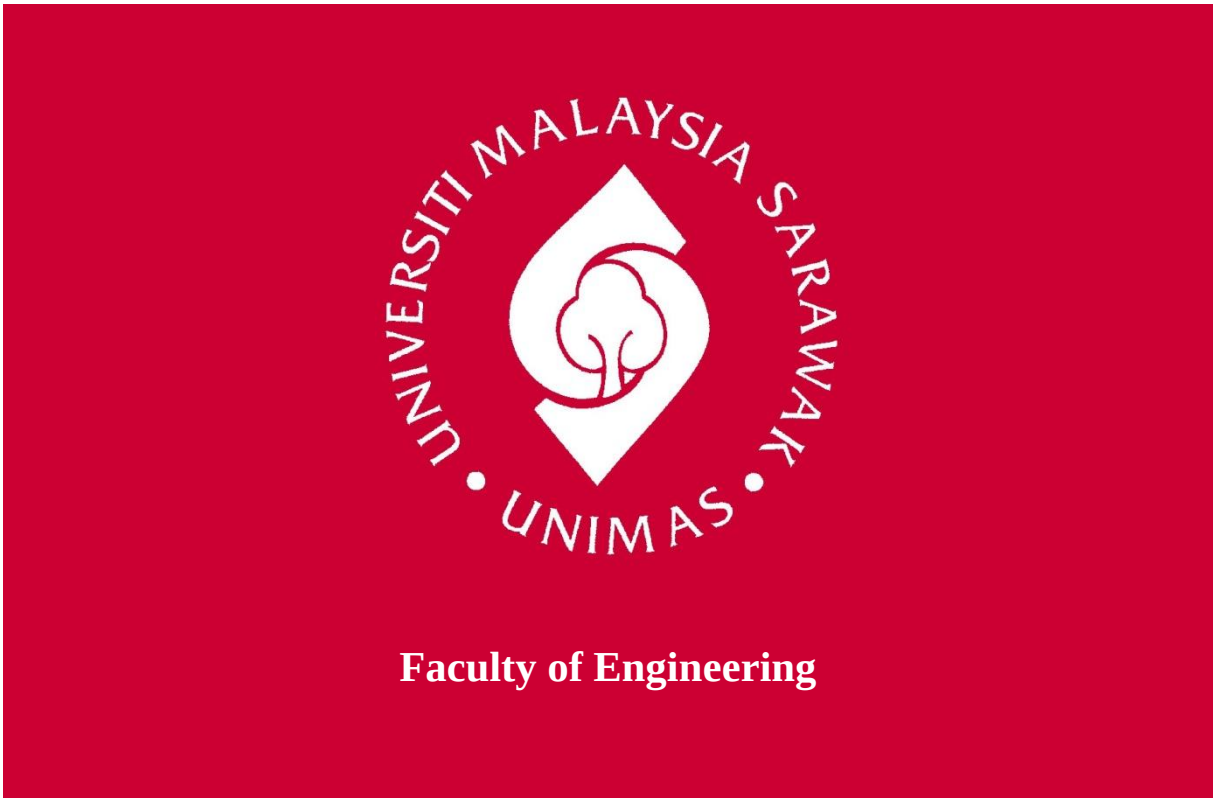

POTENTIAL OF RAZOR CLAM (AMBAL) AS COAGULANT IN WATER TREATMENT PROCESS

AMIRUL BIN ADENAN

Bachelor of Engineering with Honours
(Civil Engineering)
2008/2009

UNIVERSITI MALAYSIA SARAWAK

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This project report attached here to, entitles **"POTENTIAL OF RAZOR CLAM (AMBAL) AS COAGULANT IN WATER TREATMENT PROCESS"** prepared and submitted by **AMIRUL BIN ADENAN (13711)** as a partial fulfillment of the requirement for the Degree of Bachelor of Engineering with Honours in Civil Engineering is hereby read and approved by:

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POTENTIAL OF RAZOR CLAM (AMBAL) AS COAGULANT IN WATER TREATMENT PROCESS

AMIRUL BIN ADENAN

This Thesis Is Propose To

Faculty of Engineering, Universiti Malaysia Sarawak

For Fulfillment of The Requirements for Bestowal

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(Civil Engineering)

2009

This project report is dedicated to my beloved mother and father,

my dearest brothers and sisters

for their love and support

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CONTENTS

ABSTRAK

Objektif kajian ini adalah untuk menentukan kebolehlaksanaan penggunaan kitosan yang diekstrak daripada kerang ambal sebagai bahan pengumpal semula jadi untuk memulihkan kekeruhan dalam proses rawatan air. Kitosan ini dikaji bertujuan untuk menyelesaikan masalah pencemaran yang disebabkan oleh pembebasan mendakan ke alam sekitar yang terhasil daripada pengumpal alum. Mendakan dan air yang dirawat menggunakan pengumpal konvenstional ini mengandungi Al^{3+} yang boleh mencemarkan sungai dan menyumbang kepada pelbagai penyakit. Kitosan telah dipilih sebagai alternatif kepada masalah ini kerana kitosan merupakan sumber semula jadi, bahan bukan toksik dan 100% sumber terbiodegradasi. Dalam kajian ini, proses kajian telah dibahagikan kepada dua bahagian iaitu proses pengekstrakan kitosan dan proses menentukan dos optimum melalui eksperimen ujian jar. Dalam ujian jar ini, kekeruhan 150 hingga 180 NTU air Sungai Muara Tuang telah digunakan untuk menentukan keberkesanan pengumpal kitosan dan aluminium sulfat dalam memulihkan kekeruhan. Daripada keputusan kajian, dos optimum yang terhasil dan peratusan kekeruhan yang dipulih menggunakan kedua–dua pengumpal adalah hampir sama. Kepekatan 40 mg/L pengumpal kitosan mampu memulihkan kekeruhan sebanyak 99.39 % . Manakala 37.5 mg/L alum mampu memulihkan kekeruhan sebanyak 99.37%. Kesimpulannya, kitosan yang diekstrak daripada kerang ambal boleh diaplikasi dalam proses rawatan air.

ABSTRACT

The objective of this research was to determine the feasibility of using chitosan that was extracted from razor clam (ambal) crustacean shells as a natural coagulant to remove the turbidity in water treatment process. This chitosan coagulant was studied in order to solve the pollutant problem that was obtained by the sludge treated by alum backfill into the environment. The sludge and the water treated by this conventional coagulant containing Al^{3+} can polluted the river and induce many diseases. The chitosan has being chosen as an alternative to this problem due to its neutrality, non toxic material and 100% biodegradable resources. In this study, the process has been divided into two parts which were chitosan extraction process and the determination of coagulant optimum dosage process through the jar test experiment. In the jar test, the 150 to 180 NTU turbidity range of Muara Tuang River have been used to determine the effectiveness of using chitosan and aluminum sulphate coagulant in turbidity removed. From the result, the optimum dosage determined and the percentage of the turbidity removed by both coagulants are almost similar. The 40 mg/L concentration chitosan coagulants manage to remove 99.39 % turbidity and the 37.5 mg/L of alum manage to remove 99.37% turbidity. From the result, it can conclude that the chitosan extracted from razor clam crustacean shell can be applied as coagulant in water treatment process.

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Al	-	Aluminum
$Al_2(SO_4)_3$	-	Aluminum sulfate
Alum	-	Aluminum sulfate
AWWA	-	American Water Works Association
CH3-CO	-	Acetyl groups
COD	-	Chemical oxygen demand
Fe	-	Ferric
$FeCl_3$	-	Ferric chloride
$[Fe_2 (SO_4)_3]$	-	Ferric sulphate
HCL	-	Hydrochloric
JKR	-	Jabatan Kerja Raya
MC	-	MC is the moisture content (%),
Wws	-	Weight of the wet sample (g)
NaOH	-	Sodium Hydroxide
NDWQSP		National Drinking Water Quality Standard
PAC	-	Polyaluminium chloride
PDADMA	-	Polydiallyl dimethyl
PPM	-	Part per million
Wds	-	Weight of the dry sample (g).

CHAPTER 1

INTRODUCTION

1.1 Introduction

Water is an important resource in human civilization. It gives a lot of benefit to human, such as drinking water, preparing food, bathing, cleaning, washing, irrigating crops and many others daily use. In the past, when human start settling in one place and growing crops, they start to build house near the water resources such as river, lake, sea, rain, and ground water for their daily usage. They use the water directly from those sources without knowing the sanitary of water and term of the water treatment.

Water treatment can be describes as a process used to make water more acceptable for a desired end-use such as drinking water, industrial processes and medical. The goal of all water treatment process is to remove existing components in the water, improving it for subsequent utilization.

This water treatment process generally begins with intake at the source, followed by pretreatment, mixing, coagulation and flocculation, sedimentation, filtration, disinfection, and distribution to the tap. In all this step, coagulation and flocculation is the main and important process of the water treatment. There are variety of chemical reagent have been use as coagulant and one of the common coagulant is alum.

. In the coagulation and flocculation process, the raw water flows and mixed with suitable amount of alum into large basins. In there, the alum clings to other chemicals and impurities in the water (coagulation), causing them to form larger, and heavier particles called floc. These larger particles will settle to the bottom of the basins because of the gravity force.

According to Wikipedia (2008) in civil engineering term, the flocculation definition is a condition in which polymers, clays or other small charged particles become attached and form a fragile structure, a floc. In dispersed clay slurries, flocculation occurs after mechanical agitation ceases and the dispersed clay platelets

spontaneously form flocs because of attractions between negative face charges and positive edge charges. While, the coagulation is describe as the destabilization of colloids by neutralizing the forces that keep them apart.

In conventional water treatment process we have using aluminum sulfate $Al_2(SO_4)_3$ has been use as coagulant reagent and is also commonly known as filter alum. Alum is used in such everyday products as baking powders and deodorants. In water treatment, alum is used as a coagulant, which binds together very fine suspended particles into larger particles that can be removed by settling and filtration. This way, objectionable color and turbidity (cloudiness), as well as the aluminum itself, are removed from the drinking water.

1.2 Problem Statement

There are many potential natural resources that can be use as coagulants in water treatment process. One of the potential resources is razor clam (ambal). Razor clam is one of the sea life which can be found in stable, sandy, surf-swept beaches of the open coast and some coastal bays in all Southeast Asia, but is at its best in intertidal sandy Sarawak beaches. The intertidal sandy beaches include Asajaya, Muara Tebas, Bako,

Buntal, Lundu, Sematan, Kuala Matu Kuala Matu and Kuala Matu (Kanakaraju D. and Siti Akmar Khatijah, 2008).

Essentially, the shell of the razor clam is one of the potential resources as coagulants in water treatment process. From Juang et al (1996) and Lasco & Hurst (1999) studies, chitosan is a cationic polysaccharide which can be extracted from the shell crustaceans is an important polymer coagulants in water treatment. This prospect can be used to replace the conventional method since its resources can be easily found and available in our country.

Chitosan is chitin derivative products, which is naturally occurring biopolymer derived from recycled crustacean shells, insect exoskeletons or fungi. Chitin is harvested from the seafood processing industry throughout the world to supply the base material for the manufacturing of chitosan.

In conventional method of water treatment in Malaysia, most of the water treatment plants are using aluminum sulfate as coagulants in the treatment process. From these water treatments process, the sludge treated by alum backfill into the environment and became pollutants. This alum also pollutes drinking water and it cans adversely mankind's health because the Al^{3+} will induce many diseases such as premature aging, nowadays for our water supplies water treatments.

1.3 Aim and Objective

The primary aim of the study is to find potential of natural resource as coagulant in water treatment. In accordance with the aim of the study, the objectives of the study are as follow:

i. To extract chitosan from razor clam (ambal) crustacean shell.
ii. To use the chitosan extracted from razor clam as coagulant for the jar test.
iii. To determine the optimum dosage of using the chitosan as coagulant.
iv. To compare the chitosan coagulant with the conventional coagulant.