

**THE STUDY OF PHOTOCATALYTIC ACTIVITY OF ZINC OXIDE
/LOW-DENSITY POLYETHYLENE COATED WITH SILVER VIA
HAND LAY-UP TECHNIQUE**

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ABSTRACT

PHOTOCATALYTIC ACTIVITY OF ZINC OXIDE/LOW-DENSITY POLYETHYLENE COATED WITH SILVER VIA HAND LAY-UP TECHNIQUE

Plastic generation is more than 320 million tons annually, and the rate of plastic waste production steadily increases by 3.9% per year. The introduction of plastic waste into water bodies may lead to many adverse environmental impacts as the plastic debris is very stable and generally requires a longer time to degrade. Heterogeneous photocatalysis using zinc oxide (ZnO) semiconductor has recently emerged as an effective way to degrade organic pollutants including dyes. In this study, the Ag was doped into ZnO/LDPE composite and successfully prepared via hand lay-up technique to improve the photocatalytic degradation of MB under visible light irradiation. The Ag-doped ZnO/LDPE were characterized by using Fourier transform infrared spectroscopy (FTIR) and Optical microscopy (OM). The FTIR absorption spectra reveal the characteristic peaks and estimated intensity of conjugated carbon while the OM image showed the properties for Ag/ZnO/LDPE composites. The effect of Ag concentration on photocatalytic activity of ZnO/LDPE was also studied. The degradation efficiency of ZnO/LDPE increases as the amount of Ag deposited increases. The optimal amount of Ag deposition was found to be 0.1 mol/l. The percentage degradation and the rate constant of 0.1M Ag/ZnO/LDPE is 90.1% and 0.0038 min^{-1} respectively, comparable to ZnO/LDPE composite, 97.1%, and 0.0051 min^{-1} .

TABLE OF CONTENT

ABSTRACT	i
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENT	iv
LIST OF TABLES	vi
LIST OF FIGURE	vii
LIST OF SYMBOLS	ix
LIST OF ABBREVIATIONS	x
CHAPTER 1 INTRODUCTION	
1.1 Background of study	1
1.2 Problem Statement	3
1.3 Research Questions	4
1.3 Significant of study	5
1.4 Objectives of study	6
1.5 Scope and limitation of study	6
CHAPTER 2 LITERATURE REVIEW	
2.1 Plastic and its applications	8
2.1.1 Polyethylene (PE)	9
2.2 Waste Management Technologies	11
2.2.1 Incineration	12
2.2.2 Landfill	12
2.2.3 Recycle	13
2.3 Degradation of PE	13
2.3.1 Thermal degradation	14
2.3.2 Biodegradation	14
2.3.3 Photodegradation	15
2.4 Principle of Photo Oxidative Degradation	16
2.4.1 Photo oxidative degradation mechanism of polymer	17
2.5 Advanced oxidation process	18
2.5.1 Heterogeneous photocatalysis	19
2.6 Metal oxide photocatalyst	21
2.6.1 ZnO as photocatalyst	21
2.6.2 Mechanism of ZnO photocatalysis	23
2.7 Photocatalytic activity of ZnO	25
2.8 Modification of ZnO photocatalyst	25
2.8.2 Deposition of noble metals	25
2.8.3 Effect concentration of Ag	28

CHAPTER 1

INTRODUCTION

1.1 Background of study

Polymers are very versatile materials that continuously increase applications because of their excellent properties in flexibility, hardness, lightness, a barrier against the permeation of gases, and low cost (Sutanto, 2019). The use of polymers in several applications such as agriculture, medicine, consumer science, industry, etc leads to adverse effects on the environment due to the accumulation of plastic waste that is difficult to degrade (Ouyang *et al.*, 2021). Plastic is typically produced and remolded until they reach the end of its life span, at which point a product is discarded as waste. United Nations Program for the Environment (UNEP) had reported that only 12% of plastic waste is incinerated, and 9% is recycled. The remaining 60% are either landfilled or enter the natural environment, where plastics accumulate and persist for a long term.

Low-density polyethylene (LDPE) is one of the basic types of Polyethylene (PE) polymer. LDPE is a very attractive polymer because of its excellent mechanical properties, high thermal stability, and good resistance to chemicals. It is typically used in the film and packaging industries (Ahmed *et al.*, 2017; Wannaborworn *et al.*, 2012). Plastic packaging has the largest share, which is estimated at 35.8% in the market of plastic products, and has a short lifetime. It is also one of the main plastic waste generation