

**CHEMICAL AND BIOLOGICAL OXIDATION OF SULPHUR
COMPOUNDS UNDER ANOXIC CONDITIONS**

By

NURUL AYU FATMA RAMLI

Report is submitted as
the partial requirement for the degree of
Bachelor of Engineering (Hons.) Civil

**UNIVERSITI TEKNOLOGI MARA
NOVEMBER 2008**

DECLARATION BY THE CANDIDATE

I (Nurul Ayu Fatma Binti Ramli, 2006878801) confirm that the work is my own and that appropriate credit has been given where reference has been made to the work of others.


.....

(December 1st, 2008)

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious, the Most Merciful. Praise to Him the Almighty that in His will and consent, given me strength, guidance and keeping me healthy all the time, I had managed to complete this Final Year Project (FYP) report. There are many people that deserve my undying thanks and appreciation for support on this FYP that never seemed to end. First and foremost, I would like to express my heartfelt gratitude and a big thank you to my supervisor, Prof. Sr. Ir. Dr. Hj. Suhaimi B. Abdul Talib for his enlightening supervision, concern, countless hours spent, valuable insight, guidance, advice, encouragement and cooperation showed in assisting me to successfully complete the FYP. He is persistence in sharing their uncountable experiences and profound knowledge which has helped me to better understand bewildered problems and concepts.

My sincere and heartfelt thanks also dedicated to technical staffs of the Environmental Engineering Laboratory, Faculty of Civil Engineering, UiTM especially to Mr. Mohd Azuan Azhar B. Md Zain, Mr. Ali B. Miskam, and Mr. Mukmin for their technical assistance. I would also like to acknowledge the helpful and abundant support to all lab members especially to: Nur Azwa Bt. Muhamad Bashar, Nur Azrinawati Bt. Ab. Rahman, Muhammad Hazrin B. Yacob and Abdullah Za-im B. Fauzi, who have directly or indirectly lent a helping hand here and there and so many other things that there's not enough space to mention it all towards the completion of this FYP. Special thanks to Nurul Khamsatul Akma Bt. Kamarulzaman, the master student who have helped me during experimental of my study.

ABSTRACT

Microbial transformations of wastewater in sewer networks result in wastewater quality changes. These processes may occur in bulk water, biofilm and sewer sediment phases under aerobic, anoxic or anaerobic conditions. Anoxic conditions do not naturally occur in sewers but are caused by nitrate addition when managing odor and corrosion problems in sewer networks. The use of nitrate for the prevention of sulphide production is well documented. Batch test were designed and conducted to investigate the chemical and biochemical transformation rates of sulphur and nitrogen compounds under anoxic conditions in bulk water phase. The laboratory testing was conducted to establish the result. Throughout the experiment, the result for sulphur compounds in chemical transformation rate was found to be $0.00 \text{ mg SO}_4\text{-S L}^{-1}\text{h}^{-1}$, $0.01 \text{ mg SO}_3\text{-S L}^{-1}\text{h}^{-1}$ and $0.03 \text{ mg S}_2\text{O}_3\text{-S L}^{-1}\text{h}^{-1}$ while for nitrogen compounds it were found to be $0.01 \text{ mg NO}_3\text{-N L}^{-1}\text{h}^{-1}$ and $0.00 \text{ mg NO}_2\text{-N L}^{-1}\text{h}^{-1}$. The bio-chemical transformation rate for sulphur compounds are $0.38 \text{ mg SO}_4\text{-S L}^{-1}\text{h}^{-1}$, $0.00 \text{ mg SO}_3\text{-S L}^{-1}\text{h}^{-1}$ and $0.67 \text{ mg S}_2\text{O}_3\text{-S L}^{-1}\text{h}^{-1}$. The value for nitrogen compounds are $1.62 \text{ mg NO}_3\text{-N L}^{-1}\text{h}^{-1}$ and $0.64 \text{ mg NO}_2\text{-N L}^{-1}\text{h}^{-1}$. In sterilized wastewater the oxidation process is insignificant for chemical transformations. However, in active wastewater the oxidation process is significant for both chemical and biological transformations.

Keyword

Anoxic, nitrate, chemical, biological, wastewater, oxidation, transformation

TABLE OF CONTENTS

Title	Page
DECLARATION BY THE CANDIDATE	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iv
TABLE OF CONTENT	v
LIST OF FIGURES	vii
LIST OF TABLES	ix
LIST OF APPENDICES	x
CHAPTER 1: INTRODUCTION	
1.1 Background	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Scope of Work	3
1.5 Assumption and Limitation	5
1.6 Significance	5
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction	6
2.2 Redox Reactions in Wastewater Systems	8
2.3 Transformation Processes in Sewer Networks	12
2.3.1 Sewer Component	12
2.3.2 Condition in Sewer	13
2.3.3 Anoxic Transformation of Wastewater Organic Matter in Sewers	14
2.4 Sulphur Cycle	16
2.5 Concluding Remarks	19