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Cawangan Terengganu
Kampus Bukit Besi

TITLE:

PHOTODEGRADATION AND EXTRACTION STUDY OF NATURAL DYE FROM MANGO AND PAPAYA PLANT USING DISTILLED WATER AS SOLVENT

SUPERVISOR:

DR. NORAINI BINTI RAZALI

DR. NURUL HUDA KAMRULZAMAN

SCHOOL OF CHEMICAL ENGINEERING
COLLEGE OF ENGINEERING

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ABSTRACT

Dye sensitized solar cell (DSSC) are a type of photovoltaic technology that used photosensitizer dye to absorb sunlight and generates electrical energy. These studies aimed to analyse the performance of photodegradation process using the leaf extract of Mangifera indica (mango leaf) and carica papaya (papaya leaf) in term of their light absorbance power and ability to generate electricity. However, the use of synthetic dye and metal cause several environments concerns due to its non-biodegradable nature. DSSC research are conducted to address this problem by using natural dye because natural dye serves as cost-effective, easy to prepare, non-toxic and eco-friendly alternatives for various applications. The main objective of this research is to observe the colour of extracted natural dye from mango and papaya leaves after left 1 days, 3 days and 5 days. Additionally, the research aims to analyse change in physical and chemical properties after photodegradation, and measure conductivity of natural dye (mango and papaya leaves) before and after sunlight exposure. The experimental method used in this research include extraction, photodegradation and quality testing. In this research, the parameter study for extraction were set at 1,3, and 5 days and the conductivity measurement were recorded. The result showed the highest conductivity reading is 5 days and the lowest one is 1 day for fresh mango leaf and papaya leaf. While highest conductivity for dried mango leaf is on 1 day and lowest on 5 days because of several factor occur while conducting this research. Overall, this is due to more time spend in extraction and darkest colour was extracted which making the reading conductivity is higher. Thus, the natural dye from mango and papaya plant waste was successful and can be further investigate in the other research in future.

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BACKGROUND

1.1 Introduction

Energy plays a big role in our life in order to ensure the quality of human life, industrial development and world population crisis. However, clean and sustainability energy is hardly found in this modern world. For example, the main natural sources of energy, fossil fuels also lead to climate change and green house emission gas such as carbon dioxide which can contribute to potential pollution, global warming, and acid rain (Godfrey, K; Patrick, G.D.; Vincent, O.N. 2014) . This is proven when the increase of carbon dioxide concentration in 2023 up to level 424 ppm from 280 ppm in the mid-1770s (Lindsey, 2024). The overly usage of fuel contains their own weakness in term of health risk and environment issues. To overcome these issues, the renewable energy such as biomass, solar, wind and ocean should be applied earlier to prevent further undesired phenomenon. Among all of these, solar energy is the most suitable to replace the other non-renewable sources as it consists of more advantages compared to other renewable energy.

Solar energy is produced when the sun emitted radiant energy and reaching Earth in light and heat form. Solar energy is known as environmental technology that most abundant, cost-efficient, and available sustainable energy sources that is free and clean (Prabhakarn Arunachalam, 2019). As a renewable resource, solar energy is inexhaustible on human timescale and providing an environmentally alternative to fossil fuels without producing greenhouse gases or cause air pollution (Dada and Popoola, 2023). Solar energy has several ways to be harvested but the most common technology method used is by using solar photovoltaic (PVs). PVs or known as solar cell is a device that directly convert sunlight into electricity using solar panel (Hornsberg C, Bowden S. 2022). However, the PVs has their own disadvantages if using the wrong type of solar cell which leads to economically unstable and inefficient procedure. So, the dye synthetic solar cell (DSSC) is the most accurate replacement of inefficient type of solar cell in terms of potentially more stable and offering a simpler fabrication procedure.