

Design of Semitransparent Photovoltaic Cells

Dr.A.Karthick¹, S.Santhosh², J.V.Shyam Vivin³,
B.Selvaganapathy⁴ & M.Suryaprakash⁵

¹Assistant Professor (Sl.G), Department of Electrical and Electronics Engineering,
KPR Institute of Engineering and Technology, Coimbatore, India.

²⁻⁵Department of Electrical and Electronics Engineering,
KPR Institute of Engineering and Technology, Coimbatore, India.

Abstract:

Vitality is fundamental for monetary turn of events and development. With the quick development of improvement and the drive to grow the economy, society requests greater power. Sun based vitality is the most productive technique for vitality catch in nature. The financial drive to make sun based cells more practical and effective has driven advancements in various statement advances, including plunging, plating, thick film affidavit and slender film testimony. Ordinarily, all together for sunlight based vitality to work effectively and flexibly vitality to a structure, a lot of room is required, as housetops or land, so as to introduce sun oriented boards; these sun powered board space necessities are a huge obstacle to functional use. This downside drove specialists to think of straightforward sun powered cells, which tackles the issue by transforming any sheet of glass into a photovoltaic sun based cell.

Keywords: Arduino, Molten salt, Efficiency.

1. Introduction

Lately, the conduits of examination zeroing in on clean sustainable power source have been opened by researchers who believe sun based vitality to be the most plentiful wellspring of vitality that can fulfill society's requests, which come from nonstop financial turn of events. Sun based vitality is in any event used in 4 distinct routes in our every day lives, and this reaches from warming water to creating power [1-2]. Photovoltaic advances are at the head of the rundown of utilizations that utilization sun based force, and gauge reports for the world's sun based photovoltaic power supplies express that in the following 12 years, PV innovations will convey around 345GW and 1081 GW by 2020 and 2030, individually [3]. A photovoltaic cell is a gadget that changes over daylight into power utilizing semiconductor materials. Semiconductor materials empower electron stream when photons from daylight are assimilated and launch electrons, leaving a gap that is filled by encompassing electrons [4-5]. This wonder of electron stream by photon retention is known as the photovoltaic impact. The PV's cell coordinates the electrons a single way, which shapes a current the measure of current is relative to the quantity of retained photons, which implies that PV sun powered cells are a variable current source [6-7]. There are of around 24 models of sun based cell advancements that are produced using various sorts of materials and strategies. This survey paper is essentially inspired by straightforward sun oriented cells. Be that as it may, so as to comprehend the idea of straightforward sun oriented cells, it is critical to clarify the advancement of sun powered cells beginning from the silicon type [8-9]. Though polycrystalline cells have a less impeccable atomic structure that hinders electron stream however are somewhat less expensive to make. Notwithstanding, because of the significant expense of silicon, the market requires new materials and cycles that can give an equal effectiveness, while simultaneously decreasing expenses. The benefit of incorporated photovoltaic over more normal non-coordinated frameworks is that the underlying expense can be counterbalanced by diminishing the sum spent on building materials and work that would regularly be utilized to develop the aspect of the structure that the BIPV modules supplant [10].

2. Proposed System

Expanding the band hole of the semiconductor material is one of the vast majority of wanted properties in DSSC, which raises the significance of the color as a basic piece of DSSC. Color blend can fulfill this by expanding the excitation cycle proficiency and extending the scope of the frequency

of excitation. This aids in engrossing the photons of daylight and produce electrons and gaps. The color is reinforced synthetically to the permeable surface of the semiconductor. The DSSC's proficiency relies upon the properties of the color material, for example, high engrossing and great changing of photons into the last gadget. Nonetheless, the color must meet a few conditions to be legitimate for DSSC use, for example, the retention range must cover the entire noticeable locale including close infrared (NIR) area, the color must have securing bunches so as to tie it to the semiconductor surface, the photosensitized must have a more elevated level of vitality in the energized state level than that of conduction band in the n-type semiconductor, and a more sure oxidized state than the red bull capability of the electrolyte, and it should likewise be steady.

Fig 1. Design Module

Counter cathode (CE) The Counter terminal (CE) assumes a major part in expanding the presentation of the DSSC. A slender film of the anode material, for example, Platinum (Pt) can go about as the reactant layer on the CE side. Pt is utilized as the counter terminal in DSSC because of its high electrochemical movement, high conductivity, electro reactant inclination, and long haul strength, despite the fact that it's an over the top expensive material. What makes a material straightforward is the game plan of iotas and electrons in it. At the point when an electron has a vitality hole equivalent to a photon vitality it retains the photon and moves to a higher vitality level, the electrical force execution of the BIPV-PCM module has been determined for different directions.

3. Literature Review

Execution of straightforward sunlight based cell advances and Sun light is accessible for nothing all over the place, yet the assurance of utilizing this light for sun oriented force is confined to sun powered homesteads and housetop boards. As of late, straightforward sun oriented cells grabbed the eye of researchers because of their assortment of potential applications in our day by day lives [11-13]. Straightforward sun oriented cells are now being used for these applications in certain nations, while others are for the far future, when their productivity is improved. Straightforward sun based cells can change swarmed urban areas from solely power shoppers into power plants [14-16]. Building incorporated photovoltaic's, otherwise called BIPV, is the closest application for straightforward sun based cells. On the off chance that all the structures with 90% glass on their surface utilized straightforward sunlight based cells imprinted on the outside of the glass; the sun based cells can possibly control over 40% of that building's vitality utilization. Another use of straightforward sun oriented cells is in vehicle and electronic gadgets. Sunlight based fueled vehicles are an ideal utilization of TSC, with vehicles, planes, prepares, and vessels conceivably being controlled with sun based vitality's can possibly control all the electronic gadgets that we use in our everyday lives, from tablets, MP3 players, mobile phones, and tablets, to workstations and other versatile gadgets. Straightforward sun oriented materials and hazy materials began to be created in the previous scarcely any years. A few organizations have actualized straightforward sun powered cells with sensible effectiveness yet insufficient to rival silicon sunlight based boards [17-18]. In any case, this development has a high capability of transforming each glass surface in the serious world into a sun oriented board. Analysts are currently attempting to improve the effectiveness of TSC without yielding straightforwardness; this is relied upon to be accomplished in the following 5 years. The effects of the phase change material filled glass window (PCMW) on building 16 energy consumption in the hot summer and cold winter area of China, dynamic heat transfer process and heat transfer parameters of the PCMW and the hollow glass window (HW) exposed to different non-steady boundary conditions related to the climatic characteristic were investigated. Although any increase in PV performance has an associated decrease in ST performance, a practical and worthwhile compromise can still be achieved. This paper demonstrates that there is considerable scope for experimental realization of the combined PV/ST/PCM system particularly if this is coupled with the development of PCMs with tunable melting points and high thermal conductivity [19]. The experiments and the numerical simulations in a representative sunny summer day were conducted, and the results were in good agreement. Based on an updated mathematical model, theoretical simulation has been conducted for BIPV-PCM in this case. Furthermore, field testing for this case has

also been performed to validate the model, and then the simulated and experimental results are compared and found in considerably good agreement.

4. Hardware Description

A. Arduino UNO

Arduino Uno is a miniature regulator board dependent on 8-piece ATmega328P microcontroller. Alongside ATmega328P, it comprises different segments, for example, precious stone oscillator, sequential correspondence, voltage controller, and so on to help the miniature regulator. Arduino Uno has 14 advanced information/yield pins (out of which 6 can be utilized as PWM yields), 6 simple information sticks, a USB association, A Power barrel jack, an ICSP header and a reset button.



Fig 2. Arduino UNO

B. Paraffin Chloride

Chlorinated paraffin is integrated by response of chlorine gas with some unbranched paraffin and portions of temperature of 80–100 °C. The radial and they formed different parts of some chemical might be advanced by UV light.

At the point when the ideal level of chlorination is accomplished, buildups some above of hydrochloric corrosive and chlorine are brushed off with nitrogen. Deoxidized vegetable oil, glycidol ether or organ phosphorous mixes might be added to the last item for improved steadiness at high temperatures. Business items have been named substances of obscure or variable composition. CPs is mind boggling blends of chlorinated n-alkenes containing a great many homologues and isomers which are not totally isolated by standard expository.



Fig 3. Paraffin Chloride

C. LCD

A Liquid Crystal Display regularly shortened as LCD is essentially a showcase unit constructed utilizing Liquid Crystal innovation. At the point when we fabricate reality/true hardware based undertakings, we need a medium/gadget to show yield esteems and messages..The most fundamental type of electronic showcase accessible is 7 Segment shows – which have its own constraints. The following best accessible alternative is Liquid Crystal Displays which comes in various size determinations. Out of all accessible LCD modules in market, the most ordinarily utilized one is 16×2 LCD Module which can show 32 ASCII characters in 2 lines (16 characters in 5110 LCD module, 128×64 Graphical LCD Display and 2.4-inch TFT Touch screen LCD display.



Fig 4. LCD

D. PV Cells

Straightforward sun based cells are exceptionally provoking gadgets to create and can possibly be utilized for countless applications. The test lies in the way that straightforwardness naturally clashes with the idea of photonic assimilation. The photovoltaic standard is to assimilate photons and convert these to control, while straightforwardness intends to let through however many photons as could be expected under the circumstances. For draftsmen, just as gear and car fashioners. Photovoltaic's (PV) is the conversion of light into electricity using semiconductor materials that exhibit the photovoltaic, a phenomenon studied in physics, photochemistry, and electrochemistry. In the wake of breaking down these strategies, with various statement methods or to utilize straightforward engrossing materials that retain light in the infrared and UV areas, for example, polymers, perovskite

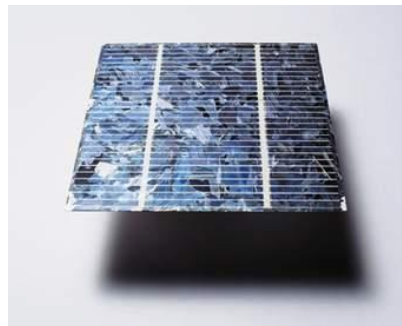


Fig 5. PV Cells

E. Voltage Sensor

An IR sensor can measure the voltage level, that is called a passive IR sensor. This module depends on obstruction point's weight standard, and it can make the info voltage of red terminal lessen multiple times of unique voltage. The maximum Arduino simple info voltage is 5 V, so the information voltage of this module ought to be not in excess of 5 V. Since the Arduino AVR chip have 10 piece AD, so this module reproduction goal is 0.00489 V (5 V/1023), and the information voltage of this module ought to be more than $0.00489 \text{ V} \times 5 = 0.02445 \text{ V}$



Fig 6. Voltage Sensor

F. Acrylic sheet

Acrylic is a straightforward plastic material with extraordinary quality, solidness, and optical lucidity. Acrylic sheet is anything but difficult to manufacture, bonds well with glues and solvents. Acrylic sheet displays glass-like characteristics clearness, splendor, and straightforwardness however at a large portion of the weight and commonly the effect opposition of glass. From sturdy signs and

lookout windows, to eye-getting retail location installations, shows and retire, acrylic plastics give extraordinary adaptability, solidness, and stylish characteristics.



Fig 7. Acrylic Sheet

G. Temperature Sensor

The Temperature Sensor LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. A thermistor is such a resistor whose block is dependent on temperature, more so than in standard resistors. The word is a mix of warm and resistor. Thermistors are extensively used as inrush current limiters, temperature sensors.



Fig 8. Temperature Sensor

H. Silicone Sealant

Silica xerogel is regularly showcased as coarse granules or touches, a few millimeters in separation over. A couple of grains may contain unobtrusive amounts of pointer substance that changes concealing when they have devoured some water. Little paper envelopes containing silica xerogel pellets, typically with a "don't eat" advised, are consistently associated with dry food groups to hold any tenacity that may cause rot of the food. Silica xerogel with a typical pore size of 2.4 nanometers has a strong affection for water particles and is commonly used as a desiccant. It is hard and clear, anyway essentially gentler than enormous silica glass or quartz; and remains hard when drenched with water. It is sometimes used in research office 29 cycles, for example to cover convection in liquids or hinder settling of suspended particle.



Fig 9. Silicone Sealant

5. Result and Conclusion

The glass to glass PV modules with phase changing material are integrated to the windows of the building. For this electrical efficiency and heat gain was calculated and compared. From our project work, we found that if we use glass to glass PV module with phase changing material in the south orientation we can reduce the cooling load of the building optimally. Various temperatures such as glass, cell and back surface temperature for the glass-glass PV

modules with phase changing material while it is integrated with the building was calculated both experimentally and theoretically.

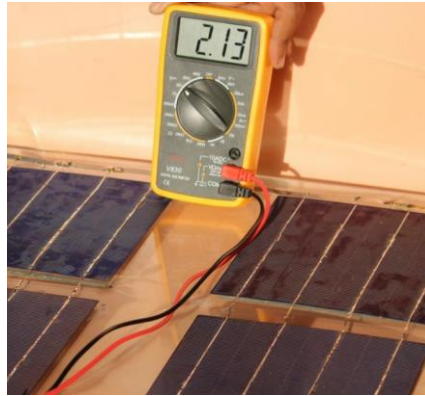


Fig 10. Hardware Setup

The experimental result shows the incorporation PCM on the back surface of the PV module decreases the back surface temperature. The PCM-PV module has the power output of 94.48 Whr on day 1 and 81.27 Whr on day 2 and 87.43 Whr on day 3 with average heat gain of 87.72Whr.

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