PHOTOCATALYTIC ACTIVITY OF LOW-DENSITY POLYETHYLENE (LDPE) UNDER VISIBLE LIGHT USING ZINC OXIDE (ZnO) AND TITANIUM DIOXIDE (TiO_2) AS PHOTOCATALYST.

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ABSTRACT

PHOTOCATALYTIC ACTIVITY OF LOW-DENSITY POLYETHYLENE (LDPE) UNDER VISIBLE LIGHT USING ZINC OXIDE (ZnO) AND TITANIUM DIOXIDE (TiO_2) AS A PHOTOCATALYST

Every day, thousands of tons of pollutants, including plastic, are released into the environment due to various natural phenomena and human acts in this world (Obebe & Adamu, 2020). When plastic waste is not adequately handled, these plastic wastes litter to surroundings which can harm wildlife, habitat, humans, and the ecosystem. Landfilling, incineration, and recycling are the most common ways to dispose of plastic waste. However, many technologies are being developed for recycling because it is a better way to handle the plastic waste. In addition, new methods for making plastics degradable are being developed, such as thermal degradation, biodegradation, and photodegradation (Lin, 2016). This study is focusing on the photocatalytic degradation of LDPE using ZnO and TiO_2 as the photocatalyst. The main objective of this study is to investigate the effect of MB photodegradation of LDPE over ZnO and TiO_2 photocatalyst under visible light and the kinetic degradation of MB by using the Langmuir-Hinshelwood model can be determined. The studies showed photocatalysis for polymer degradation was found to be practical, affordable, and energy-efficient. This is because the photocatalytic is one of the alternative methods for degrading plastic that has been proven effective. By using fabrication process, three samples which are LDPE, (30/70 wt/wt %) of ZnO/LDPE, and 30/70 (wt/wt %) of TiO_2/LDPE can be prepared.

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

Polymer materials have a lot of interesting properties that make them beneficial in a variety of uses due to their great flexibility, strength, lightness, and low cost (Heath & Cooper, 2013). It has become an issue of serious concern with the importance of its impacts on the environment because of the accumulation of plastic waste that is hard to degrade (Sutanto, 2019). Municipal solid waste has become a serious issue in recent years since waste production has risen due to rapid urbanization and industry, growing populations, and upgraded lifestyles. According to the United Nations Environment Program (UNEP), plastics contribute 45% of Malaysia's municipal solid waste (MSW) among ASEAN countries. This equals 13 million tons of waste produced annually, and 13.2% of this amount comes from plastic packaging, such as polyethylene (PE) (Jain, 2017).

Plastic packaging from polymers such as polypropylene (PP), polystyrene (PS), polyvinylchloride (PVC), polyethylene (PE), and polyethylene terephthalate (PET) have been widely utilized in packaging due to their lightweight, good mechanical performance, and barrier properties among other characteristics (Ncube et al., 2021). Since they are non-biodegradable, most of them end up in landfills, which take centuries to decompose, causing severe pollution (Chen et al., 2021). As a strategy of reducing waste disposed into the environment, the packaging industry