بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــســـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

Production of high quality pulp from bagasse by using non- conventional pulping and bleaching methods

A Thesis

Submitted to
The Chemistry Department
Faculty of Science
Ain Shams University

By

El Barbary Mohamed Hassan

(M.Sc.)

For
The Degree of
Doctor of Philosophy
In
Chemistry
1998

جامعة عين شمس

كليــــة العــــلوم

وافق مجلس الكلية على تقديم الرسالة بتاريخ ١٢/٧/٩٢

لجنة الامتحان أ.د. [illegible]

أ.د. [illegible]

أ.د. [illegible]

وافق مجلس الكلية على منح الدرجة بتاريخ

Ain Shams University
Faculty of Science

Approval Sheet

Name **El Barbary Mohamed Hassan**

Thesis title **Production of high quality pulp from bagasse by using non-conventional pulping and bleaching methods**

Supervisors	**Approved**
From Ain Shams University	
Prof . Dr. Mohamed Mohamed Habashy	M. Habashy
From National Research Centre	
Prof . Dr. Nadia Shukry Hanna	Nadia Shukry
Prof .Dr. Samira Fahmy Yacoub	Samira Fahmy

Credit

Prof .Dr. A. F. Fahmy
A.F.M. Fahmy
Head of Chemistry Department

Acknowledgment

The author likes to express his sincere gratitude to Prof. Dr. Mohamed Mohamed Habashy, professor of organic chemistry, faculty of science, Ain Shams University , for his support and follow during the research .

The author is indebted to Prof. Dr. Nadia Shukry Hanna, and to Prof. Dr. Samira Fahmy Yacoub, professors at Cellulose and Paper Department , National Research Centre, for suggesting the topic of this work, following its progress with interest , supervision and discussion of the results , careful guidance , encouragement , valuable advises and continuos help .

The author wishes also to express his sincere debt to Prof. R. Patt, Dr. O. Kordsachia , Institute for Wood Technology, Hamburg University , Germany , for providing the chelants, catalyst and activator used in this study , and for their helpful advises.

The author acknowledges financial support generously provided by the NRC.

2.5. Conventional Bleaching 39
2.6. H_2O_2 Bleaching 40
2.6.1. Pulp pretreatment 40
2.6.2. Bleaching experiments 40
2.6.3. Determination of residual H_2O_2 41
2.6.4. Preparation of laboratory sheets for brightness determination SCAN -C11-75... 41
2.7. Analysis of Bleached Pulp 42
2.7.1. Micro - kappa number 42
2.8. Determination of Strength Properties for Unbleached and Bleached Pulps 42
2.8.1. Preparation of laboratory hand made paper sheets for papermaking properties 42
2.8.1.1. Beating and disintegration 42
2.8.1.2. Sheet making 43
2.8.2. Paper sheet properties 43
2.8.2.1. Basis weight 43
2.8.3. Strength properties 43
2.8.3.1. Tensile strength and breaking length 43
2.8.3.2. Bursting strength 44
2.8.3.3. Tear resistance 44

3. RESULTS ADN DISCUSSION
3.1. Pulping Experiments 45
3.1.1. Determination of the optimum methanol charge 46
3.1.2. Determination of the optimum cooking time 47
3.1.3. Effect of chemical charge on ASAM pulp properties 60
3.1.3.1. Effect of chemical charge on pulp screened yield of ASAM alternatives 62
3.1.3.2. Effect of chemical charge on pulp viscosity of ASAM alternatives . 66
3.1.3.3. Effect of chemical charge on kappa number of ASAM alternatives. 69
3.1.3.4. Effect of chemical charge on pulp brightness of ASAM alternatives 71
3.1.4. Effect of alkali ratio on ASAM pulp properties 71
3.1.4.1. Effect of alkali ratio on pulp screened yield of ASAM alternatives ... 74
3.1.4.2. Effect of alkali ratio on pulp viscosity of ASAM alternatives 74
3.1.4.3. Effect of alkali ratio on kappa number of ASAM alternatives..... 79
3.1.4.4. Effect of alkali ratio on pulp brightness of ASAM alternatives 81
3.1.5. ASAM pulping under varied ratios of NaOH : Na_2CO_3 81
3.1.6. Papermaking properties of unbleached ASAM pulps 86
3.1.6.1. Beating resistance 86
3.1.6.2. Strength properties 93
3.1.6.2.1. Breaking length 93
3.1.6.2.2. Burst factor 93
3.1.6.2.3. Tear factor 94
3.2. Conventional Bleaching 95
3.3. TCF Bleaching of ASAM Bagasse Pulps 98
3.3.1. Pulp pretreatment with chelating agent 99
3.3.2. Peroxide bleach experiments (P) 101
3.3.2.1. Effect of H_2O_2 and NaOH charges and NaOH : H_2O_2 ratio on pulp properties 102
3.3.2.2. Effect of $MgSO_4$ charge on pulp properties 107

3.3.2.3. Effect of the type of the chelant added in the P stage on pulp properties 109
3.3.2.4. The importance of the Q stage 113
3.3.2.5. Effect of H_2O_2 catalyst 115
3.3.2.6. Effect of H_2O_2 activator 119
3.3.2.7. Peroxide bleach experiments on ASAM alternatives and soda-AQ pulps 122

3.4. Papermaking Properties for conventionally Bleached Pulps 131

3.5. Papermaking Properties of ASAM Alternatives and Soda - AQ Bleached with H_2O_2 133

4. Summary and conclusion 136

5. Refrences 140

Arabic Summary

Aim of the work

Pulp and paper industry represents a source of pollution when the wastes of this industry are discharged to public waters. Although conventional pulping processes have been modified, so that least amounts of emissions develop, many bleach plants are still using chlorine and its compounds which deliver great loads of impurities and hard destroyable chlorolignin compounds.

The reduction of the above mentioned harmfull effects requires, besides financial investments, growing environmental awareness. New pulping and bleaching technology, more stringent effluent regulations, environmental pressure groups and new market demands have had a considerable influence on modern bleaching practices in many European countries. Pulp bleach plants are under both governmental and public pressure to lower the release of chlorinated compounds.

In most countries there are also local environmental organizations with great influence. In Egypt, the Egyptian Environmental Affairs Agency (EEAA) has been established 1994 in accordance with the provision of public low no.4. EEAA sector areas of action include, among other activities, industry and hazardous industrial wastes . The agency adopts a range of policies for the protection of the environment . This means that it is now the right time to think about new pulping and bleaching techniques, which are environmentally friendly , to be applied in Egypt .

Progress in pulp industry allover the world is forced not only by environmental protection reasons but also with the necessity of sparing use of wood. Some nonwood plant fibres have become important supplementary raw materials for pulp industry in many countries using pulpwood. Bagasse fibres have the greatest potential and are considered very promising .

The objective of our study was the production of high quality pulp from bagasse by using environmentally benign pulping and bleaching agents . ASAM pulping process, a comparatively new pulping method, has found great interest in many countries. This pulping process allows the use of bleaching agents, which are less selective to lignin than chlorine itself, e.g. ozone, hydrogen peroxide, peracids ....etc. Our study is aimed also at using a single bleach agent in order to reach brightness levels > 80% ISO. Hydrogen peroxide is relatively a cheap bleaching agent and is available in the Egyptian market. The ASAM pulping process and peroxide bleach of bagasse have been optimized and we hope that our results can find the way to be appllied in the industry .