شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

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

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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

DECREASING THE NEGATIVE ECOLOGICAL AND ECONOMICAL EFFECTS FOR CORROSION PROBLEMS OF METALLIC EQUIPMENT IN OIL FIELDS

Submitted By
Mohamed Abd El-Moneim Ahmed Shaban
B.Sc. of Science, Faculty of Science, Ain Shams University, 1984
Master in Environmental Sciences, Institute of Environmental Studies and Research, Ain Shams University, 1993

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

2021

APPROVAL SHEET

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Mohammed Abd el Monem Ahmed

ABSTRACT

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Title: Decreasing the negative ecological and economical effects for corrosion problems of metallic equipment in oil fields

By

Mohammed Abd El Monem Ahmed Shaban

Chemistry Department, Faculty of Science, Ain Shams University

Degree: Doctor of Philosophy (Ph.D.) of Science in Environmental Science, Environmental Studies and Research Institute, Ain Shams University, 2020.

Abstract

Citric acid (tricarboxylic acid) containing three carboxyl functional groups (-COOH) was used to synthesize three compounds of triquaternary ammonium trimeric cationic surfactants. The reaction procedures were carried out by reaction of tricarboxylic acid with 2-(2-Chloroethoxy) ethanol to yield tri-chloro alkyl tri-ester (**AE**). The tri-chloro alkyl tri-ester was quaterinized by different tertiary nitrogen atoms namely: Tri-*n*-butyl amine, Tri-*n*-octyl amine, and Tri-*n*-dodecyl amine to produce three tricationic triquaternary ammonium trimeric salts acting as surface-active agents. In addition, the reaction of 3-pyridinyl methanol and 2-(dimethyl amino) ethanol was quaterinized with 1-Bromododecane to produce two quaternary ammonium monomeric cationic surfactants. The chemical structures of the synthesized monocationic and tricationic surfactants were confirmed using micro-elemental analysis, FTIR spectroscopy and ^{1}HNMR Spectroscopy. The synthesized triquaternary ammonium trimeric

cationic surfactants and monocationic surfactants were evaluated as corrosion inhibitors for S90 carbon steel in the deep oil wells formation water by various electrochemical techniques such as potentiodynamic polarization measurements and electrochemical impedance measurements (EIS). Moreover, the quantum chemical calculations were used to study the corrosion inhibition efficiency of the prepared triquaternary ammonium tricationic surfactants and monocationic surfactants. The surface morphology of the carbon steel alloy in the deep oil wells formation water in the absence and presence of the selected prepared compounds was determined using Atomic force microscopy (AFM) technique. AFM technique confirmed that the prepared cationic surfactants have protective properties for carbon steel in the deep oil wells formation water. The corrosion inhibition efficiency of the synthesized triquaternary ammonium trimeric cationic surfactants and monomeric cationic surfactants depends on their chemical structures and their concentrations.

Keywords: Cationic surfactants, Corrosion inhibitor, S90 steel, oil wells formation water, EIS, Polarization, AFM, Quantum chemical calculations, Adsorption process.

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