IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

THE RELATIONSHIP BETWEEN ATOMIC NUMBER & EFFICIENCY AT DYE SOLAR CELLS

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ABSTRACT

In this work the effect of changing the anode of polymer solar cell on their performance was experimentally investigated .The cells were fabricated from ITO which act as a cathode beside MEH PPV ,Ecrchrom Black T and Rohadamin B dyer . The anodes which c are AL, GL ,AU with atomic number 13 , 47 and 79 were used . It was found that the efficiency of the solar cell of AL, GL ,AU electrode for Ecrchrom dye are 1.66, 1.59 , and 1.58 Respectively the efficiency for Rohadamin , Ecrchrom Black T dye are 1.49, 1.48 and 1.46 respectively these results shows clearly that the efficiency increases as the atomic number decreases this conforms with the fact that energy gap increase with the atomic number.

KEYWORDS: Ecrchrom Black T, Rohadamin B, thin film, solar cell, photovoltaic property, optical property.

INTRODUCTION

Human need energy so as to make life easier now a day petroleum fuels are the most wide spread energy which cause type[1] recently it was discovered that petroleum fuel cause air pollution which cause severe biological hazards' [2, 3] this forces scientists to search cheap free pollution energy forms [4,5] the most popular alternative that satisfies these needs is the solar energy [6] solar energy can be converted into many energy forms but the most preferable energy conversion is the electric energy conversion .[7] this is done by solar cells which converts solar radiation energy into electric energy [8,9]solar cells fabricated form silicone are the more commercially available solar cell types .Despite the fact that silicone solar cells are stable and live for a long time .but they suffer from some drawbacks first of all these cells are expensive and needs complex fabrication techniques. This encourages scientists to search for a new generation of cells.The direct conversion of light into electricity is done by solar cells. The usage of solar energy for heat has a long history but the origin of devices which produce electricity is much more recent. It is closely linked to modern solid-state electronics. Indeed, the first usable solar cell was invented at Bell Laboratories, the birthplace of the transistor - in the early 1950's. The first solar cells found a ready application in supplying electrical power to satellites. Terrestrial systems soon followed, these were what we would now call remote industrial or professional applications, providing small amounts of power in inaccessible and remote locations, needing little or no maintenance or attention. Examples of such applications include signal or monitoring equipment, or telecommunication and corrosion protection systems. Since then, numerous photovoltaic systems have been installed to provide electricity to the large number of people on our planet that do not have (nor, in the foreseeable future, are likely to have) access to mains electricity. The most popular wide spreaded cell [10] .Its characterized by long life time , chemical stability and relatively a degut efficiency .However silicon solar cell suffers from noticeable setbacks It is efficiency is still low , it cannot exceed 25% . The fabrication of silicon solar cells is very complex, the made these cells expensive [11].

MATERIALS & METHODS

Six samples were prepared by depositing ***HEH-PPV*** and using a different electrode ***Al*** **,** ***Ag*** and ***Au*** to act as an anode were prepared as shown in Fig(1) below .

The V- I curve for all solar cell sample were found by using electric circuit consisting of ammeter , volt meter and power supply as shown in fig (2)

AL
DYE
HEH-PPV
TTO

Fig (1): Polymer solar cell

RESULTS & DISCUSSION

The results and curves obtained by the Ultra-Violet device and curve.

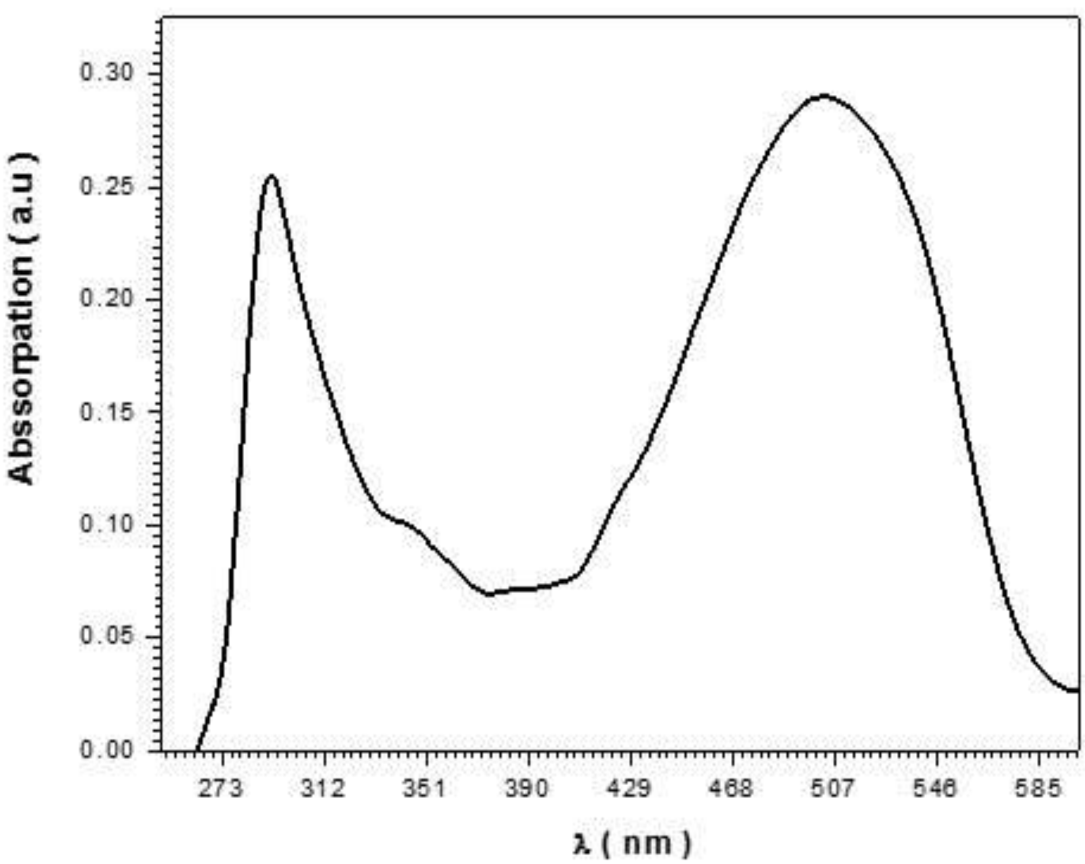


Fig (3) shows the relation between absorbance and wavelength of Ecrchrom Black T.

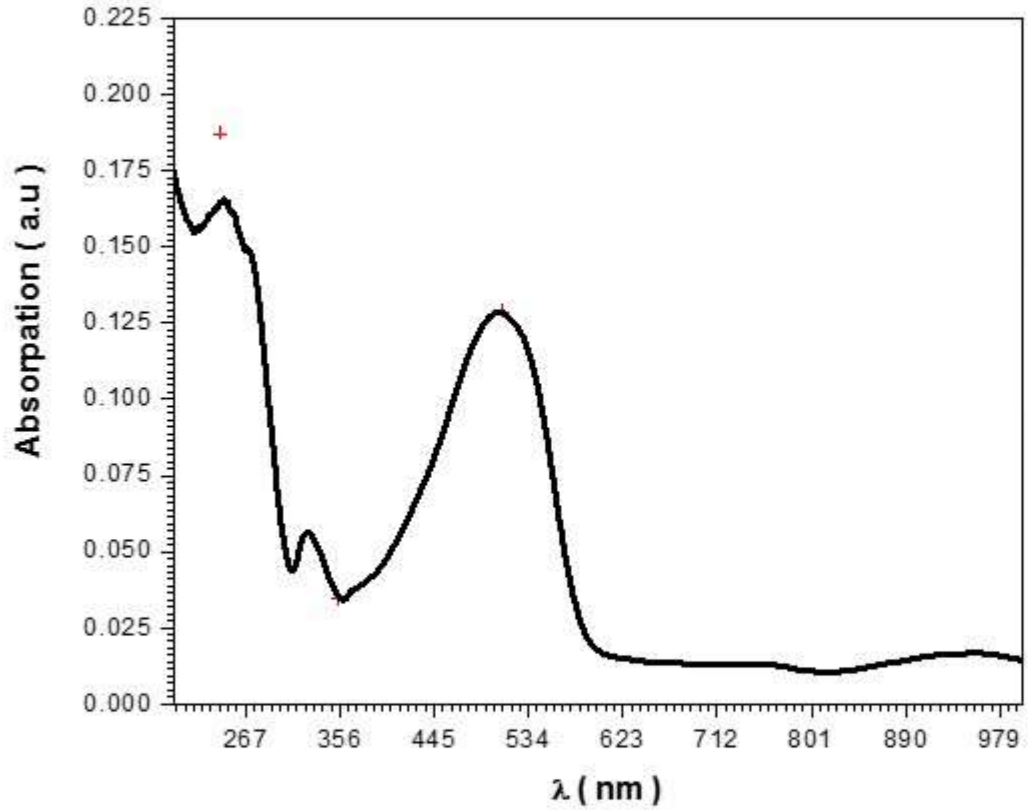
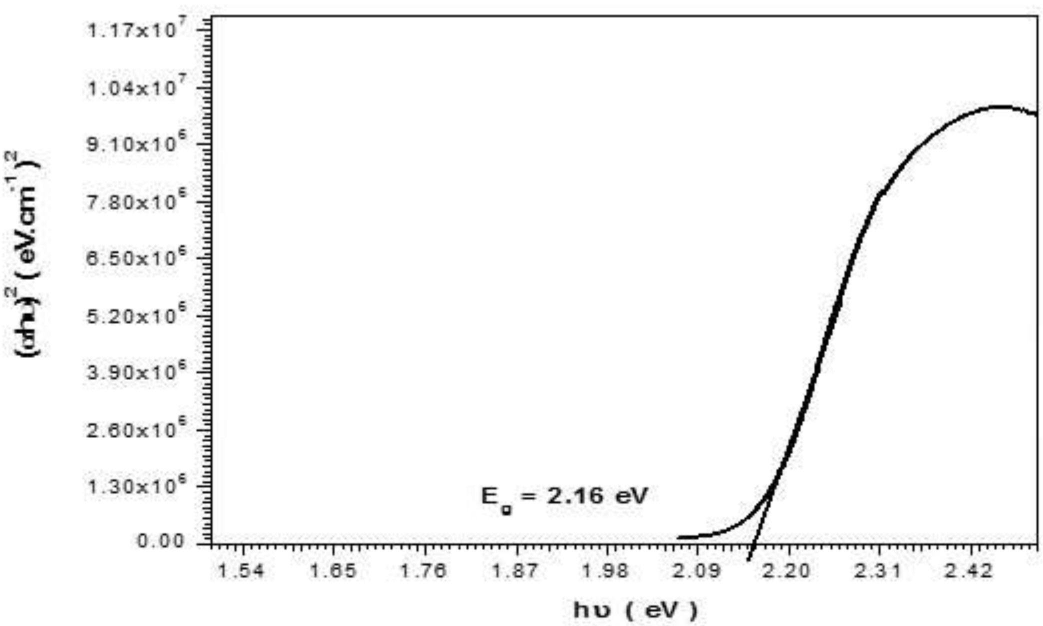


Fig (4) shows the relation between absorbance and wavelength of Rohadamin



Fig(5) The optical energy gap (E_g) value of Ecrchrom Black T

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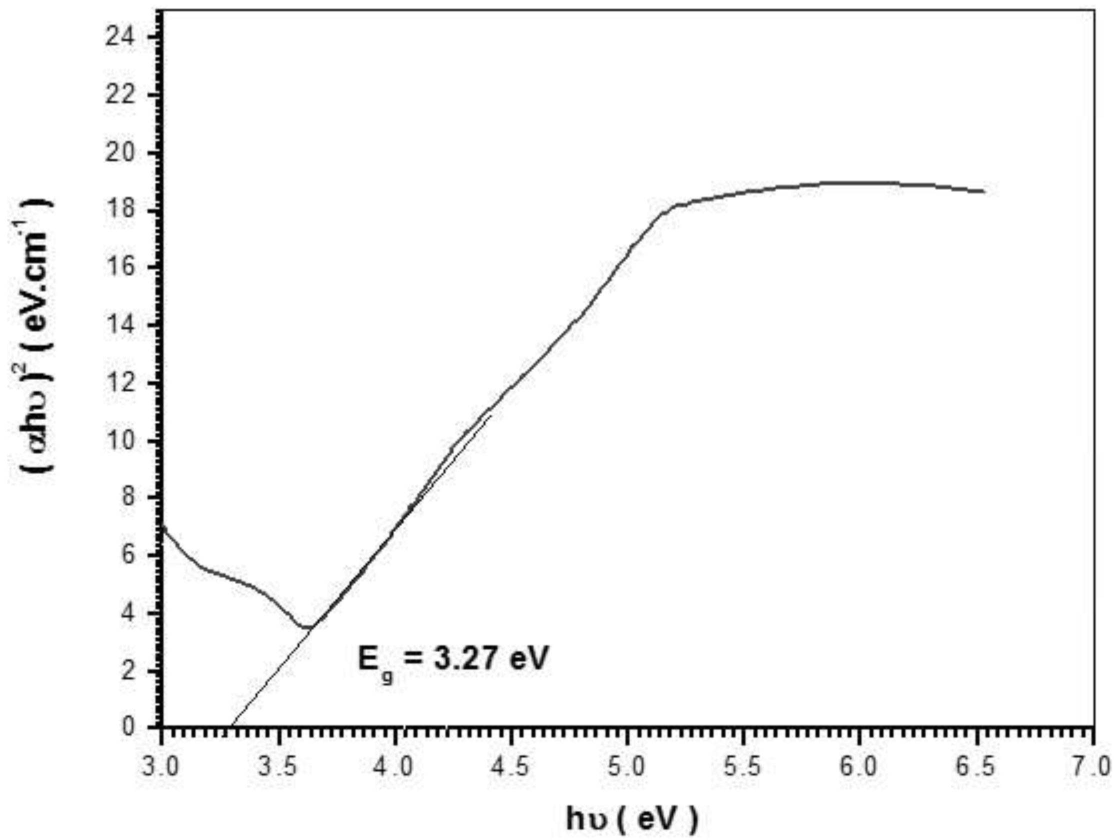

Fig (6) the optical energy gap (E_g) value of Rohadamin B

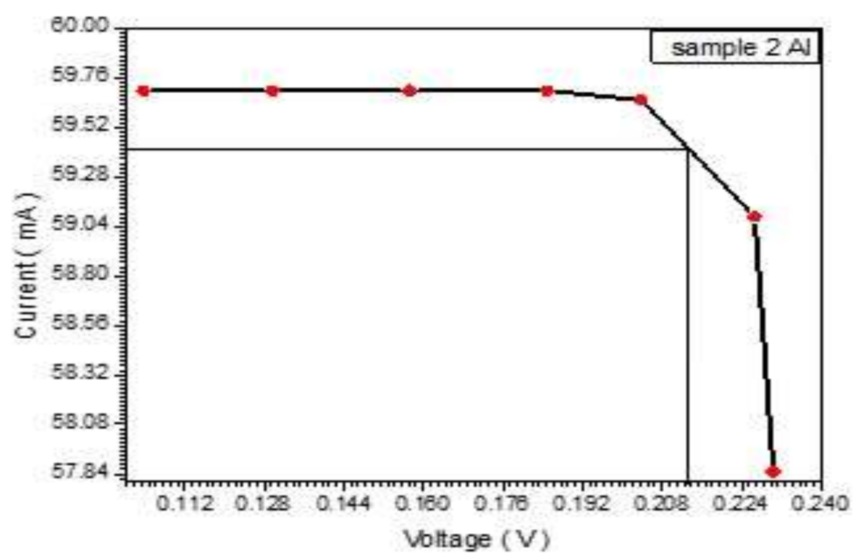

Fig (7) several factors for characterization of sample 1(Al)

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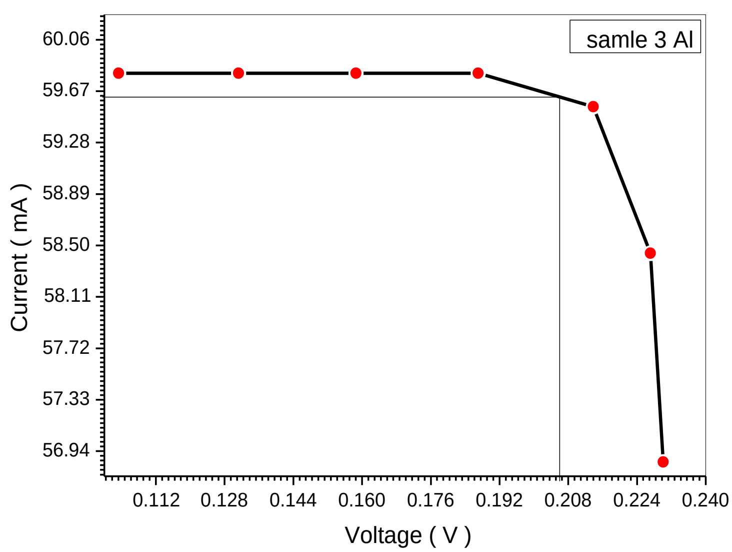
Table (1) I-V reaction for sample 1(Al)

V(V)	I(A)
0.10334	59.80562
0.13125	59.80562
0.15859	59.80562
0.18703	59.80562
0.21384	59.55197
0.22712	58.44101
0.23011	56.85815



Fig(8) several factors for characterization of sample 1(Al)

Table (2) I-V reaction for sample 1(Al)

V(V)	
0.10334	59.80562
0.13125	59.80562
0.15859	59.80562
0.18703	59.80562
0.21384	59.55197
0.22712	58.44101
0.23011	56.85815

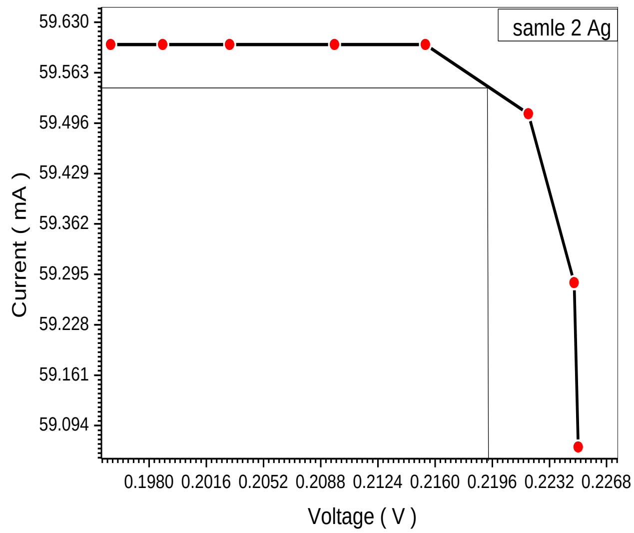


Fig (9) several factors for characterization of sample 2(Ag)

Table (3) I-V reaction for sample 2(Ag)

V(V)	I(A)
0.19558	59.60045
0.19886	59.60045
0.20307	59.60045
0.20967	59.60045
0.21539	59.60045
0.22188	59.50843
0.22476	59.28393
0.22501	59.06551

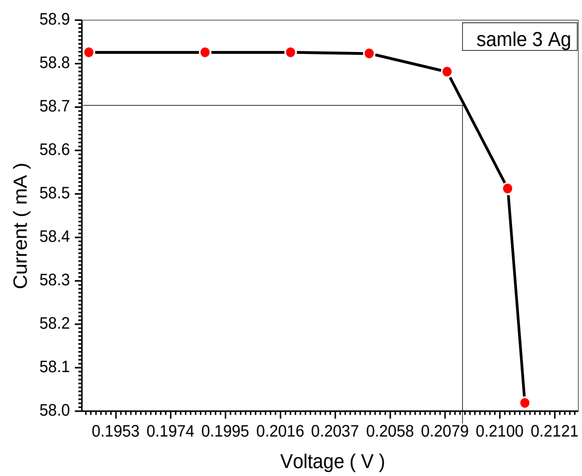


Fig (10) several factors for characterization of sample 2Ag

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Table (4) I-V reaction for sample 2(Ag)

V(V)	I(A)
0.19427	58.82567
0.19872	58.82567
0.20199	58.82567
0.20500	58.82315
0.20798	58.78118
0.21030	58.51219
0.21096	58.01871

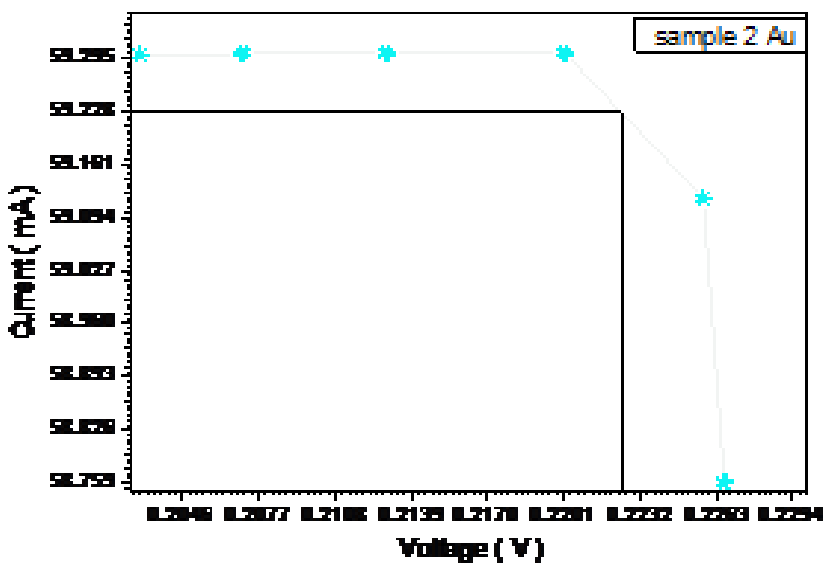

Fig (11) several factors for characterization of sample 3(Au)

Table (5) I-V reaction for sample 3(Au)

V(V)	I(A)
0.20289	59.29876
0.20704	59.30045
0.21289	59.30045
0.22012	59.30045
0.22577	59.11809
0.22662	58.76079

ISSN: 2277-9655
Impact Factor: 4.116

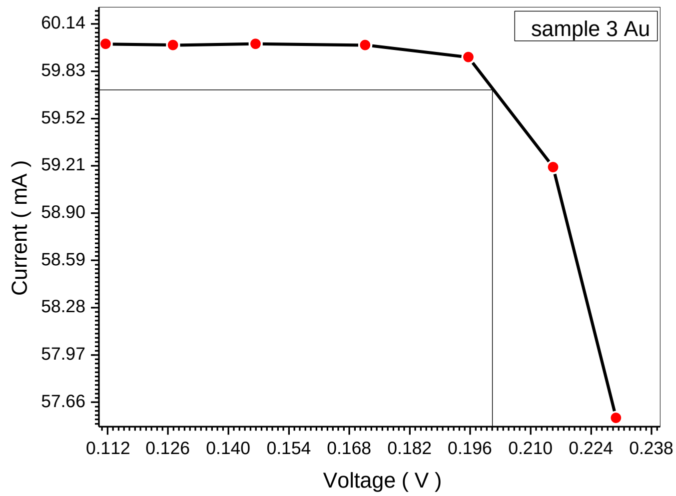

Fig (12) several factors for characterization of sample 3(Au)

Table (6) I-V reaction for sample 3(Au)

V(V)	I(A)
0.11158	60.00899
0.12717	60.00126
0.1463	60.00899
0.17168	60.00126
0.1956	59.92247
0.21522	59.20098
0.22978	57.55716

Table (7)sample1 performance and Atomic number for electrodes

No of sample	I_{scm} A	I max mA	V_{oc}(V)	V_{max} (V)	FF	J_{scm} A/cm^2	P_{max}	% ɳ	**Atomic number**
Sample (AL)	59.69	59.41	0.2303	0.2130	0.9952	9.5517	13.685	1.66	13
Sample (Ag)	59.60	59.54	0.2250	0.2193	0.9738	9.5308	13.060	1.59	47
Sample (Au)	59.30	59.22	0.2266	0.2224	0.9816	9.4880	13.192	1.58	79

Table (8)sample 2performance and Atomic number for electrodes

No of sample	I_{scm} A	I max mA	V_{oc}(V)	V_{max} (V)	FF	J_{scm} A/cm^2	P_{max}	% ɳ	**Atomic numbe**
Sample3(Ag)	58.85	58.70	0.2109	0.2085	.9858	9.4168	12.2395	1.48s	13
Sample3(AL)	59.80	59.62	0.2301	0.2059	.8921	9.5688	12.2395	1.49	47
Sample3(Au)	60.00	59.70	0.2300	0.2011	.8698	9.6012	12.0080	1.46	79

DISCUSSION

Fig (3) and to shows the optical energy gap (Eg) forEcrchromBlack T,and Rohadamin*B*. The optical energy gap (E_g) has been calculated by the relation $(\alpha h\upsilon)^2 = C(h\upsilon - E_g)$ where (C) is constant. By plotting $(\alpha h\upsilon)^2$vs photon energy (hυ). And extrapolating the straight thin portion of the curve to intercept the energy axis, of the energy gap has been obtaired. The value of (E_g) obtained was (EcrchromBlackT, and Rohadamin*B*.)

Fig s(6) to fig (12) were used to find (I_{sc}) , (V_{oc}) , (I_{max}) and (V_{max}) for all samples . parameters to were used calculate power conversion efficiency η for the samples the dye sensitized solar cell(***EcrchromBlack, and RohadaminB***.). These results for the samples are recorded in table (4) shows that increase of atomic number Z decreases effecting – this can be under stood it are take into account the fact that according to Hydrogen difference between energy levels in atom , which can represent the energy gap E_g is proportional to Z , 109
E_g = E ; Z thus increase of Z increases E_g which decrease chances for electrons transfer from valence to conduction and which decrease in turn current and efficiency

CONCLUSIONS

This work shows that the electrode type affect polymer solar cell performance. This performance depend on the atomic number of the electrode

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