



كلية العلوم – قسم الكيمياء

Synthesis of Silver Nanoparticle Using Some Cationic Surfactant and Their Applications

Thesis

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1998

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(2019)



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Acknowledgement

At the beginning, praise is to Almighty Allah, the lord of the world, whose guidance, blessings and help enabled me to take my first step on the path of improving my knowledge through this humble effort.

*Very special thanks to **Prof. Dr. Mostafa Khalil**, Professor of Inorganic Chemistry, faculty of science, Ain Shams University, for his continuous encouragement, valuable advices, continuous cooperation, support, and valuable criticism during the achievement of the research work.*

*I wish to express my deep thanks, ultimate appreciation and respect for **Prof. Dr. Ismail Abd El Rahman Aiad**, Professor of Applied Chemistry, Petrochemical Department, Egyptian Petroleum Research Institute "EPRI", not only for suggesting the subject investigated, but also for suggesting the research problem, guidance, advice and valuable help throughout this work. Their constructive criticism and comments from the initial conception to the end of this work are highly appreciated and the motivation that I need to succeed in the future.*

*I wish also to express my appreciation to **Ass. Prof. Salah Mahmoud Tawfik**, Ass. Prof. of Applied Organic chemistry, Egyptian Petroleum Research Institute "EPRI", for his kind advices, valuable help, guidance and encouragement at all stages of my work.*

*Special thanks for my **dear friends** and **colleagues** at chemistry department and all members of **EPRI Staff** who helped me to make this work.*

*I would really like to express my deepest gratitude and appreciation to **my parents** for their invaluable help, continual encouragement and moral supports. I wish also to say to **my parents**: "There are no words to match my gratitude".*

Finally, but most important, I thank Allah Almighty again on all things in my life.

Nariman Mohamed Hussien Elwakeel

2019



" تثبيت جزيئات الفضة النانوية باستخدام المواد ذات النشاط السطحي

الكاثيونية المحضرة وتطبيقاتها"

رساله مقدمه للحصول علي درجه الماجستير في العلوم كجزء مكمل لمتطلبات

رساله الماجستير بكلية العلوم (قسم الكيمياء)

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الدارسات العليا

تاريخ موافقة مجلس القسم:

2.19 / /

اجيز الرسالة بتاريخ:

2.19/ /

موافقة مجلس الكلية

٢٠١٩ / /

ختم الأجازة
موافقة مجلس الجامعة

۲.۱۹/ /



**عنوان الرسالة: " تثبيت جزيئات الفضة النانوية باستخدام المواد ذات النشاط السطحي
الكاتيونية المحضرة وتطبيقاتها "**

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القسم التابع له: الكيمياء .

سنة المنح / ٢٠١٩

شكر وتقدير

أتقدم بالشكر والعرفان لأساتذتي الأفاضل
الذين قاموا بالإشراف على هذا العمل وهم :

- | | |
|-------------------------------|--|
| أ.د/ مصطفى محمد حسن خليل | أستاذ الكيمياء غير عضوية
كلية العلوم جامعه عين شمس |
| أ.د / اسماعيل عبد الرحمن عياد | أستاذ الكيمياء التطبيقية- رئيس قسم
البتروكيماويات – معهد بحوث البترول |
| د /صلاح محمود توفيق | استاذ باحث مساعد الكيمياء العضويه التطبيقيه-
قسم البترو كيماويات- معهد بحوث البترول |

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List of Abbreviations

Symbol	Abbreviation	unit
C	Molar concentration	ML ⁻¹
γ	Surface tension	mNm ⁻¹
Π	Effectiveness	mNm ⁻¹
PC ₂₀	Efficiency	ML ⁻¹
CMC	Critical micelle concentration	mML ⁻¹
π_{cmc}	The effectiveness	mNm ⁻¹
γ_o	surface tension of bi-distilled water	mNm ⁻¹
γ_{cmc}	surface tension of aqueous surfactant solution at critical micelle concentration	mNm ⁻¹
Pc20	The efficiency	mNm ⁻¹
Γ_{max}	maximum surface excess	mol.cm ⁻²
A_{min}	minimum surface area	A ² molecule ⁻¹
ΔG	free energy	kJ/mol
ΔS	Entropy	kJ.mol ⁻¹ K ⁻¹
ΔH	Enthalpy	Kcal.

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Aim of the work

The aim of the work includes:

1. Synthesis of fatty mono ester of methyl diethanol amine via reaction of molar ratio amount 1:1 from the methyl diethanol amine and corresponding fatty acid (decanoic, dodecanoic, tetradecanoic and hexadecanoic acid) in xylene and p-tolune sulphonic acid (catalyst).
2. Synthesis of cationic surfactants via quaternization of the obtained fatty ester (step 1) with benzyl chloride in absolute ethyl alcohol.
3. Confirmation the chemical structures of the synthesized cationic surfactants using: FTIR and $^1\text{HNMR}$.
4. Preparation of colloidal silver nanoparticles.
5. Preparation of silver nanoparticles stabilized by prepared cationic surfactant.
6. Investigation of the self-assembling of the synthesized surfactants onto the prepared silver nanoparticles using the following techniques
 - a- Ultraviolet absorption spectroscopy (UV)
 - b- Transmission electron microscope (TEM)
 - c- Dynamic light scattering (DLS)
7. Determination the surface activity of the synthesized cationic surfactants via surface tension measurements at different temperatures (20, 40 and 60 °C)
8. Determination the surface parameters of the synthesized cationic surfactants including: critical micelle concentration (CMC), effectiveness (Π_{cmc}), efficiency (PC_{20}), maximum surface (Γ_{max}) and minimum surface area