



## ABSTRACT

The need for energy is growing constantly, thus it is crucial to action quickly to make the most out of renewable sources of energy. We propose using solar energy out of all the sources of energy because it is one of the sustainable and renewable forms of energy. The dye-sensitized solar cells (DSSC) were selected as a result since they have recently received increased attention due to their potential as solar energy conversion devices. To capture light for the DSSC, natural dye was utilized as pigments in the dye. Natural dye is preferred over dye based on ruthenium since it is safer, less expensive, and biodegradable while also being better for the environment and economy. The extract of Bauhinia x Blakeana flowers was utilized to produce the natural dye. Because of its vibrant purple colour, bauhinia was chosen. This can improve in our ability to physically observe a colour changing test. Following that, the extraction will dope on metal oxide. Calcium oxide, a metal oxide, was applied. The doping which lasts for six to eight days. This study aims to determine the optimal period for natural dye extraction in metal oxide, investigate the presence of a functional group in the dye following doping, and investigate the colour shift between the natural dye extraction on metal oxide before and after doping. The outcomes show that as the time taken increased, the concentration is decreased. The conductivity test also demonstrates that it will decrease as the amount of time required increases. The final test, an FT-IR analysis, reveals that anthocyanin is present and that the lower day has the largest peak of O-H bonding. Overall, the flowers of Bauhinia x Blakeana can be utilised to extract natural dyes that can be used as the basis dye for DSSC.

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# CHAPTER ONE

## BACKGROUND

### 1.1 Introduction

Research on dye-sensitized solar cells is one of the most contentious topics in the field of solar energy (DSSC). The DSSC, unlike the silicon solar cell, is a possible method of solar energy conversion due to its lower cost components and simple construction process. (Wan Almaz Dhafina, Hasiah Salleh, Muhamad Zalani Daud, Mohd Sabri Mohd Ghazali, 2018)

Among the common solvents used in the extraction of plant pigments used to produce natural dye are acetone, distilled water, ethanol, and methanol. Plant parts utilized in the reported production of natural dyes included leaf, flower, fruit, and tuber. According to sources, the natural colour pigments used in DSSC were anthocyanin, betalain, carotenoid, and chlorophyll. (Reza Hemmatzadeh, Ahmad Mohammadi, 2013)

In DSSCs, titanium dioxide ( $\text{TiO}_2$ ) is typically used as the electron-collecting metal oxide layer. However, several studies have reported that calcium oxide has unique catalytic and biological properties. Because their activity is strongly influenced by their analysis, these properties are most needed for a variety of applications in multiple fields, including materials science, environmental science, and medicine. The main reason for using biological methods to produce calcium oxide ( $\text{CaO}$ ) is to reduce the use of harmful chemicals in the manufacturing process, making the process more economical and environmentally friendly.

In this study, I explored the use of a natural dye from *Bauhinia x breakana* flowers in my  $\text{CaO}$ -based products and reported how it was applied. To my knowledge, the field of natural DSSC No studies have been conducted to investigate the sensitization of  $\text{CaO}$  by natural pigments from the flowers of *Bauhinia x breakana*.