Ain Shams University
Faculty of Science
Chemistry Department

SYNTHESIS AND CHARACTERIZATION OF SOME POLYAROMATIC COMPOUNDS AND THEIR APPLICATION ON CEMENTITIOUS MATERIALS

A Thesis Submitted By

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M.Sc. Chemistry, Faculty of Science
Beni suef University (2006)

To Chemistry Department, Faculty of Science, Ain Shams University

Thesis Submitted for the Award Ph.D Degree in Chemistry

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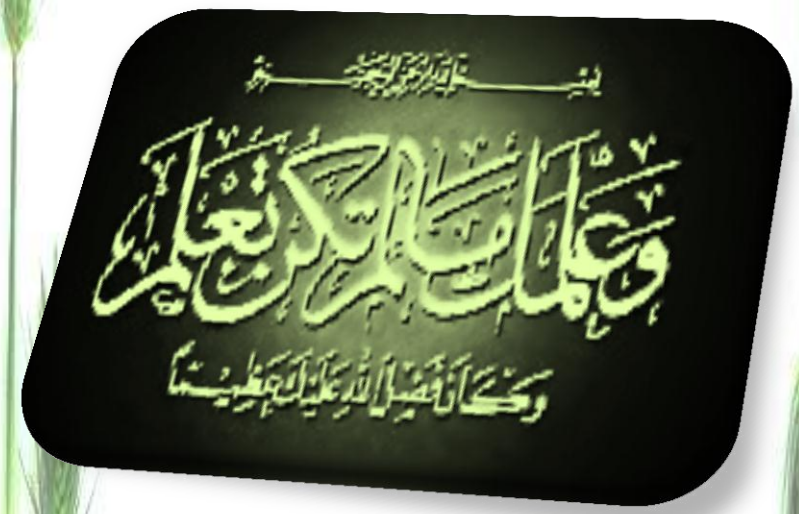
بسم الله الرحمن الرحيم
وعلمك ما لم تكن تعلم
وكان فضل الله عليك عظيما

Dedication

To the memory of

My father and my brother

May their souls rest in peace

DEDICATION

The thesis is dedicated to the late ***Prof. Dr. Abdelsatar S. A. H. Elgazwy****, who suggested the subject of this investigation with* ***Prof. Dr. Salah A. Abo-El-Enein (D. Sc.)***

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ABESTRACT

Chemical admixtures are organic compounds including retarders, accelerators and superplasticizers; their role is mainly acting during the initial mixing of cement, mortar or concrete with water in the preparation of the fresh pastes. Superplastizers are added to the fresh cement pastes to improve the physico-chemical and mechanical properties of cement and concrete pastes; their effect is to increase the flowing characteristics of the fresh pastes by reducing the standard water of consistency (decrease the initial W/C ratio and increasing the workability during the preparation of the fresh cement pastes. In this investigation, three novel organic aromatic compounds were prepared, and from the results obtained regarding chemical analysis, molecular and structural characteristics, it was formed that one of these superplasticizers proved to be the more effective one this is sodium 5,5`-diformayl-2,2`-dioxido-1,1`-binaphthyl-4,4`-disulfonate (SDD) which represents the novel superplasticizer achieved. There fore, this superplasticizes (SDD) was used in this study with different doses of 0.25,0.50,0.75 and 1.00% by mass of cement and the physic-mechanical and chemical characteristics of the hardened cement pastes were studied at different ages of hydration namely, 1,3,7,28 90 and 180 days. The results obtained indicated that the compressive strength of the hardened cement pastes increase with increasing additions of SDD up to 0.50% and 0.75% by mass of cement, whereas the strength decreases at 1.00% addition of SDD. Evidently, at low SDD additions the strength increases due to electrostatic repulsion as a result of adsorption of SDD around cement grains leading to similar charges of cement grains. At higher SDD addition (at 1.00%) the decrease in strength values is mainly due to steric effect, a result which is related to the higher conjugation system and the planner structure of SDD.

CHAPTER I

Introduction & Object of Investigation

CHAPTER II

Materials & Experimental Techniques

CHAPTER III

Results & Discussion

Summary & Conclusion

References

Arabic Summary

Abbreviations

Symbols	Description
SDD	Sodium5,5'-Diformyl-2,2'- Dioxide -1,1'-Binaphthyl-4,4'-Disulfonate
DDD	5,5'-Diformyl-3,3'-Diiodo-2,2'-Dioxido-1,1'-Binaphthyl-4,4'-Disulfonate
SMD	Sodium3',3"-Methylene Bis(2,2'-Dioxido-1,1'-Binaphthyl -3- Sulfonate)
OPC	Ordinary Portland Cement
DBD	3,3'-Diiodo-1,1'-Binaphthyl-2,2'-Diol
MBD	3,3'-Methylenedi-1,1'-Bibenzobenzene-2,2'-Diol
NMR	Nuclear Magnetic Resonance
FTIR	Infra Red Spectroscopy
SiO_2	Silicon Dioxide
Al_2O_3	Aluminum Oxide
Fe_2O_3	Ferric Oxide
CaO	Calcium Oxide
MgO	Magnesium Oxide
SO_3	Sulfur Trioxide
K2O	Potassium Oxide

Na_2O	Sodium Oxide
LSF	Lime Saturation Factor
SM	Silica Modulus
AM	Alumina Modulus
C_3S	Tricalcium Silicate
C_2S	Di calcium Silicate
C_3A	Tricalcium Aluminate
C_4AF	Tetracalcium Alumino Ferrite
W/C	Water/Cement Ratio
Wn	Chemically Combined Water
XRD	X-ray Diffraction Analysis
DSC	Differential Scanning Calorimetry
CSH	Calcium Silicate Hydrates
C3A.3CaSO4.32H2O	Calcium Sulphoaluminate Hydrate (Ettringite)
$C_3A.CaSO_4.12H_2O$	Mono-Sulphate Hydrate
CH	Calcium Hydroxide
CC	Calcium Carbonate
CASH	Calcium Aluminosilicate Hydrate