Ain Ahams University
Faculty of science
Department of Chemistry

ELECTROPOLYMERIZATION OF SOME AROMATIC AMINE DERIVATIVES AND THE APPLICATION OF THE OBTAINED POLYMERS AS CORROSION INHIBOTORS

Thesis
Submitted By
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M. Sc. chemistry (2000)
To
Chemistry Department
Faculty of Science
Beni-Suef Branch
Cairo University

For the Degree of Ph.D. of Science
(Chemistry)

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(2005)

Approval Sheet

Title

ELECTROPOLYMERIZATION OF SOME AROMATIC AMINE DERIVATIVES AND THE APPLICATION OF THE OBTAINED POLYMERS AS CORROSION INHIBOTORS

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M.Sc. Chemistry (1999)

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Head of Chemistry Depart

Acknowledgement

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No words can ever express my sincere gratitude to **ALLAH** who guided and aided me to bring forth this thesis to light

All words fail to express my thanks and sincere gratitude to Prof. Dr./ **Sayed Sabet Abd EL Rehim,** Professor of physical chemistry, Faculty of Science, Ain Shams University, Prof. Dr./ **El-Saied Mahmoud Sayyah,** Professor of physical chemistry, Faculty of Science, Beni-Suef Branch, Cairo University and Dr./ **Magdy Ahmed Mahmoud,** Assistant Professor of physical chemistry, Faculty of Science, Ain Shams University, for suggesting the point of research, their continuous supervision, advice, fruitful discussions, indispensable help to write down this work in its final from.

Also, I wish to express my thanks to all the staff members of Chemistry Department, Faculity of Science, Ain Shams University and the staff members of Electrochemistry Lab. Faculty of Science, Beni-Suef University for their cooperation.

I owe great support and sincere love to my family who stood by me during hard and difficult times.

S. M. Kamal

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March 13th, 2005

Professor S.M. Sayyah,
"Polymer Research Laboratory,
Chemistry Department – Faculty of Science,
Cairo University – Beni-Suef Branch,
62514 Beni-Suef City,
EGYPT.

Dear Professor Sayyah;

It is my pleasure to inform you that the paper entitled:

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December 7th, 2004

Professor S.M. Sayyah,
Polymer Research Laboratory,
Department of Chemistry – Faculty of Science,
Cairo University – Beni-Suef Branch,
62514 Beni-Suef City,
EGYPT.

Dear Professor Sayyah;

It is my pleasure to inform you that the paper entitled:

"Electrochemical Polymerization of 2-Amino-4-(4-methoxyphenyl)thiazole and Characterization of the Obtained Polymer",

by:

S.M. Sayyah, S.S. Abd El-Rehim & S.M. Kamal,

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May 17th, 2004

Professor S. M. Sayyah,
Chemistry DEpartment,
Cairo University – Beni-Suef Branch,
62514 Beni-Suef
EGYPT.

Dear Professor Sayyah;

It is my pleasure to inform you that the paper entitled:

"Electrochemical Polymerization of 2-Chloroaniline and Characterization of the Obtained Polymer Films"

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Contents

Content

ABSTRACT

NAME : Soha Mohammed Kamal

TITLE OF THESIS : Electropolymerization of some aromatic amine derivatives and the application of the obtained polymer as corrosion inhibitors

DEGREE : Ph.D. in Science (Physical Chemistry – Electrochemistry)

Electropolymerization of 2-amino-4-(4-methoxyphenyl) thiazole, 2-Chloroaniline, 3-methoxyaniline and a binary mixture of (2-amino-4-(4-methoxyphenyl) thiazole with 2-Chloroaniline) on platinum foil electrode from aqueous acid medium solution were carried out under different reaction parameters such as duration time, current density, temperature, acid and monomer concentrations. The initial rate of the electropolymerization reaction for each polymerization system was calculated from the yield-time curves. The orders of the electropolymerization reactions with respect to current density, acid and monomer concentrations for each polymerization system were determined from the double logarithmic relationship between the initial rates and the concentration of the investigated parameters.

The effect of temperature on the electropolymerization reaction rate for each system was investigated and the initial rate was calculated. The apparent activation energy (E_a) for each electropolymerization system was determined using Arrhenius equation, Also the thermodynamic activation parameters (ΔS^* and ΔH^*) were calculated using Eyring equation. From the above kinetic studies, the reaction rate law for each electro-copolymerization system is given. The mechanism of the electropolymerization reaction for each system is discussed.

The obtained polymer samples were characterized by cyclic voltammetry, elemental analysis, UV-visible ir, ^{1}H-NMR spectroscopy, GPC and thermal analysis. The surface morphology