Womens College for Arts,
Science, and Education
Chemistry Department

Preparation of Some Mesoporous Polysiloxane Immobilized Ligand Systems and Their Applications for Extraction of Heavy Metals

Thesis Submitted in Partial Fulfillment of The Requirements of The Degree of Philosophy Doctor of Science in Chemistry

(Inorganic and Analytical Chemistry)

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

DEDICATION

TO THE SPIRIT OF MY LOVELY SISTER

Samia

Acknowledgement

All thanks and grateful to **ALLAH**, *who granted me the courage and power to finish this research, without his help my efforts would have gone in vain.*

I wish to express my deep appreciation to my supervisors; **Prof. Dr. Mona Abd El-aziz Ahmed, Prof. Dr. Issa M. El-Nahhal, and Prof. Dr. Nizam M. El-Ashgar.** *They are my excellent guides to the charming scientific world. They taught me solid knowledge, gave me strong support and encouragement, showed me the right way and methods to overcome any difficulties. Their enthusiasm to science and their personality impressed me deeply. I learned so much and I appreciated them very much.*

I would like to thank my ***Parents Abdallah*** *and* ***Malyha*** *who have always convinced me that I can achieve anything I set my mind to. Even though far away their love and support are very important to me and keep me going.*

✍**Asmah A. Abushawesh**

Aim of the Work

The aim of the present work is to synthesize new functionalized polysiloxane biligand systems with multiple donated atoms and to examine their potential for extraction of metal ions from aqueous solutions**.**

1. PREPARATION.

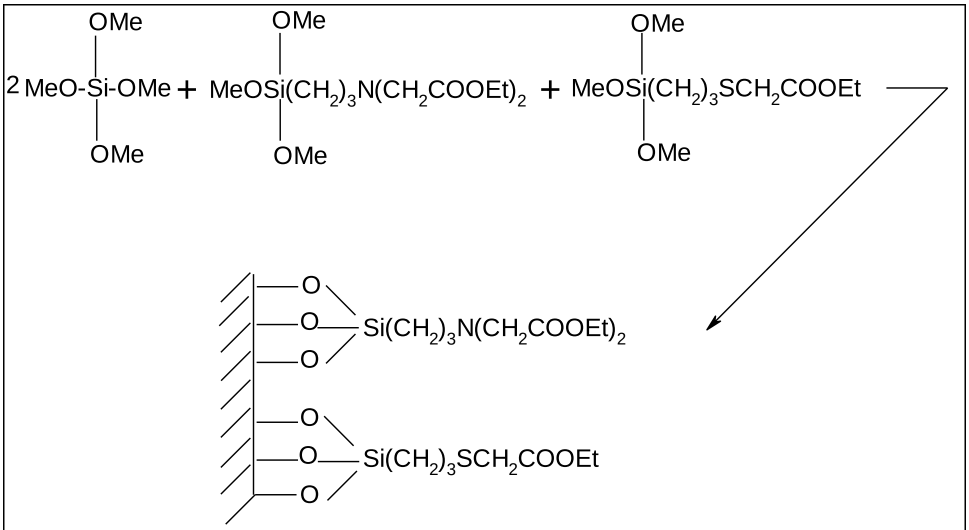
Different polysiloxane-immobilized biligand systems are prepared by sol-gel hydrolytic polycondensation of $Si(OR)_4$ with appropriate silane agents. New polysiloxane biligand systems were prepared by reaction of

DEIDA-PTMS and ThEA-PTMS with TEOS.

EDATrEA-PTMS and ThEA-PTMS with TEOS.

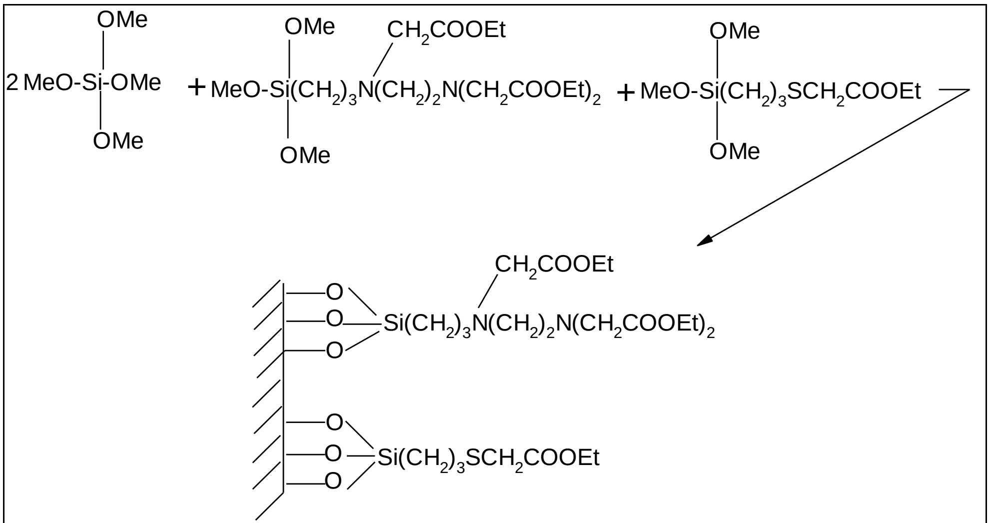
DETrATEA-PTMS and ThEA-PTMS with TEOS.

The polysiloxane-immobilized biligand systems then modified with ethylenediamine and diethylenetriamine by direct reaction as shown in the following schemes I-III.



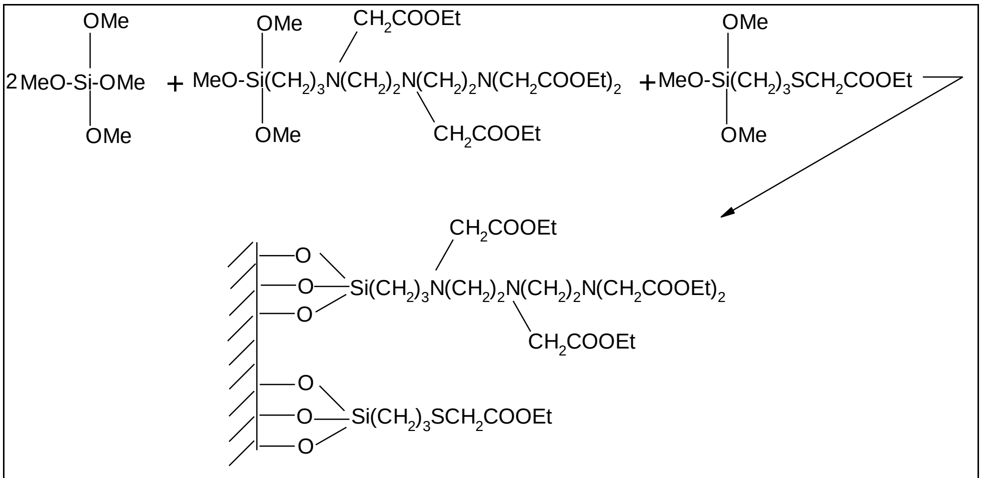
P-(N-S)-TrEA

Scheme I



P-(NN-S)-TEA

Scheme II



P-(NNN-S)-PEA

Scheme III

2. Characterization.

A number of analytical chemistry techniques were used to characterize the structural properties of the prepared polysiloxane immobilized biligand systems include:

1) Elemental Analysis.
2) FTIR Spectroscopy.
3) Atomic Absorption Spectroscopy (AAS).
4) XPS Spectra.
5) Thermal Analysis (TGA).
6) Solid State NMR (CP-MAS ^{13}C NMR).
7) Polarized Optical Microscope

The use of these technical methods would provide precious information about the structural behavior of the polysiloxane-immobilized biligand systems.

3. Application.

The prepared materials have several applications. These immobilized biligand systems were used for extraction of heavy metal ions from aqueous solutions in Gaza Strip.

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