Realization and Characterization of Dye Sensitized Solar Cell Using Natural Dye from Strawberry

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Abstract

Today, silicon photovoltaic cells dominate the market with over 90% of sales. These cells, referred to as first-generation solar cells, are made of inorganic material and, beyond the improvement of performances in terms of reliability and efficiency of photovoltaic devices, the challenge is to significantly reduce the cost of manufacturing these cells. To do this, replace the inorganic material (silicon) by other organic materials, easy to implement, is a very promising solution although technological hurdles remain to be overcome. In this context, we propose in our work the realization of a dye-sensitized solar cell (DSSC). It represents a preliminary step to improve the development of this

type of cells in our laboratory.
A DSSC is a photo-electrochemical device that converts sunlight into electricity with relatively low cost. It is essentially composed of dye (photogeneration) and a semi-conductor (TiO2, for the transport of charges) [1].
The functioning scheme of a Typically DSSC is shown in figure 1. A layer of TiO2 (titanium dioxide) is deposed on a TCO glass (transparent conductive oxide). The dye is grafted to the surface of the semiconductor film in contact with the electrolyte. At the rear of the cell, there is a second electrode [2].

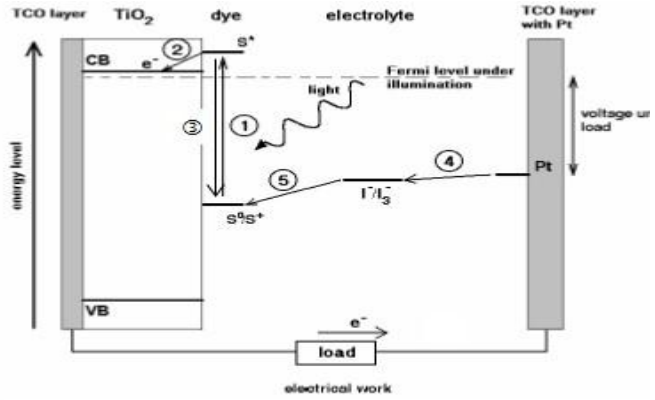

Figure 1: The functioning scheme of DSSC [3]

The working principle of DSSC is very simple. To make our cell in laboratory, we divided our work into three main parts:

- The first part aims to develop a transparent conductive anode by the PVD method (physical vapor deposition of thin gold layers). To characterize their transparency we use a spectrophotometer.
- The second part was consecrated to chemical preparation of the dough TiO2, the dye and the electrolyte.
- In the last part, we assembled our cell (fig 2), which is based on the following structure: electrode/TiO_2/dye/electrolyte/rear electrode and we perform electrical testing of our cell under illumination (fig 3).

Figure 2: Our dye solar cell

Figure 3: Electrical Test of our cell

The solar cell that we realized represents a preliminary step to improve the development of this type of cells in our laboratory. Tests carried out have demonstrated the advantages and limitations of our experimental process, especially on the side of the anode. These results allowed us to reflect and develop other strategies for the future of our work in this area.

Key words: Solar cell, DSSC, photovoltaic, dye, Graetzel

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