شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

Ain Shams University Information Network
جامعة عين شمس
شبكة المعلومات الجامعية
@ ASUNET

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار
في درجة حرارة من 15-25 مئوية ورطوبة نسبية من 20-40%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

Ain Shams University Information Network
جامعة عين شمس
شبكة المعلومات الجامعية
@ ASUNET

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

EVALUATION OF SULFUR GUARD BED MATERIALS IN PETROLEUM REFINING BY ADSORPTION

A Thesis
Submitted for the Degree of Master of Science
(Chemistry)

By
Tamer Zaki Sharara
B.Sc. (1995)

To
The Department of Chemistry,
The Faculty of Science,
Ain Shams University

Cairo, Egypt
1998

Cop 2

EVALUATION OF SULFUR GUARD BED MATERIALS IN PETROLEUM REFINING BY ADSORPTION

A Thesis
Submitted for the Degree of Master of Science
(Chemistry)

By
Tamer Zaki Sharara
B.Sc. (1995)

To
The Department of Chemistry,
The Faculty of Science,
Ain Shams University

Cairo, Egypt
1998

EVALUATION OF SULFUR GUARD BED MATERIALS IN PETROLEUM REFINING BY ADSORPTION

M.Sc. Thesis

Thesis Supervisors

Dr. *Lely Henin Khalil*

Prof. Dr. *Sara Mikhail Soliman*

Prof. Dr. *Youssef Barakat Youssef*

Approved

L. H. Khalil

S. M. Khalil

Youssef Barakat

A F M Fahmy

Prof. Dr. *Amin Farouk Fahmy*

Head of Chemistry Department

Faculty of Science

Ain Shams University

Presenting

To

Prof. Dr. Sara Mikhail

You offered much and learnt much, the appearance and success of this work is the deed of your hands, and its presentation to you is the least expressing for your strife.

To my parents, my sister Nermine, my brother Dr. Osama and his wife.

CONTENTS

Page

ACKNOWLEDGMENT

AIM OF THE PRESENT WORK

CHAPTER I

LITERATURE SURVEY 1

1.1.0 Crude Petroleum 1

1.2.0 Non-hydrocarbon Constituents 1

1.2.1 Nitrogen Compounds 1

1.2.2 Oxygen Compounds 3

1.2.3 Sulfur Compounds 3

1.3.0 Desulfurization Processes 6

1.3.1 Solvent Extraction 6

1.3.2 Sulfuric Acid Treatment 8

1.3.3 Biodesulfurization 9

1.3.4 Photochemical Technique 9

1.3.5 Catalytic Hydrogenation 10

1.3.6 Adsorption Technique 17

A- Synthetic Adsorbents 18

B- Natural Adsorbents (Clays) 19

C- Guard Bed Adsorbents 21

i- Clay Minerals 24

Structure of Kaolinite 27

Structure of Montmorillonite 30

CHAPTER II

EXPERIMENTAL 32

2.1.0 Preparation of The Solid Materials 33

2.2.0 Preparation of The Adsorptive Dimethyldisulfide 33

2.3.0 Adsorption Method 33

2.4.0 Guard Bed Reactor 34

2.5.0 Analytical Methods 38

2.5.1 Chromatographic Analysis 38

2.5.2 X-ray Fluorescence 39

2.6.0 Structure and Phase Changes of Materials 39

2.6.1 X-ray Technique 39

2.6.2 Differential Thermal Analysis (DTA) 39

2.6.3 Acidity 40

CHAPTER III

RESULTS AND DISCUSSION 41

3.1.0 Investigation of Some Physical Properties of The Adsorbent Materials 41

3.1.1 Chemical Analysis 41

3.1.2 X-ray Analysis 46

3.1.3 Thermal Analysis 55

A- Cement-kiln Dust (Waste Material) 58

B- Charcoal 57

C- Petroleum Coke 57

D- Kaolinite Clay 58