

**REMOVAL OF MALACHITE GREEN DYE USING SULPHURIC ACID
TREATED DURIAN LEAVES ADSORBENT**

FAZRIZAL BIN DOLKAFRI

**Final Year Project Submitted in
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Chemistry
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JANUARY 2016

ACKNOWLEDGEMENTS

Assalamualaikum w.b.t. In the name of Allah, Most Gracious and Most Merciful, I thank Allah for all His blessing for the completion of this research. Special thanks to my parent whom always give me the inspiration and support for always being there to boost my spirit up in completion of this research. To my supervisor Miss Wan Khaima Azira binti Wan Mat Khalir and my co-supervisor Madam Mardhiah Binti Ismail, I would like to express my appreciation for the guidance both of you give me through this research and thanks for giving me the opportunities to participate in this research. To Mr Mohd Fauzie Bin Idrus, I would like to express gratitude for being a technical support for every final year student and me in completing this research. Finally to all of my friend especially to Nur'Ain binti Mohd Nizam Prushotman, Azwanis Sofea binti Asmadi, Nur Fatin Adlina binti Mohd Fouzi, Liyana Ainun binti Yamin and Faris Ilyamuddin bin Hamzah for the exchange of information during the research and also a gratitude to every person that have supporting this research.

Fazrizal Bin Dolkafri

TABLE OF CONTENT

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	ix
ABSTRAK	x
CHAPTER 1 INTRODUCTION	
1.1 Background of the study	1
1.2 Problem statement	5
1.3 Significance of the study	6
1.4 Objectives of the study	7
1.5 Scope of the study	8
CHAPTER 2 LITERATURE REVIEW	
2.1 Malachite green in aqueous waste	9
2.2 Treatment technologies for malachite green dye in aqueous waste	12
2.3 Adsorption	15
2.4 Acid treatment on plant waste adsorbent	16
CHAPTER 3 RESEARCH METHODOLOGY	
3.1 Materials	
3.1.1 Raw Material	20
3.1.2 Chemical Reagent	20
3.1.3 Glassware	20
3.1.4 Equipment and Analytical Instrument	21
3.2 Methods	
3.2.1 Sample Collection	21
3.2.2 Sulphuric acid treatment	22
3.2.3 Preparation of stock solution of malachite green dye	22
3.3 Batch malachite green adsorption study	
3.3.1 Determination of pH effects	23
3.3.2 Effects of adsorbent dosage	23
3.3.3 Effects of initial malachite green concentration and contact time	24
3.3.4 Isotherm study	24
3.3.5 Result calculation	25

CHAPTER 4 RESULTS AND DISCUSSIONS	
4.1 Determination of pH effect	28
4.2 Effect of adsorbent dosage	30
4.3 Effect of initial concentration of malachite green and contact time	32
4.4 Adsorption kinetic	34
4.5 Adsorption isotherm	
4.5.1 Langmuir isotherm model	40
4.5.2 Freundlich isotherm model	42
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	44
CITED REFERENCES	46
APPENDICES	49
CURRICULUM VITAE	52

ABSTRACT

REMOVAL OF MALACHITE GREEN DYE USING SULPHURIC ACID TREATED DURIAN LEAVES ADSORBENT

Durian leaves was treated with sulphuric acid and its performance in the removal of malachite green from aqueous solution was evaluated. This study was performed in a batch adsorption system. The effect of several important parameters which can affect adsorption capacity such as pH, dosage, initial concentration and contact time were also studied. The optimum pH for malachite green adsorption was 10. Even at low adsorbent dosage of 0.02 g, the adsorption has reached 93% of malachite green could be removed. The adsorption capacity was also dependent on malachite green concentration and contact time which only 30 min at concentration 10 mg/L of malachite green to reach equilibrium. Two isotherm model : Langmuir and Freundlich were used to analyze malachite green ions adsorption process and from the equilibrium data presented better fitting to Langmuir isotherm model which is based on assumption that adsorption occur at specific homogenous sites on the adsorbent. Based on Langmuir model, the maximum adsorption of malachite green ions was 294.12 mg/g. Two kinetic models; pseudo-first order and pseudo-second order were used to analyze malachite green ions adsorption process and the results shows that pseudo-second order was fitted well and chemical reaction could be the rate determining steps.