

DECOLOURISATION OF TEXTILE EFFLUENT
BY USING NATURAL ADSORBENTS

DIYANA SHAZLIZASHAH BINTI AZIZSHAH

BACHELOR OF SCIENCE (Hons.)
TEXTILE TECHNOLOGY
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA.

JANUARY 2014

ACKNOWLEDGEMENT

In the name of Allah, The most Gracious and Most Merciful

Firstly, I would like to express my deepest gratitude to Allah S.W.T for giving me patience, courage and strength in finishing this project in the given time.

I would like to convey my appreciation and thankfulness to my supervisor, Associate Professor Dr. Hajah Khadijah Bt Omar for accepting me as the supervisee and for guiding me throughout the project from the very beginning until the end. Her hard work in helping me out in doing this project will never be forgotten. I also would like to deliver my appreciation to Dr. Suzaini Abdul Ghani, the FYP Coordinator who has guided me in making the proposal of this project.

My gratitude also goes to all academic and non academic staff from the Department of Textile Technology, Faculty of Applied Science, Universiti Teknologi Mara(UiTM) especially Encik Zainal Sukail who has helped me in the laboratory.

Special thanks to my beloved parents, Mr Azizshah Haji Sahrom and Madam Haliza Khalid for being supportive, understanding, and for their endless love. Deep gratitude is extended to my family, friends, classmates and seniors for their encouragement, help and idea given to me in carrying out this project.

Last but not least to my best friend, Hani Amirah Abdul Malik thank you for everything. This project would not have been completed and succeed in time without all the supports and encouragement from all of you. Thank you.

Abstract

The control of water pollution has become of increasing importance in recent years. The release of dyes into the environment constitutes only a small proportion of water pollution, but dyes are visible even in small quantities. Currently, decolourisation of textile effluent is by physio-chemical means, such methods are often very costly and although the dyes are removed, accumulation of concentrated sludge creates a disposal problem. There is a need to find alternative treatments that are effective in removing dyes from large volumes of effluents and are low in cost, such as biological or combination systems. Adsorption technique is widely used to remove certain classes of pollutants from waters, especially those which are not easily biodegradable. Currently, a combination of biological treatment and adsorption on activated carbon is becoming more common for removal dyes from textile effluent. Although commercial activated carbon is a preferred adsorbent for colour removal, its widespread use is restricted due to its relatively high cost which led to the study on alternative non-conventional and low-cost adsorbents. In this study, the use of non-conventional low-cost natural adsorbents to decolourise the simulated dye effluent has been reviewed. Betel nut husk (buah pinang), roasted sunflowers seed husk (kulit kuaci) and pine nuts, are natural adsorbent waste abundantly available in Malaysia were used for the decolourisation of textile effluent. The effects of type of dyes and pH value were studied. The results indicate that betel nut husk and sunflower husk used in this study are an attractive alternative for decolourisation of textile effluent according to their efficiency of the adsorbents to decolourise the simulated dye effluent. The decolourisation worked by using 1.5g of adsorbent at pH 10 for both dyes.

Table of Contents

Acknowledgement.....	i
Abstract.....	ii
Abstrak.....	iii
Chapter 1: Introduction.....	1
1.1 Background of the study	1
1.2 Objectives of the study	3
1.3 Scope of the study	3
1.4 Significance of the study	3
Chapter 2: Literature Review	4
2.1 Textile Wastewater	4
2.2 Characteristics of Textile Wastewater	5
2.2.1 Physical Characterisation.....	6
a) Turbidity.....	6
b) Colour.....	6
c) Temperature.....	7
d) Odour	7
2.2.2 Chemical Characterisation	8
2.3 Treatment of Decolourisation of Textile Effluent.....	8
2.3.1 Chemical Methods	10
a) Oxidative Process.....	10
b) Electrochemical Destruction	10

c)	Sodium Hypochlorite (NaOCl)	11
2.3.2	Biological Methods	11
a)	Decolourisation by White-rot Fungi	11
b)	Adsorption by Living/Dead Microbial Biomass	12
2.3.3	Physical Methods	12
a)	Adsorption	13
b)	Membrane Filtration.....	13
2.4	Decolourisation of Textile Effluent using Natural Adsorbent.....	14
2.4.1	Activated Carbon.....	15
2.4.2	Non-conventional Low Cost Adsorbents.....	16
a)	Agricultural Solid Waste.....	16
b)	Biomass (dead and living)	17
c)	Miscellaneous Adsorbent.....	17
Chapter 3:	Methodology	19
3.1	Materials.....	19
3.1.1	Adsorbents.....	19
3.1.2	Dyes: Eversol Orange 3R and Supra Red BWS	19
3.1.3	Apparatus and equipments	19
3.1.4	Chemicals	19
3.2	Methods.....	20
3.2.1	Preparation of adsorbents	20
3.2.2	Preparation of simulated dye effluent	21
3.2.3	Decolourisation of simulated dye effluent using the adsorbent	21
a)	Adsorbents characteristics and effect on decolourisation.....	21
b)	Influence of pH values	22
c)	Effect of adsorbent dosage	22