REALIZATION AND CHARACTERIZATION OF THIN FILMS SNO$_2$, TiO$_2$ FOR SOLAR CELL GRATZEL TYPE.

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EXTENDED ABSTRACT

The dye-sensitized solar cells or solar cell type called Grätzel offers an alternative concept technically and economically credible today for photovoltaic devices. The aim of this project and realize that cell with a tremendous return. The first steps in this work and to make transparent conductive thin layers with low resistance of SnO$_2$: F and TiO$_2$ layers according to SPRAY method and the method of Dr. BLADE respectively. After that what is the use of organic dye and the preparation of the cathode and against the mounting of the solar cell. The characterizations of thin films and of our cells and organic dye that is optically and electrically, and also spectral. We present the current state of land, new concepts of nanocrystallins dye-sensitized solar cell, and the prospects for the future development of technology.

KEYWORDS: GRATZEL, solar cell, thin films, SnO$_2$, TiO$_2$, BLADE, spray, dye-sensitized.

1. INTRODUCTION

In recent years, photovoltaic cells have found a benefit of increasing importance. This appearance and the high consumption of energy and petroleum recognized risk of this energy and also due to production costs of this energy. This opened the doors on another source of energy less expensive and easy to produce with a rather normal life, it is photovoltaic.

2. PRACTICAL PART

2-1: depositing the conductive layer:
The first main part of this project is to make a layer of conductive SnO$_2$: F with low resistance, on a glass substrate. After making various concentrations of F doping concentration that gave us a low resistance and 9% (34Ω).

Figure 1: The resistance variation as a function of square% of the doping.
later washing with distilled water and is prepared against the cathode is the burning with graphite and add a drop of tri iodide and climb our solar cell.

3. CHARACTERIZATION OF ORGANIC SOLUTION:

The organic solution used is a raspberry juice; juice characterization is done with the method of IR spectroscopy, the following figure rise show:

![Infrared spectra of the organic solution.](image)

**Figure 2: Infrared spectra of the organic solution.**

The spectrum shows several spikes, using an abacus to IR can be derived organic functions that are in our organic solution:
- Functions of oxygenated sulfur made in several forms (found under different wavelengths)
- Structures of OH, NH
- The chlorocarbonate
- Let the carbon sulfur
- Cycles benzene bonded to an atom of nitrogen.

According to his interpretations and comparisons made with items we find that the organic molecule has the following form:

![The chemical form of the organic molecule.](image)

**Figure 3: The chemical form of the organic molecule**
4. CHARACTERIZATION OF THE SOLAR CELL:
4.1 Characterization SEM photo:
The scanning electron microscope allowed us to analyze the deposited surface, were performed SEM photos for the SnO2 surface and also to the surface of TiO2 in the following figures we show respectively:

![Figure 4](image1.png)

**Figure 4**: the substrate surface with deposition of SnO2: F

![Figure 5](image2.png)

**Figure 5**: TiO2 surfaces before annealing.

![Figure 6](image3.png)

**Figure 6**: TiO2 surfaces after annealing
4.2 Optical characterization:

The optical properties of the most important characterization of a transparent conductive thin film is transmittance, energy gap, the following graph shows the spectrum of transmition and the energy gap of the deposited layer respectively for SnO$_2$: F 9%.

![Figure 7: transmittance spectrum of a thin layer of SnO$_2$: F (9%) prepared at T = 400 °C by the method spray](image)

**Figure 7:** transmittance spectrum of a thin layer of SnO$_2$: F (9%) prepared at T = 400 °C by the method spray

![Figure 8: Determination of the energy gap by extrapolating from the variation of $(\alpha \cdot h\nu)^2$ versus $h\nu$ for a thin film SnO2: F](image)

**Figure 8:** Determination of the energy gap by extrapolating from the variation of $(\alpha \cdot h\nu)^2$ versus $h\nu$ for a thin film SnO2: F

The spectrum below shows the X-ray diffraction of the thin layer of SnO$_2$: F to 9%.

![Figure 9: spectrum-ray diffraction (XRD) of thin film SnO$_2$: F](image)

**Figure 9:** spectrum-ray diffraction (XRD) of thin film SnO$_2$: F
Note that the layers of report [F] / [Sn] = 9% gives an orientation along the direction (211).

4.3 electric characterizations:

Electrical characterization realized is I (V), we made up two solar cells the following graphs shows their characterization under illumination:

**Figure 10:** characterization of the solar cell [I] under light and darkness

**Figure 11:** characterization of the solar cell [II] under light and darkness

Relations used to calculate the performance of these solar cells are:

\[
\eta = \frac{FF \times V_{ac} \times J_{sc}}{P}
\]

\[
FF = \frac{P_{max}}{V_{ac} \times J_{sc}} = \frac{I_{max} \times V_{max}}{I_{sc} \times V_{ac}}
\]

From these relations we can deduce the performance of our cells:

Solar sell (I):

\[
\eta = 0.146 \%
\]

Solar sell (II):

\[
\eta = 0.131\%
\]
5. Conclusions:
The work is purely experimental work, and experimental work in the most important is knowing how to interpret the results in that there are no experimental work of bad results there are misinterpretations and results that j ‘was able to get his results that were achieved in our laboratory "LMESM", albeit in low yield but we managed to have a solar cell with an efficiency.

REFERENCES:

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