شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم باللّه العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

Ain Shams University
Faculty of Science
Department of Chemistry

SYNTHESIS OF SOME NONIONIC POLYURETHANE SURFACTANTS AND EVALUATION OF THEIR EFFECTS IN IMPROVING THE PROPERTIES OF WATER BASE MUD

A Thesis

Submitted for the requirements for Ph.D. degree in Chemistry

Presented by
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M. Sc in Chemistry

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(2021)

Ain Shams University
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Approval Sheet

Ph.D. Thesis

"Synthesis of some nonionic polyurethane surfactants and evaluation of their effects in improving the properties of water base mud"

Submitted by

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"M.Sc in Organic Chemistry"

A Thesis for

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ACKNOWLEDGEMENT

I am deeply thankful to Allah for showing me the right path and helping me to complete this work.

I wish to express my appreciation and gratitude to

PROF. DR. GALAL HOSNI SAYED

Prof. *of Organic chemistry, Ain Shams University*

I wish also to express my appreciation to

PROF. DR. NABEL ABDEL MONEEM NEGM

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I wish also to express my appreciation to

PROF. DR. MAHMOUD IBRAHIM ABDOU

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I wish also to express my appreciation to

DR. NASER REFAAT ABDEL RAHMAN

Lecturer of Petrochemicals, Egyptian Petroleum Research Institute (EPRI)

For their suggesting the research problem, guidance, advice and valuable help throughout this work.

Finally, my special appreciation, gratefulness and thankfulness to my Mother, Fat her, Family, Friends, Daughters and my wife.

Elsayed Anter

Aim of the work

Rheological and filtrate loss control properties are considered to be the best two properties for effective and reasonable drilling fluid. Rheology is responsible for carrying drilled solids and retaining weighting materials and other mud components in suspension while drilling and even when circulation is stopped or interrupted for any reason. Filtrate loss control plays important role in wellbore stability, safe drilling, and completion and production operations. In addition; filtrate loss control contributing in saving reservoir porosity and permeability and consequently production rate. In these work four new polyurethanes with different molecular weights and their corresponding esters (oleate and linoleate) were synthesized. These polymers were used to improve the rheological and filtrate loss control properties for drilling fluids and to compare with the commercial materials.

Summary of study

The procedures and the methodology of this study can be summarized in the following topics: -

The experimental protocol of the study is divided into two sections, the first is synthesis of different nonionic polyurethane additives; the second is the evaluation of the different polyurethanes and their corresponding esters (oleates and linoleates) as rheological modifiers and filtrate loss reducers in water base drilling fluids.

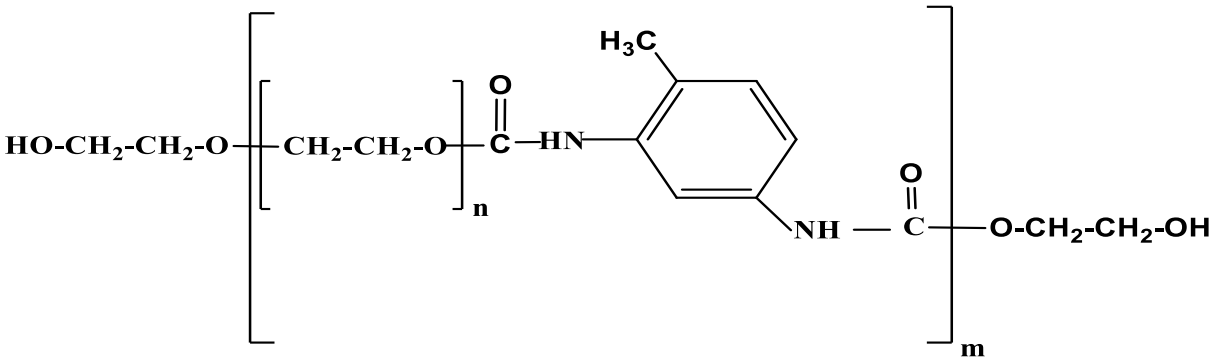
1. Synthesis of the polymeric additives

a- Toluene diisocyanate (TDI) was reacted by polyethylene glycol with different molecular weight (4000, 6000, 10000 and 20000 g $mole^{-1}$) in appropriate amount of suitable solvent and catalyst.

b- The obtained nonionic polyurethane polymers were characterized by FTIR spectroscopy.

The formation of the nonionic polyurethane polymer was confirmed by the appearance of IR absorption band at 1724 cm^{-1} corresponding to (C=O) group of the formed ester in urethane and the disappearance of the isocyanate group at 2100 cm^{-1} IR absorption band of the molecular weights of the obtained polymers were determined by gas chromatography measurements.

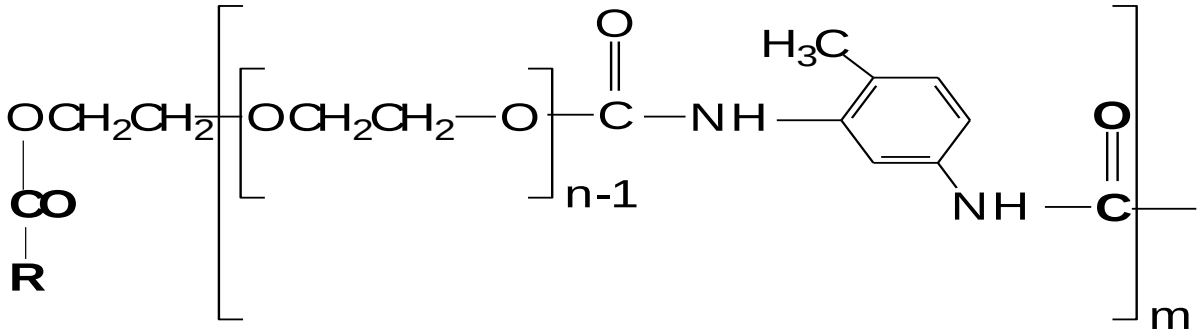
The chemical structures of the synthesized compounds were confirmed to have the following chemical structure.



Polyurethanes (PU 4, 6, 10 and 20), where PU4 = PU4000 g/mole, PU6 = PU6000 g/mole, PU10 = PU10000 g/mole and PU20 = PU20000 g/mole.

c- The targeted compounds were synthesized by reaction of the different nonionic polyurethane polymers and two fatty acids namely: oleic and linoleic acids in equimolar ratio of (1:1).

d- The chemical structure of the synthesized fatty esters of the nonionic polymers was characterized by FTIR spectroscopy. The formation of the ester linkage between the polymers and the fatty acids was assigned at 1728 cm^{-1}. The synthesized compounds were confirmed to have the following chemical structure: -



Polyurethanes esters (PU4O, PU6O, PU10O, PU20O, PU4L, PU6L, PU10L and PU20L), where PU4O = 4000O g/mole, PU6O = PU6000O g/mole, PU10O=PU10000O g/mole and PU20O = PU20000O g/mole, PU4L = 4000L g/mole, PU6L = PU6000L g/mole, PU10L = PU10000L g/mole and PU20L= PU20000L g/mole.

e- The synthesized water soluble polyurethane surfactants and their corresponding esters (oleates and linoleates) were applied in water base drilling fluids as rheological modifiers and filtrate loss controlling agents.

2. Evaluation of the synthesized additives

The synthesized nonionic polyurethane polymers were evaluated as additives in water base drilling fluids during drilling wells operations to cover improvement of two main processes: -

1- Rheological properties (Apparent viscosity (AV), Plastic viscosity (PV), Yield Point (YP), Yield Point/Plastic viscosity (YP/PV), Gel strength (G10s and G10 min), Thixotropic properties) of drilling fluid which are required in providing most of functions of drilling fluids during drilling operations of different types of wells.

2- Improving impermeable film on and beneath the solids components of filter cake which accordingly help in controlling the filtrate loss.