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REDUCTION OF REFLECTION LOSSES IN SOLAR PANEL BY USING BN ANTI REFLECTIVE COATING

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ABSTRACT

Direct energy conversion from sunlight to electricity is obtain through solar cells. Efficiency of solar cells is about 23.89% in laboratory and 13.76% commercially. Low efficiency is due to high percentage of optical losses. More than 30% of incident light is reflected back from the surface of single crystalline silicon (Si) solar cells because of the high refractive index of Silicon material. The initial objective of this project is to minimize the reflection losses in solar cells using Anti-Reflective coating (ARC). In solar cell application, a single layer thin film Anti-Reflective coating is often used. But such a single layer Anti-Reflective coating and Double layer Anti-Reflective coating reduces reflectivity only in a limited range. Triple layer Anti-Reflective coatings are therefore widely utilized to improve conversion efficiencies and current density of Si solar cells. Such Triple layer anti reflective coating can eliminate the need for a mechanical tracking device for proper optical alignment of the solar cell with respect to incident sunlight

Keywords: single crystalline silicon, Anti-Reflective coating

INTRODUCTION

Direct energy conversion from sunlight is possible with the help of solar cells. The basic idea of a solar cell is to convert light energy into electrical energy directly or indirectly. Direct method is photovoltaic effect and indirect method is by first converting the solar energy to heat of chemical energy. The most common form of solar cells is based on the photovoltaic (PV) effect Advantage of solar cell is they do not have moving mechanical parts which make them noiseless, reliable, utilization flexible, highly modular, low maintenance, no emission and leading to longer life Silicon is widely used semiconductor material for solar cells. Advantage of Si over other semiconductor devices is due to well-developed microelectronics industry which has considerable knowledge of working with Si. This makes Si a better candidate for solar cells as

Types of solar cell:

- Monocrystalline solar cells
- Polycrystalline solar cells
- Amorphous or thin film solar cells

Monocrystalline solar cells are cut from a silicon ingot grown from a single large crystal of silicon; polycrystalline cells are cut from an ingot made up of many smaller crystals; amorphous solar cells are made by depositing a thin film of silicon onto a sheet of another material such as steel. The panel is formed as one piece and the individual cells are not as visible as in other types compared to other semiconductor material such as gallium arsenide or germanium

The solar cell works in three steps: Photons in sunlight hit the solar panel and are absorbed by semiconducting Materials, such as silicon Electrons are loose from their atoms, causing a difference current starts flowing through the material to cancel the potential and this electricity is captured. Due to the special composition of solar cells, the electrons are only allowed to move in a single direction an array of solar cells converts solar energy into a usable amount of direct electricity

EXPERIMENTAL

The Boron nitride (BN) Thin films were prepared by the ceramic type coating technique. The black colours solvent have absorbs the sunlight and produced electricity in high efficiency output this BN solvent has apply on the solar cell and dry the solar cell up to 2h in the atmospheric condition the solar test on after coating solar cell is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect. It is a form of photoelectric cell which when exposed to light, can generate and support an electric current source, but do require an external load for power consumption and support an electric current source, but do require an external load for power consumption photovoltaic is the field of technology and research related to the practical application of photovoltaic cells in producing electricity from sunlight In such cases the cell is sometimes used as a photo detector, detecting light or other electromagnetic radiation near the visible range or measuring light intensity

Multi-Meter: A multi meter. Or a multi tester also known as a VOM (Volt-Ohm meter), is an electronic measuring instrument that combines several measurement functions in one unit. A typical multimeter would include basic features such as the ability to measure voltage, current, and resistance. Analog multimeters use a micro meter whose pointer moves over a scale calibrated for all the different measurements that can be made. Digital multimeters display the measured value in numerals, and may also display a bar of a length proportional to the quantity being measured. Digital multimeters are now far more common than analog ones, but analog multimeters are still preferable in some cases for example when monitoring a rapidly- varying value. A multimeter can be a hand-held device useful for basic fault finding and field service work, or a bench instrument which can measure to very high degree of accuracy. They can be used to troubleshoot electrical problems in a wide array of industrial and household devices such as electronic equipment, motor controls, domestic appliances, power supplies and systems multimeter

Specification of the coating material: Increasing the coating layers that has to increase the performance of the solar cell. Increasing coating layers the compare to the normal solar cell life time is high. When increasing the layers the cost also reduce.

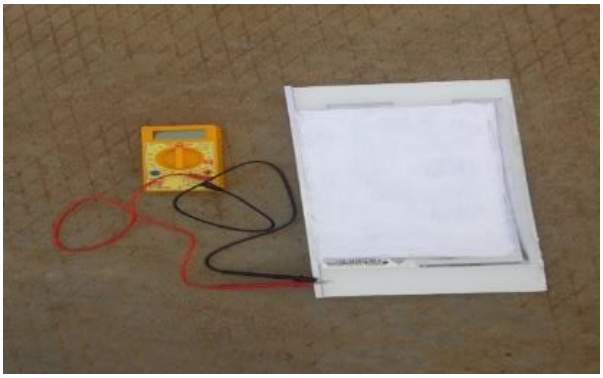

Figure.1.Coated BN Solar Panel

RESULT AND DISCUSSION

All the cell parameters improved. The increasing in fill factors is due to the improvements in paste contact. The blue response of the cell improved indicating that the efficiency of the solar cell. There was significant change in the cell efficiency of uncoated solar cell The Uncoated performance the efficiency of the solar cell performance has increased in the peak level time. The solar cell has tested on day by day. Due to the sunlight the performance of the solar cell has varied day by day silicon oxide antireflection coating can be used to improve short circuit current in etching of silicon solar cells. The improvement in Iscin solar cells further confirms that the etching of surface passivates. The use of the evaporation, for the deposition of an antireflection coating of sio on silicon solar cells, proved to be the deposit effect of the characteristic of the deposition technique and of the nature of the silicon surface. The use of the chemical spray technique for the deposition of an antireflection coating of Tio2 on silicon solar cells, proved to be the deposit effect of the characteristic of the deposition technique and of the nature of the silicon surface

The increasing in fill factor is due to the improvement in paste contact. The blue response of the cell improved indicating that the efficieny of the solar panel. There was siginificant change in the cell efficiency of coated solar cell the coated for BN performance efficiency of the solar cell performance had increased in the peak level time. The solar cell has tested on day by day. Due to the sunlight the performance of the solar cell has varied day by day. Compare to uncoated performance the coated cell performance has improved in the solar cell efficiency 2.62 % has improved in the BN coated. The fill factor has also improve. In the BN coated method the bluecolour represent the Current. The green colour represent the Voltage andredcolour represent the Power values

Voltage (Voc)	Current (ISC)	power	FF %	Efficiency
14	2.8	39.2	0.85	22
15	2.5	37.5	0.93	21.75

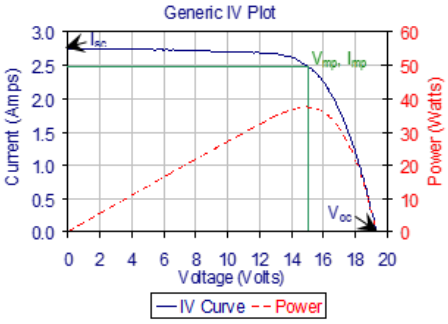

Figure.2.Voltage vs Current,

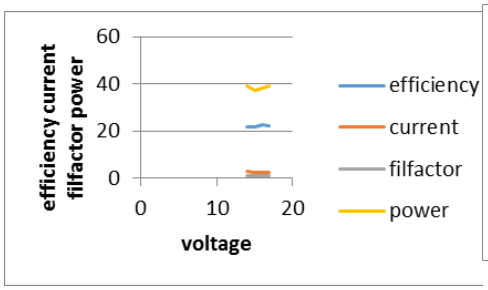

Figure.3.Voltage vs Efficiency current, power fill factor

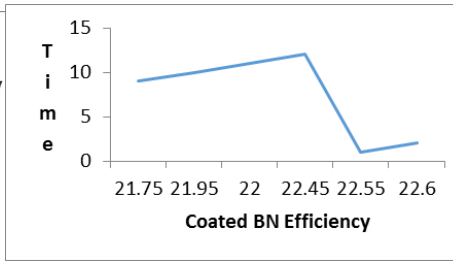

Figure.4.Time vs Coated BN Efficiency

Figure.2.plot of current verses voltage for a solar cell module power is the product of the current times voltage. The power scale is on the right. The voltage andcurrent where their product produce the most power is called the max power point andVmp and Imp are the max power voltage and current respectively. Short circuit current is label disc and open circuit voltage is labeled Voc

The load on the circuit determines the voltage and current. Depending on the position on the IV curve, an increase in load can increase or decrease the power output by the solar cells. Doubling the number of cells will generally increase the power, but the power increase will depend on the current and voltage dictated by the load. Modern inverters contain max power point trackers that adjust the perceived load to operate the facility at maximum possible output. A photovoltaic system connected to The utility grid contains an inverter that changes direct current and voltage from the solar array toalternating current that is available on the utility grid.

CONCLUSIONS

The commercial cell process was developed to substantially increase the cell performance of polycrystalline silicon solar cell. These improvements in cell performance lead to higher wattage products Advantage to further increase the efficiency are being investigated the reflectivity of BN material is very high. The reflectivity of uncoated material is low camper to BN. The antireflective coatings are used to reduce the reflection loss and increase the efficiency of the solar module. So it is therefore widely utilized to improve the conversion efficiencies of Si Solar cells. This project concluded the optimum condition for a BN reflective coating and its influence on improving the conversion efficiency of Si Solar cells. This journal concluded the optimum condition for a BN Reflective coating and its influence on improving the conversion efficiency of Si Solar cell. It is illustrated that this triple layer Anti- Reflective Coating can increase the efficiency 2.62% and 0.75 % of solar cell. Moreover these Anti-Reflective coating

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