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Optical Properties of A Thin Film Synthesized from Lidah Mertua Plant (*Sansevieria tifasciata*) Using A Dip Coating Method

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ABSTRACT

A study has been conducted on the characterization of optical properties of thin films from lidah mertua (Sansevieria trifasciata) with dip coating method. The dip coating method was applied with different time immersion treatments. The measuring variables in the manufacture of this thin film were tested based on the optical properties of their absorbance value of the extract and the thickness of thin film. The absorbance spectral of extraction pigments were measured using UV-Vis in the wavelength range 350 nm to 700 nm. The results of the measurements showed that the extract of the S. trifasciata has high absorbance. Besides that, the minimum coating thickness is produced by a concentration of 12.5% with a 5 minute immersion time of 520 nm.

Introduction

A thin film is a film that has a thickness ranging from 10^{-6} to 10^{-9} meters which is made from organic material, inorganic, metal, or organic metal mixture. A thin film is widely used, one of them as a coating on solar cells [1]. Solar or photovoltaic cells are devices that convert solar energy into electricity by photovoltaic effects. The photovoltaic effect is an event in which a cell can absorb light energy and convert it into electrical energy [2-4]. The technique used here in making thin film is a dip coating technique. Compared with dip coating method, spin coating method is more commonly used [5], but the extracts made in this study were highly liquid so that the dip method was selected in the manufacture of thin films.

The organic material used in this study is the plant lidah mertua (*Sansevieria trifasciata*) can acts as a sensitizer and able to absorb light energy optimally. There are about 150 species of

lidah mertua plant, but only three types of lidah mertua plants are easy to find, i.e. *laurentii* plant-type injections, *masoniana* and *zeylancia* [6,7]. The purpose of this research is to analyze the optical properties of the thin film from lidah mertua extract. This study measures characterizations of thin film using UV-Vis spectrophotometer measurement. UV-Vis spectrophotometer measurements were performed to determine the absorbance spectrum of a material [8].

The parameters which influence the dip coating method are temperature, solution pH, solution concentration, and immersion time [9]. This study focused on the effect of solution concentration and immersion time on the thickness of the coating because the materials used purely from the extract. So this research is about synthesis thin layer from the extract of lidah mertua with dip coating method reviewed based on the variation of immersion time and the concentration of the solution.

Experimental Method

This research was done through 4 stages, namely preparation stage, extraction of lidah mertua plant, absorbance measurement, and synthesis of thin film. For preparation stage, this stage includes cleaning tools for the extraction process. In extract stage of lidah mertua plant, the leaves of clean lidah mertua are cut into small pieces. The leaf blended and weighed for 20 grams and then mixed with 100 ml of 96% ethanol solvent for 24 hours. Next we filtered the extract of the lidah mertua plant with filter paper into an Erlenmeyer glass. After that, the absorbance spectrum of the extract was tested using a UV-Vis spectrophotometer.

We sensitized a thin film using dip coating method with different immersion time and concentration of solution. Variations of immersion time are 1 minute, 2 minutes, 3 minutes, 4 minutes, and 5 minutes. The extract is then dissolved with ethanol into a concentration 12.5%, 25%, 50%, 75%, and 100% of the main solution. After that we measure the coating thickness using trinoculer optical microscope.

Result and Discussion

The spectrum of absorbance of the lidah mertua extract is fairly wide, cbnmhg,yovering a wavelength from 500 nm to 700 nm with a maximum wavelength of 663 nm. The absorption value at that point is 2,581 a.u.

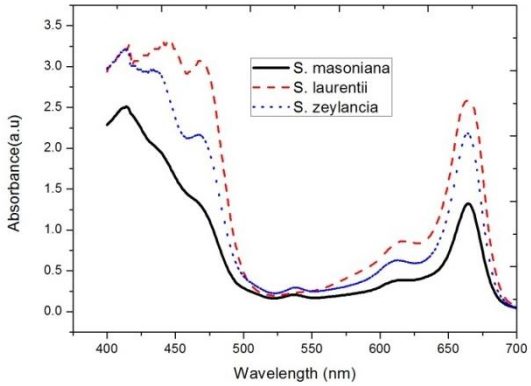

Figure 1. The result of absorbance spectrum of lidah mertua plant extract

The *laurentii* plant extract has the widest spectrum area of 123,983 while the extract from masoniana and zeylancia are 89,057 and 104,458, respectively. The area of the absorbance spectrum will affect the number of photons absorbed.

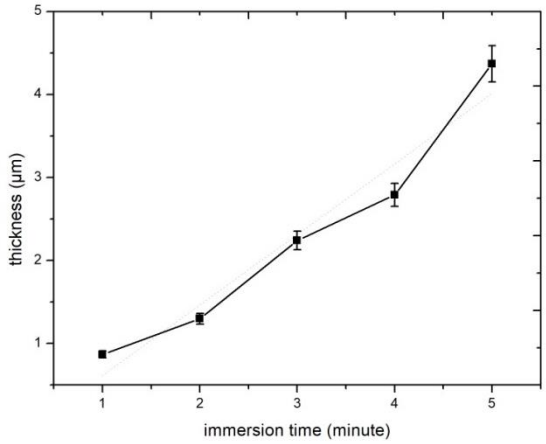

Figure 2. The effect of immersion time on the thickness of thin film from lidah mertua plant extract

The thickness of the layer is viewed from three points, namely the left, middle, and right of the substrate. Then the thickness can be seen using optical microscope. From Fig. 2, we can see that the shorter the immersion time, the thinner the resulting layer. Meanwhile, for the variation of concentration of solution, the thickness of thin film can be seen in the figure below.

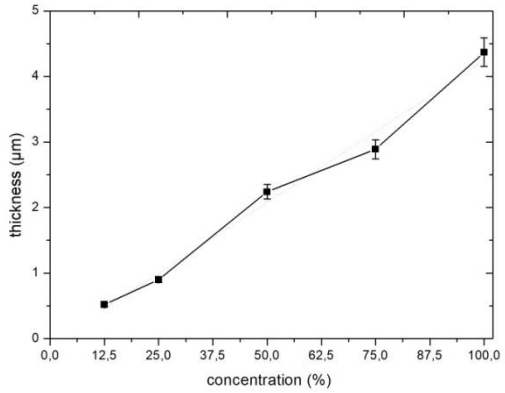

Figure3. The effect of solution concentration on the thickness of thin film from lidah mertua plant extract

From Fig. 3, we can see that the smaller the concentration of solution used, the thinner the resulting layer. This is because more and more solvents are used then the more liquid a solution, so the thinner the layer we gets.

Conclusion

The results of the measurements showed that the extract of the lidah mertua (*Sansevieria trifasciata*) has high absorbance it can be used as a manufacture of thin film. The width of the absorbance spectrum of the lidah mertua extract of the laurentii, masoniana, and zeylancia species was 123,983 a.u nm; 89,057 a.u nm; and 104,458 a.u nm. Thus, the most optimum absorbance area was produced by the laurentii. Maximum layer thickness resulting from plant extract of lidah mertua at 100% concentration with immersion time of 5 minutes 4,37 µm. Besides that, the minimum coating thickness was produced by a concentration of 12.5% with a 5 minute immersion time.

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