Study the Effect of Doping Ratios the n-type Silicon SWCNTm / PLA on Solar Cell Efficiency

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Abstract

In this work, SWCNTm / PLA was employed as a fundamental compound, and nanofilms of SWCNTm / PLA were coated onto n-kind silicon substrates. The spin coated technique was used to determine the thickness in (SWCNTm / PLA). Various thicknesses in (SWCNTm / PLA) (162, 100, and 82) n.m are procured via at vary spin spades (1500, 3000, and 4500) r.pm.' light (100 mw/cm2) and dark (J-V) requirements were used to produce the current denisity-volt features. The characteristics of the photovoltaic models namely, open circuit voltage (Voc), short–circuit current density (Jsc), foll ratio (FF), and energy conversion efficiency (ŋ) were calculated. The better thickness of (SWCNTm / PLA) films for highest (ŋ), (Jsc) and greatest power point presentation' is 100 n m, according to our findings.

Key Words: SWCNTm, PLA, Nano-films, Efficiency (ŋ).

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Introduction

'Mixed polymer "solar cells' are a 'successful photovoltaic system' with ecologically stable manufacturing, law costs, and a wide applications ("Beek WJ et al, 2005"). A 'solar' cell is a big- zone p-n circuit designed to transfers sun-light to electricity. The device's performance is affected by the photovoltaic impact, at use of solar cells (Lee YJ e t *al*, 2009). Fig, illustrates (I_V) features of a 'solar' 'cell' Darkness and light (Oman et al, 1999).

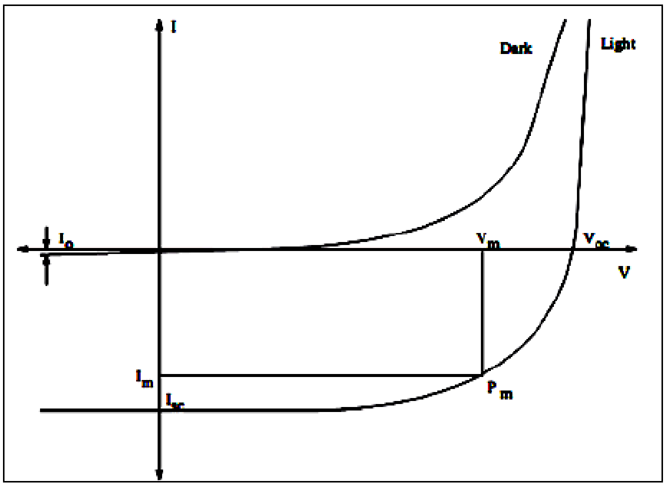

Fig. 1. I–V Curve Dark, Illumination

Muech examine is carry during the past few years to obtain new polymeric materials with enhanced specific properties.

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Conductive polymers are of great interest based on their potential technical application. After synthesizing polymers from new monomers, they have concentrated on hetero phasic polymer systems such as composites, polymer materials and graft copolymers (Kazmerski, L 1980). These materials are being utilized as active materials in energy storage ("E.W. Paul, et al, 1985) display, microelectronics industry and photo applications (A. Kitani, J. et al 1986, R. Kullsh, et al 1992, C.Y. Chao, et al 2002 and M.K. Ram, at al 1997).
Since 1992, Saricftic has discovered ultra-fast charge transfer in p-conductive polymer/fullerene composites (N.S. Sariciftic et al 1992, G.Yu et al 1994). Various donor-acceptor type polymer solar cells (Lidan Wang et al, 2021) have been successfully developed. Organic/Inorganic Heterojunctions Solar cells are a good alternative to reducing costs and simplifying battery manufacturing processes (Krebs FC et al, 2008). Inspeafic poly (o-Toluidine) (POT) has received great 'interest. It"s intriguing 'electro-chemical' properties. The polymer can prepared via many method by metal ions in an aqueous solution (A. Kitani et al, 1986).
SWCNTm / PLA is a PANI derivative' in which a CH3 group is contained diriection on aromaetic circle of the aneline metal in the aniline modified Pani derivative. SWCNTm / PLA is probably the most widely studied. As well as other workers have used different electrolytes with various constrainrations to study the electrochemical polymerization of o-toluidine (M.K. Ram et al, 1997).

Experimental Work

Via a spen coaeted (model 4000) electronic system, SWCNTm / PLA were formed on seilicon (n_type) with a theckness of 1millimetres. The spen, coeting method can be used to adjust the theckness of the SWCNTm / PLA films as shown below:

Spin speed (rpm)	Thickness SWCNTm / PLA film(nm)
1500	162
3000	100
4500	82

The silicon wafers (1mm thick) were ultrasonically cleaned, and then its dried at 150 °C. The substrates were scraped in HF to clear from native oxide, then cleaned in distilled water and dried. Aluminum metal was deposited onto the back touch using vacuum coating device (Edward vacuum evaporation).

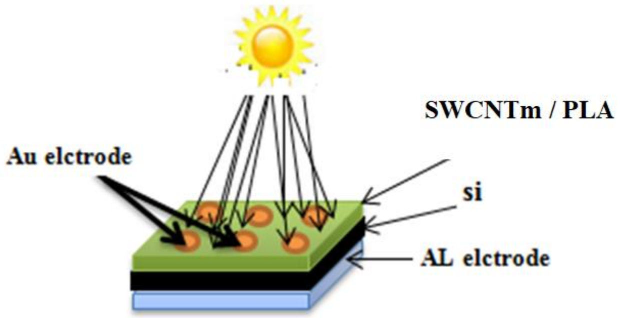

Figure 2. Schematic of SWCNTm / PLA - SI substrate

The (I-V) features were performed via using Kiethley 6517 A Elecrometry/High resistance. Measurements were taken in both light and dark condition. The photovoltaic parameters, that is, (Voc), (Jsc), (FF), and (η) were calculated.

Result and Discussion

SWCNTm / PLA film put on glass by spin coating typically electrically absorption spectrum as shown in fig 3. It shows the two center-center absorption band and 550nm. The first band of absorption is generally refers to benzene ring π-π*at 440 nm electronic transition on basis of polyaniline and theoretical calculations on the belt structure (D. Kumar. 2001). This position. The amount of coupling among adjacent phenylenc rings in the polymer chain is linked to this piak. In relation to the relevant transformation of PANI, showing a piak blue-shifted, reducing thereby revealing SWCNTm / PLA conjugated length, which is due to steric hindrance CH3 group. The two absorption band at 550nm due to the exciton transition between the HOMO.

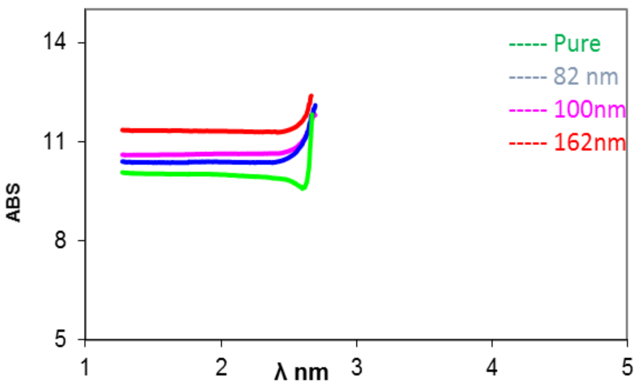

Fig. 3. UV-V is absorbance spectrum of SWCNTm/PLA film

The J_V features of the constructed SWCNTm/ PLA /n/SI solar cell structure are shown in figures 4-6, both determined in the dark and the light. The specific result of the polymer film thickness is (162, 100, 82)nm. The light intensity is 100 milliwatts per square centimeter, measured via spectroscopic, ellipsometry. It is desirable that the rectifying junction exists at the interaction among the silicon layer and the silicon layer Polymer film. It can really be confirmed via the observations that the silicon layer used in this study is n-kind, and the SWCNTm / PLA film is considered to be a hole transport layer.

The variables of a solar cell, ie (Voc), (Jsc), maximum current (I_{max}), maximum voltage Vmax) and (FF) have been determined. The solar η is certain via:

$$= (FF\ V_{oc} J_{sc})/P_{in\ \eta}$$

Here Pin is the incoming lights power

SWCNTm / PLA one of the organic polymer that are widely using because of their applications in solar cell devices It was obtained Aniso type n-p heterojunction (HJ) by SWCNTm / PLA - Si) where SWCNTm / PLA are p – type and (Si) is n-type. The (J-V) Characteristics of (162, 100 and 82) nm of SWCNTm / PLA solar cell devices in dark and light at intensity' 100mW/cm^2, is appear in fig, (2, 3, 4) respectively. The Voc, is, about (0.45, 0.5 and 0.45) Vol. respectively at Jsc (8.7, 11.1 and 15.2) mA / cm2 respectively. The (FF) is (0.601, 0.538 and 0.411) and the efficiency is about (1.18, 1.6 and 1.32) % respectively.

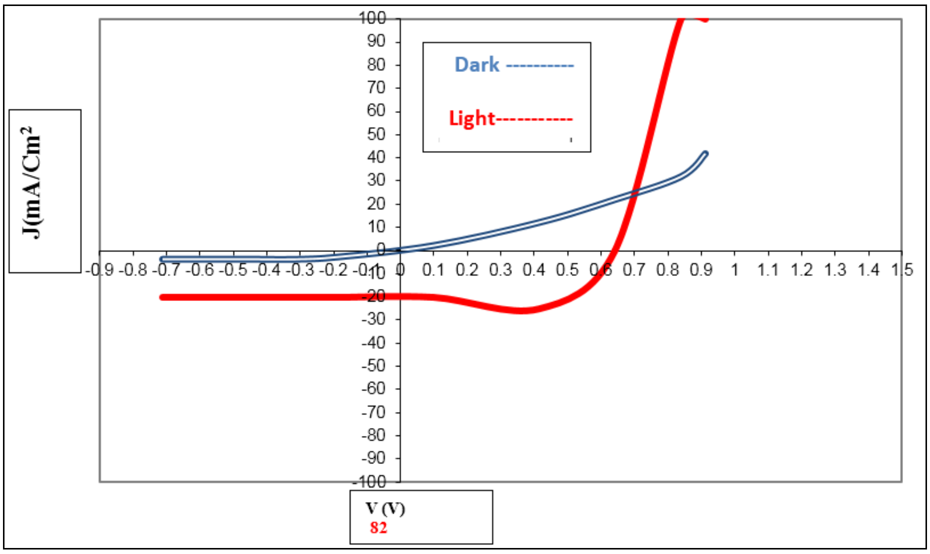

Figure 4. J_V for SWCNTm / PLA solar cell 1500 r pm

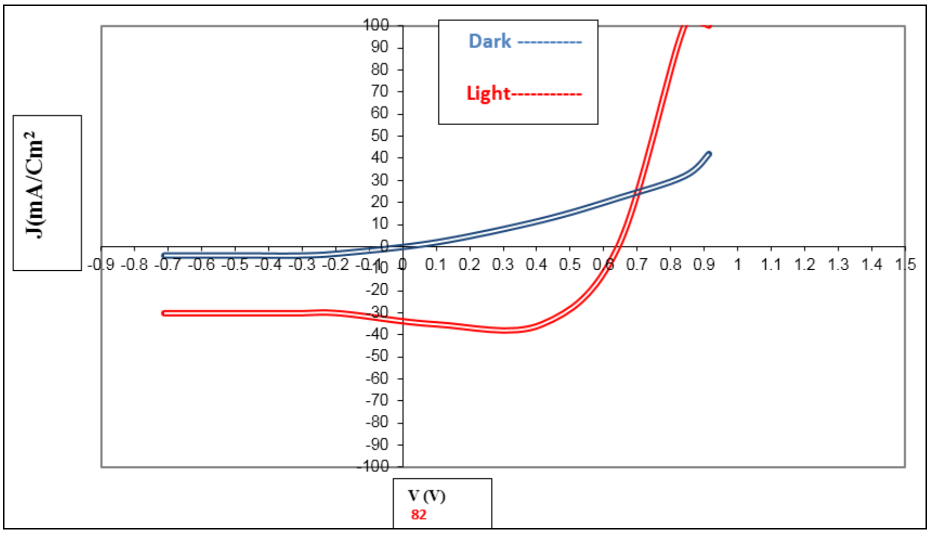

Fig. 5. J-V for SWCNTm / PLA solar cell 3000 rpm

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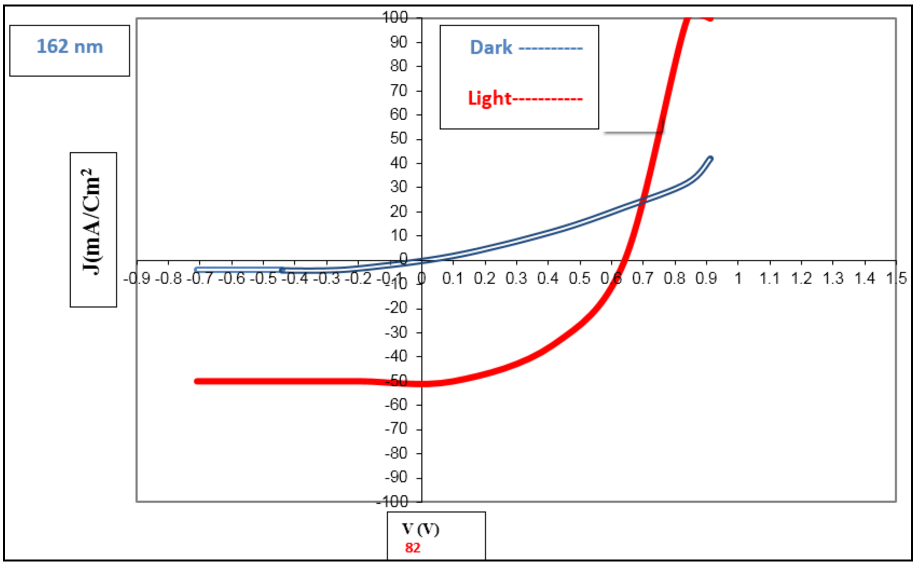

Figure 6. J-V for SWCNTm / PLA solar cell 4500 rpm

Conclusion

Via I_V that the maximum soliar call effeciency is achieved when the palymer theckness is 100 n m. This is where this palymer, at this theckness, aids in improving the design of the soliar cell as well as increasing the current deinsity, resulting in the highest effeciency.

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