BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

INVESTIGATING THE EFFICIENCY OF NATURAL ZEOLITE AS A REMEDIATION OPTION FOR ACID MINE DRAINAGE

A Case study of Tibet Hima Mining Company Limited-Kilembe Mines

BY

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ABSTRACT

Acid mine drainage (AMD) is the most serious environmental problem faced by the mining industry today. This acid mine drainage is usually high in acidity and heavy metals thus requires several mitigation measures.

The conventional remediation methods used particularly active treatment and passive treatment methods have a lot of short comings such as high capital and operating costs, production of high volumes of sludge and require large areas for installation which calls for alternatives.

Natural zeolites were considered as alternatives attributed to their good structural stability, porous structure and high cation exchange capacity. Untreated Natural Zeolites were characterized and utilized as adsorbents for the remediation of acid mine drainage from Tibet Hima Mining Company Limited.

XRF analyses showed that Natural Zeolite samples from Mount Elgon are majorly enriched with Silicon (IV) oxide, Aluminium oxide and Calcium Oxide with 46%, 16% and 13% respectively.

Laboratory tests showed that AMD is currently discharged at level 42 with a p.H of 4.97, a copper concentration of 854.7 mg/l and iron concentration of 851.3 mg/l way above the recommended NEMA limit of 1 mg/l and 0.3 mg/l respectively for copper and iron.

The laboratory tests revealed that natural zeolite was able to neutralize the p.H of AMD from 4.97 to 7.21 and was also able to remove 99.874 % of Iron and 99.977% of copper from the AMD solution thus efficient as a remediation option.

However for large scale implementation, pilot testing should be done to establish all parameters for an efficient operation.

DECLARATION

I NASASIRA MICHAEL BAKAMAA hereby declare to the best of my knowledge that this is my true and original piece of work and has never been submitted to any university or institution of higher learning by anybody for any academic award.

Signature.....

Date .....

APPROVAL

This piece of work has been approved by;

Main Supervisor

Mr. TUGUME WYCLIFFE

Signature.....

Date.....

DEDICATION

I dedicate this report to my beloved mum; Mrs. Kirabo Macklean for her generous support towards me. Am very humbled and equally grateful for her support and May the Almighty God reward her abundantly.

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First and foremost, I thank the Almighty God for his grace, mercy, wisdom and protection.

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LIST OF ACRONYMS/ ABBREVIATIONS

AD	Acidic Drainage
ALD	Anoxic Limestone Drain
AMD	Acid Mine Drainage
ARD	Acid Rock Drainage
CEC	Cation Exchange Capacity
IAEA	International Atomic Energy Agency
MOLC	Modified Open Limestone Channel
NTUs	Nephelometric Turbidity Units
OLC	Open Limestone Channel
OLD	Oxic Limestone Drain
ppm	Parts per million
QECA	Queen Elizabeth Conservation Area
SAPS	Successive Alkalinity Producing Systems
TDS	Total Dissolved Salts
UNBS	Uganda National Bureau of Standards
UNEP	United Nations Environment Programme
W.H.O	World Health Organization
XRD	X-ray Diffraction
XRF	X-ray Fluorescence

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CHAPTER ONE: INTRODUCTION

1.0 INTRODUCTION

This chapter includes the following; Background of the study, Statement of the problem, Purpose of the study, Justification of the study, Objectives of the study, Hypothesis, and finally the Scope of the study

1.1 BACKGROUND

The mining industry plays a crucial role in the economies of many countries, especially in the form of employment creation and foreign currency earnings that are essential for socio-economic development (Mpofu *et al.*, 2014).

Focus in the mining sector should, however, not be only on the economic aspects, but also on sustainable environmental management, which is part of the integrated global efforts for environmentally friendly production processes (Mpofu *et al.*, 2014)

The mining industry in Uganda at its peak in the 1960's and 1970's accounted up to 35% of the country's export earnings most of which came from Kilembe Mines now called Tibet Hima Mining Company Limited.(UNEP, 2012)

Despite the contributions by Kilembe mines, the mining of massive chalcopyrite and pyrite deposits at Kilembe mines between 1956 and 1979 exposed these sulphide minerals to water and oxygen. As a result, these sulphide minerals became unstable and underwent a series of complex weathering reactions thus forming acid mine drainage which is acidic water laden with heavy metals.

The formation of AMD is primarily a function of the geology, hydrology and mining technology employed at the mine site (Kepler & McCleary, 1994). The resulting AMD water is usually high in acidity and dissolved heavy metals.

This recently abandoned Kilembe copper mine in western Uganda may be a source of contamination for the domestic water sources of Kasese town mainly due to acid mine drainage. (Mwongyera *et al.*, 2014)

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