Ain Shams University **Faculty of Science**

Protection of petroleum equipments against corrosion and bacterial growth using novel quaternary amine inhibitors

A Thesis submitted for
The Award of the Ph.D. Degree of Science in Chemistry

By

Ahmed Hamed Mostafa Hassan

M.Sc. Inorganic Chemistry - Menoufia University (2013)

Thesis Supervisors

Prof. Dr. Galal Hosni Sayed

Prof. of Organic Chemistry, Faculty of Science, Ain Shams University

Prof. Dr. Nabel Abdel MoneemNegm

Prof. of Petrochemicals, Petrochemicals Department
Egyptian Petroleum Research Institute

Prof.Dr. Khalid Zakaria Selim

Prof of Applied Physical Chemistry
Analysis and Evaluation Department
Egyptian Petroleum Research Institute

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Ain Shams University

Faculty of Science

Approval Sheet

***Title:* - Protection of petroleum equipments against corrosion and bacterial growth using novel quaternary amine inhibitors**

***Name of Candidate*:Ahmed Hamed Mostafa Hassan**

This Thesis has been approved for submission by supervisor:-

Thesis Supervisors **Thesis approved**

Prof. Dr. Galal Hosni Sayed……

Prof. of Organic Chemistry

Faculty of Science, Ain Shams University

Prof. Dr. Nabel Abdel MoneemNegm…….

Prof. of Petrochemicals

Petrochemicals Department

Egyptian Petroleum Research Institute

Prof. Dr. Khalid ZakariaSelim.....

Prof of Applied Physical Chemistry

Analysis and Evaluation Department

Egyptian Petroleum Research Institute

Head of Chemistry Department

Faculty of Science Ain Shams University

Prof. Dr. Ayman Ayoub Abd Elshafy

Ain Shams University

Faculty of Science

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Examiners Committee	**Approval**
Prof. Dr. Galal Hosni Sayed *Prof. of Organic Chemistry* *Faculty of Science Ain Shams University*	.....
Prof. Dr. Nabel Abdel Moneem Negm *Prof. of Petrochemicals* *Petrochemicals Department* *Egyptian Petroleum Research Institute*	.....
Prof. Dr. Mohamed Helmy Aref *Prof. of Organic Chemistry* *Chemistry Department* *Faculty of Science Benha University*	.....
Prof. Dr. Hassan Ahmed Shehata *.Prof. of Physical Chemistry* *Faculty of Science- Azhar University*	.....

Head of Chemistry Department
Faculty of Science Ain Shams University
Prof. Dr. Ayman Ayoub Abd Elshafy

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Prof. Dr.Khaled Zakaria Selim *Prof of Applied Physical Chemistry* *Analysis and Evaluation Department* *Egyptian Petroleum Research Institute*	……

Head of Chemistry Department
Faculty of Science Ain Shams University
Prof. Dr. Ayman Ayoub Abd Elshafy

Ain Shams University

Faculty of Science

Researcher Data

Name: Ahmed Hamed Mostafa Hassan

Date of Birth: 23/08/1986

Academic Degree: MSc. Degree of Science

Field of specification: Chemistry

University issued the Degree: Menoufia University - Faculty of Science- Chemistry Department

Graduation year: - 2007

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Prof. of Applied Organic Chemistry

Egyptian Petroleum Research Institute

(EPRI)

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Prof. Dr. Khaled Zakaria Selim

Prof of Applied Physical Chemistry

Analysis and Evaluation Department

Egyptian Petroleum Research Institute

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Abstract

In this study, three Schiff's base compounds were prepared from the reaction of o-phenylenediamine, p-phenylenediamine, and 2-aminobenzoimidazole with acetophenone. The obtained Schiff's bases were quaternized using dimethyl sulfate to obtain three quaternary ammonium salts designated as AH4, AH5, and AH6. The newly synthesized quaternary ammonium salts were evaluated as corrosion inhibitors for protection of carbon steel in 1 N H_2SO_4 using different electrochemical methods, including potentiodynamic polarization and electrochemical impedance measurements at 25 ^{o}C.The adsorption of the inhibitors was obeyed Langmuir adsorption isotherm. The inhibitors were behaved as mixed type inhibitors according to their ΔG_{ads} values which were in the range of physicochemical adsorption values. The maximum inhibition efficiency was obtained using compound AH6 at concentration of 400 ppm to result an efficiency of 92.3%.

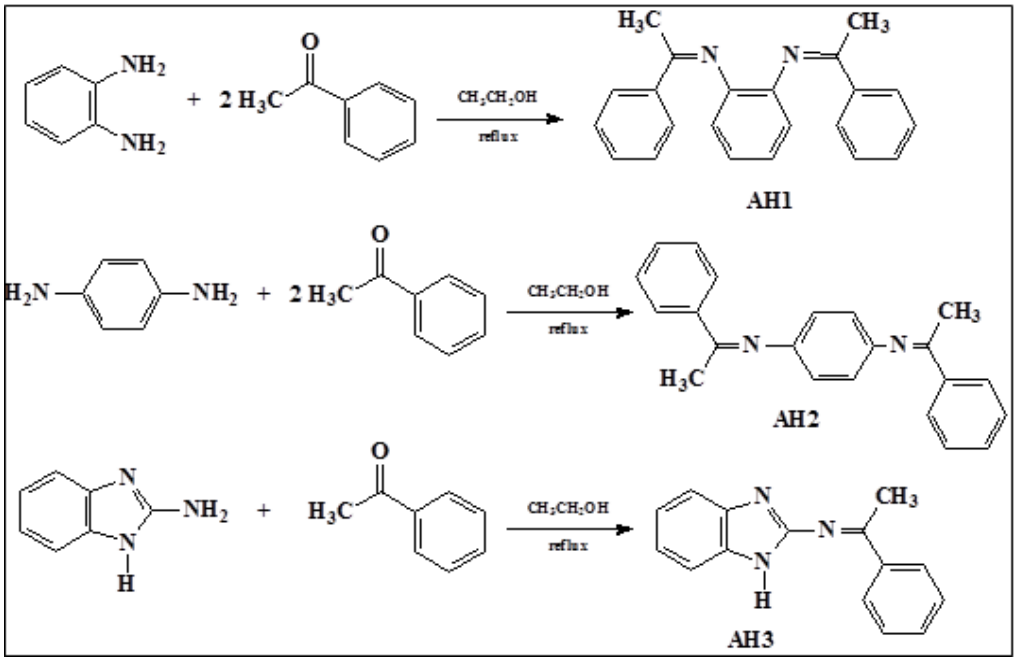
Antimicrobial evaluation of the prepared compounds showed their high inhibiting effect on Gram-positive and Gram-negative and sulfate reducing bacteria.

Keywords: Schiff's base, corrosion, adsorption, inhibition, antimicrobial evaluation.

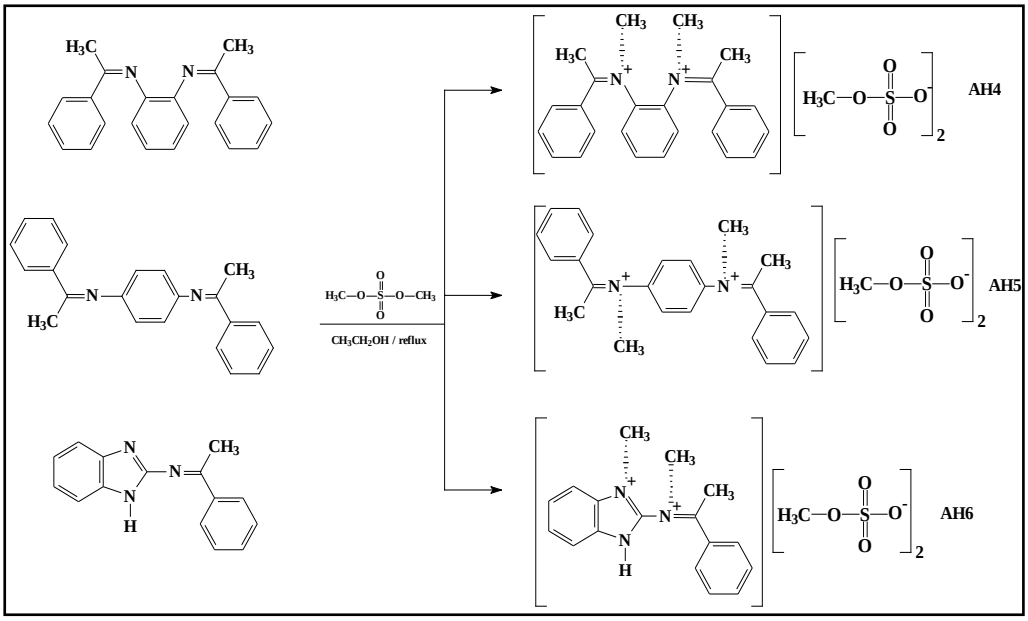
SUMMARY AND CONCLUSION

In this work, different series of Schiff's base derivatives and quaternary ammonium salts have been prepared as a corrosion inhibitor and against different bacterial growth at different conditions through the following :-

1- Preparation of different series from Schiff's base derivatives starting with different compounds (o-phenylenediamine, p-phenylenediamine, 2-aminobenzoimidazole and acetophenone) to obtain **AH1**, **AH2**, **AH3** as showed in the following Scheme:-



2- Quaternization using dimethyl sulphate to obtain **AH4**, **AH5**, **AH6**.



3- Characterization of the prepared compounds using IR, ^{1}H-NMR analysis.

4- Studying the physicochemical properties of the prepared compounds

5- Evaluation of the prepared compounds as corrosion inhibitors using the electrochemical methods.

6- Studying the effect of the prepared compounds as corrosion inhibitor at acidic media (1 N H_2SO_4).

7- Antimicrobial evaluation of the prepared compounds.

8- Maximization of the obtained results to determine the most efficient inhibitors.

The chemical structures of the synthesized compounds were elucidated by elemental analyses, infrared spectroscopic analysis and ^{1}HNMR spectroscopy.