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CHE 365

TITLE:

DEVELOPMENT OF DYE-SENSITIZED SOLAR CELLS WITH NATURAL DYE DOPED ON METAL OXIDE

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ABSTRACT

The combination of post covid recovery, depleted fossil fuel reverse and extreme weather condition led to surge in demand for energy. Solar energy is a sustainable industry that capture interest energy industry in the world. The material that most commonly used nowadays is from synthetic dye. Therefore, natural dye from plan is proposed. This is because the natural never pollute like synthetic dye as they are obtained. The objective of this study is to find out the best extraction time of natural dye in metal oxide. The natural dye was extracted from Pandanus Amaryllifolius (leaves) using convectional extraction method and doped into metal oxide which is Magnesium Oxide (MgO) for 5 - 7 days. The result obtained had showed the concentration of dye increasing as the time extract is increase. The natural dye is also tested with conductivity and the result showed a decreasing trend. Also, by FTIR, the longer the magnesium oxide is doped into the sample, the higher the transmittance showing the presence of O-H bonding determine the ability for the adsorption of solar energy. To conclude, natural dye from Pandan leaves has the potential to be used for the Dye-Synthesized Solar Cells (DSSC).

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CHAPTER ONE

BACKGROUND

1.1. INTRODUCTION

The current global situation is extremely unstable due to the energy crisis. The world is currently facing a situation in which it may soon run out of non-renewable energy sources due to the combination of the growing demand for energy and the limited resources of fossil fuels. The International Energy Agency estimates that fossil fuels continue to account for more than 80 percentage of the world's primary energy use (International Energy Agency, 2020). Degradation of the environment and shifts in the climate are two additional side effects of the use of fossil fuels. According to the findings of the Intergovernmental Panel on Climate Change (IPCC), the biggest contributor to rising levels of greenhouse gas emissions and overall warming is the combustion of fossil fuels(IPCC, 2018).

In view of the current predicament, it is of the utmost importance that we identify sources of sustainable and renewable energy that are not only kind to the environment but also commercially feasible. Utilizing energy from the sun is one possible approach that might be taken. Solar energy is a form of renewable energy that is not only plentiful but also free of harmful emissions. The National Renewable Energy Laboratory (NREL) estimates that the entire amount of solar energy that reaches the surface of the earth is approximately 10,000 times greater than the amount of energy that is utilised by people in a single year (NREL, 2020). However, the efficiency of solar cells, which convert light from the sun into electricity, is still rather low, and the cost of these cells is still relatively expensive.

Figure 1.1 above shows samples of dyes will be processed for this study

Researchers are investigating a wide variety of approaches to enhance the efficiency of solar cells while simultaneously lowering their cost. This will allow them to overcome the problems described above. The utilisation of natural dyes as a source of low-cost and ecologically benign pigments for solar cells is one possible technique. Plants are the source of natural dyes, which have been used for ages to colour textiles, food, and cosmetics. Natural dyes are obtained from plants. They pose no health risks, can be broken down naturally, and can be replenished. Natural dyes may be used in solar cells, however their efficiency is still very low at this time.

Doping natural dyes with metal oxides is one method that can be used to improve the efficiency of the natural dyes. Doping is a method that involves introducing impurities, in this example metal oxide, into a substance, in this case natural dye, in very minute amounts in order to change the properties of the material. Using FTIR (Fourier-transform infrared spectroscopy) as a method of characterisation, the purpose of this study is to evaluate the effect of doping metal oxide into natural dye on its effectiveness of absorbing solar light. This will be done by analysing the results of the spectroscopy.

During the course of this research, the natural pigment will be collected from leaves and then infused into magnesium oxide. The absorbance of the sample will be measured using FTIR in order to arrive at a conclusion regarding the solar light that was taken in. This study aims to investigate the effect that doping natural dye with metal oxide has on its effectiveness of collecting solar light. If successful, the findings of this study could contribute to the development of renewable energy sources that are both more economical and more reliable.