acquire enough K.E. to move towards their corresponding ffectively before they recombine together. Fill factor FF , which indicates the quality of the solar ed that , its value increases with the increase in ambient temperature.

M. Yin, L. Lu, H. Zhang, X. Chen, X. Zhu, J. Che, D. Li, Silicon Solar Cells: High- Performance nidirectional Thin-Film Amorphous Silicon Solar Cell Modules Achieved by 3D Geometry (Adv. Mater. 42/2015), Advanced Materials, 27 (2015) 6768-6768.

ers, D.M. Balazs, A. Paulke, S. Albrecht, I. Lange, L. Protesescu, M.V. Kovalenko, M.A. Loi, D. Free carrier generation and recombination in PbS quantum dot solar cells, Applied Physics 108 (2016) 103102.

haer, M. Tadros, M. Khalifa, Effect of Light intensity and Temperature on Crystalline Silicon lodules Parameters, in, Citeseer, 2014.

F. Loutre, D. Paillard, F. Vimeux, E. Cortijo, Does mean annual insolation have the l to change the climate?, Earth and Planetary Science Letters, 221 (2004) 1-14.

temperatures. Then normalized susceptibility was obtained from the ratio of (÷/÷ RT) where ÷ RT is room temperature susceptibility. Typical plot of normalized susceptibility (÷/÷ RT) verses temperature is presented in the Figure 2. From this plot it is seen that for magnesium ferrite, the susceptibility slowly increases and reaches peak value with temperature and suddenly drops to zero. The sudden drop of ÷/÷RT curve shows the formation of single phase cubic spinel [8].The increases in susceptibility with peak values suggests there is existence of Multidomain (MD)particles in the material [9]. The peak is found to suppress with substitution of Gd^{3+} in $MgFe_2O_4$ and also Curie temperature (Tc) decreases with Gd^{3+} content. For the composition x = 0.2; y = 0, 0.05 and 0.1, susceptibility is found to be independent on temperature upto Tc and after Tc it suddenly drops to zero. Such nature of curve indicates that the presence of SD particles in the materials [9]. Joshi et al [10] also reported similar behavior in Mg-Zn ferrite system. The compositions with x = 0.4 and x = 0.6 for y = 0, 0.05 and 0.1 shows exponential decrease in susceptibility indicating SD to SP transition. The composition with x = 0.8 and x = 1 with y = 0 , 0.05 and 0.1 shows paramagnetic behavior at and above room temperature.

Curie temperatures (Tc) obtained from susceptibility plots are presented table 1. The Curie temperature measurement of all the samples was also been carried out by the method suggested by Loria- Sinha [11] and also presented in the table 1. These values are found to be in good agreement with the values obtained from temperature dependence of normalized susceptibility. On substitution of Zn^{2+} in $MgFe_2O_4$ Curie temperature found to decrease. This is because substituted Zn^{2+} ion invariably occupies tetrahedral (A) site, resulting into decrease in A-B interactions [12]. The composition with x= 0.8 and 1.00 shows paramagnetic behavior at room temperature, their Curie temperature lies below room temperature. Substitution of Gd^{3+} ion, Curie temperature of each composition is found to decrease. This is attributed to dilution of B-B interaction [12]. On substitution Gd^{3+} ion occupies B-site replacing equivalent Fe^{3+} ions and so also decrease in magnetization at B-site.