CERTIFICATE

This is to certify that the work which is being presented in thesis entitled "MALACHITE GREEN DYE REMOVAL USING PRETREATED RICE HUSK AS LOW COST ADSORBENT" is submitted by SURYA PRAKASH, ROLL NO- 2K14/ENE/017 in the partial fulfillment of the requirement for the award of the degree of MASTER OF TECHNOLOGY in ENVIRONMENTAL ENGINEERING to DEPARTMENT of ENVIRONMENTAL ENGINEERING, DELHI TECHNOLOGICAL UNIVERSITY. It is the record of students's own work carried under the supervision and guidance

Mrs. Geeta Singh

(Supervisor)

Assistant Professor

Department of Environmental Engineering

Delhi Technological University,

Delhi

ACKNOWLEDGEMENT

I would like to express my hearty gratitude to my project guide Mrs. Geeta Singh, Assistant Professor, Delhi Technological University, Delhi for giving me the opportunity to work under her insightful and substantial guidance and bestowing me with her constant guidance, encouragement, kind suggestions and tireless endeavors for this project thesis.

I wish to thank my HOD, Prof. A.K. Gupta. I am highly grateful to Sh. Sunil Tirki and all the Faculty and laboratory staff of Department of Environmental Engineering for their cooperation.

Surya Prakash
Roll No. 2K14/ENE/017
M.TECH (ENVIRONMENTAL ENGINEERING)
Department of Environmental Engineering
Delhi Technological University
Delhi-110042

DECLARATION

I, hereby declare that the work being presented in the project entitled "MALACHITE GREEN DYE REMOVAL USING PRETREATED RICE HUSK AS LOW COST ADSORBENT" is an original work and an authentic report carried out as apart of my major project. The contents of this report have not been previously formed the basis for the award of any degree, diploma or other similar title or recognition and is being utilized by me for the submission of my Major-2 Report to complete the requirements of Master's degree of Examination in Environment Engineering, as per Delhi Technological University curriculum.

Surya Prakash

Roll No. 2K14/ENE/017

M.TECH (ENVIRONMENTAL ENGINEERING)

Department of Environmental Engineering

Delhi Technological Univeristy

Delhi-110042

Table of Contents

Titles						
Certificate						
Acknowledgement						
Declaration						
Table of Contents						
List of Figure						
List of Table						
Abstract						
Titles						
Chapter 1. Introduction						
Chapter 2. Literature Review						
	2.1	Malachite Green Dye	4			
	2.2	Methods of dye removal	6			
		2.2.1 Coagulation-flocculation	6			
		2.2.2 oxidation	6			
		2.2.3 Photocatalytic degradation	6			
		2.2.4 Membrane process	7			
		2.2.5 Biological treatment	7			
		2.2.6 Adsorption	8			
	2.3	Adsorption as a method of waste water treatment	8			
	2.4	Rice Husk	9			
		2.4.1 Rice husk as a potentially low-cost biosorbent dye removal	9			

		2.4.2 Properties of Rice Husk	10			
	2.5	Studies on MG as an Adsorbate	11			
Ch	19					
	3.1	Objective of the Present Work				
	3.2	Scopes of the present work				
Ch	20-38					
	4.1	Equipments and Chemicals	20			
	4.2	Preparation of adsorbent	21			
	4.3	Procedure of the tests for MG removal	28			
		4.3.1 Experimental Studies				
		4.3.2 Observations				
Ch	39-43					
	5.1	The effect of different bed depth	39			
	5.2	The effect of flow rate on breakthrough curve	40			
	5.3	The effect of initial concentration on breakthrough curve	40			
	5.4	The effect of initial solution pH on breakthrough curve	41			
	5.5	Column Regeneration and Reuse	42			
Chapter 5. Conclusion						
Reference						

List of Figures

Sl no.	Figure no.		Captions	Page no
1	4.1	:	Instrumental setup	23
2	4.2	:	pH meter	23
3	4.3	:	weigh machine	24
4	4.4		weight measurement	25
5	4.5	:	Sieves	25
6	4.6	:	malachite green dye	26
7	4.7	:	Oven	26
8	4.8	:	Spectrophotometer	27
9	4.9	:	sample collection	27
10	4.10	:	spectrophotometer reading	28
11	4.11	:	Relationship between time & C/Co	30
12	4.12	:	Relationship between time & C/Co	31
13	4.13	:	Relationship between time & C/Co	33
14	4.14	:	Relationship between time & C/Co	34
15	4.15	:	Relationship between time & C/Co	35
16	4.16	:	Service time vs bed depth	38
17	5.1	:	Effect of flow rate on breakthrough curve	40
18	5.2	:	The effect of initial concentration on breakthrough curve	41

19	5.3	:	The effect of initial solution pH on breakthrough curve	42

List of Tables

Sl	Table	Table Captions	Page no	
no.	no.		Cupitons	
1	2.1	:	Properties of malachite green	5
2	2.2	:	Typical composition office husk	10
3	2.3	:	Chemical composition in mineral ash	11
4	2.4	:	Reported physicochemical characteristics of rice husk	11
5	4.1	:	Instruments used	20
6	4.2	:	Observation table 1	29
7	4.3	:	Observation table 2	30
8	4.4	:	Observation table 3	32
9	4.5		Observation table 4	33
10	4.6	:	Observation table 5	34
11	4.7	:	Volume of MG treated and the mass of TREATED RICE HUSK required up to breakthrough	36