

**EFFECT OF THERMAL TREATMENT ON GREEN SYNTHESIS OF ZINC
OXIDE USING *COSMOS CAUDATUS* LEAF EXTRACT AS
PHOTOCATALYST FOR
DEGRADATION OF METHYLENE BLUE DYE**

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
ABSTRACT	xi
ABSTRAK	xii
CHAPTER 1 INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	4
1.3 Research Questions	5
1.4 Objectives	5
1.5 Significance of Study	6
1.6 Expected Output/Outcomes/Implication	6
CHAPTER 2 LITERATURE REVIEW	
2.1 Water Pollution	7
2.2 Water Treatment Process	9
2.2.1 Advanced Oxidation Processes (AOPs)	10
2.3 Photocatalysis	11
2.4 Semiconductor Photocatalyst	13
2.5 ZnO Phase	13
2.6 Synthesis ZnO	14
2.6.1 Green Synthesis of ZnO	15
2.7 Parameter Study	15
2.8 Application of ZnO	16
2.8.1 ZnO in Photocatalyst	17
2.9 Mechanism and Limitations of ZnO as Photocatalyst	18

2.10	Organic Pollutants	19
2.11	Methylene Blue Dye	19

CHAPTER 3 RESEARCH METHODOLOGY

3.1	Materials	21
	3.1.1 General Chemicals	21
	3.1.2 Apparatus and Equipment	22
3.2	Methodology	24
	3.2.1 Preparation of <i>Cosmos caudatus</i> Extract	24
	3.2.3 Green Synthesis of Zinc Oxide	25
3.3	Photocatalytic Degradation of Methylene Blue Dye	26
3.4	Characterizations	28
	3.4.1 Fourier Transform Infrared (FTIR) Spectroscopy	28
	3.4.2 Energy-Dispersive X-ray Spectroscopy (EDX)	29

CHAPTER 4 RESULTS AND DISCUSSION

4.1	Fourier Transform Infrared Spectroscopy (FTIR)	30
4.2	Photodegradation	34
	4.2.1 Photodegradation of Methylene Blue Dye of Zinc Oxide	34
4.3	Ultraviolet-Visible Diffuse Reflectance Spectroscopy (UV-Vis DRS)	39

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

CITED REFERENCES	45
APPENDICES	48
CURRICULUM VITAE	51

ABSTRACT

EFFECT OF THERMAL TREATMENT ON GREEN SYNTHESIS OF ZINC OXIDE USING *COSMOS CAUDATUS* LEAF EXTRACT AS PHOTOCATALYST FOR DEGRADATION O METHYLENE BLUE

Water pollution caused by synthetic dyes such as methylene blue (MB) is a growing environmental concern due to its toxicity, stability, and resistance to degradation. Conventional water treatment methods often face limitations such as high costs, low efficiency at trace concentrations, and secondary pollution. Photocatalysis using semiconductor materials like zinc oxide (ZnO) presents as promising alternative for dye degradation, particularly under UV light exposure. This research focuses on the green synthesis of ZnO nanoparticles using *Cosmos caudatus* leaf extract as a natural reducing and stabilizing agent. The main objective of this study is to explore the potential of plant-based synthesis in developing effective photocatalysts for wastewater treatment. Specifically, the study aims to evaluate the effect of different calcination temperatures (450 °C, 500 °C, and 550 °C) on the photocatalytic degradation efficiency of methylene blue dye. The biosynthesized ZnO will be prepared through a green synthesis method followed by heat treatment at selected calcination temperatures. The resulting samples will be characterized using Energy Dispersive X-ray Spectroscopy (EDX) and Fourier-transform infrared (FTIR) spectroscopy to determine their morphology properties and functional groups. The photocatalytic performance of the ZnO nanoparticles will be tested by monitoring the degradation rate of methylene blue dye under irradiation light. The expected outcome of this study is the development of a cost-effective and eco-friendly photocatalyst with high degradation efficiency, contributing to sustainable wastewater treatment technologies.