

République Algérienne Démocratique et Populaire
Ministère de l'Enseignement Supérieur et de la Recherche
Scientifique

Université Echahid Hamma Lakhdar –EL OUED



Faculté de Sciences Exactes

Département de Chimie

Thèse en vue de l'obtention du diplôme de doctorat en chimie

Spécialité : Electrochimie analytique et environnement

SUJET DE LA THESE :

**SYNTHÈSE, ÉTUDE DE L'INTERACTION AVEC LE RADICAL ANION
SUPEROXIDE, LE 2,2-DIPHENYL-1PICRYLHYDRAZYL, ET L'ADN DE
QUELQUES DITHIOLTHIONES ET LEUR DÉRIVÉS**

Présentée Par :

M^{me} : BENAICHA HANANE

Devant le jury composé de:

Mr. M. R. OUAHRANI	Professeur, Université de El Oued	président
Mr. T. LANEZ	Professeur, Université de El Oued	rapporteur
Mr. M. SAIDI	Professeur, Université de Ouargla	Co-rapporteur
Mr. M. Hadjedj	Professeur, Université de Ouargla	Examineur

Soutenu Le: 11/07/2019

Année universitaire 2018/2019

Contents	Pages
General introduction	v
Part one the bibliographic study	
First chapter: dithiole thione	
I. organosulfuric compounds	1
I.1.properties of sulfur atom	1
I.2. the main sulfur compounds	1
II.. dithiole thione	3
II.1. properties of dithiole thione	3
II.2. dithiole thione and cancer chemopreventive	5
Second chapter: the biological activity	
I. the antioxidant activity	7
I.1. what is free radicals	7
I.1.1. generation of free radicals	8
I.1.2. active and reactive oxygen species	8
I.1.3.oxidative stress	9
I.2. antioxidants	10
I.2.1. antioxidant protection	10
I.2.2. enzymatic antioxidants	13
I.2.3. non-enzymatic antioxidants	18
I.3. methods of measuring antioxidant activity	20
II. the antimutagenic activity	20
II.1. what is DNA	20
II.1.1. the structure of DNA	25
II.1.2. DNA function	25
II.2. types of mutation	27
II.2.1. mutation causes	28
II.3. the interaction with organometalic compounds	
Third chapter: the methods used in the study of biological activity	

I. the electrochemical technique	29
I.1. voltammetry	29
I.1.1. cyclic voltammetry	29
I.1.2. using of cyclic voltammetry in biological activity study	32
I.1.2.1. the general experimental process	32
I.1.2.2. the main parameters obtained from cyclic voltammograms	33
II. the spectroscopic technique	36
II.1. the ultraviolet –visible spectroscopy	36
II.2. using of the uv-vis spectroscopy in biological activity study	36
II.2.1. the general experimental process	37
II.2.2. the main parameters obtained from uv-vis spectroscopy	39
III. molecular docking	39
III.1. theory of molecular docking	40
III.2. what is autodock	41
III.2.1. theory of autodock	41
III.2.2. molecular modeling	
Part two: experimental study	
First chapter: the study of antioxidant activity	
I. inhibition of superoxide anion free radical	44
I.1. superoxide anion	44
I.1.1. reactivity of superoxide anion	44
I.1.2. generation of superoxide anion	45
I.2. methodology of studying antioxidant activity	45
I.2.1. experimental	47
I.2.1.1. material and methods	47
I.2.2. results and discussion	48
I.2.2.1. the antioxidant power of $O_2^{\cdot-}$ using cyclic voltammetry	48
I.2.2.2. the study of the interaction of $O_2^{\cdot-}$ -antioxidant	49
I.2.2.2.a. the study of the interaction of $O_2^{\cdot-}$ - PDT01	49
I.2.2.2.b. the study of the interaction of $O_2^{\cdot-}$ -PDT02	53
I.2.2.2.c. the study of the interaction of $O_2^{\cdot-}$ -PDT03	57
I.2.2.2.d. the study of the interaction of $O_2^{\cdot-}$ -PDT04	61
I.2.2.2.e. the study of the interaction of $O_2^{\cdot-}$ -PDT05	65
II. inhibition of DPPH free radical	70
II.1. the free radical DPPH	72
II.2. methodology of studying antioxidant activity	72
II.2.1. electrochemical technique	72
II.2.1.1. material and methods	73
II.2.1.2. results and discussion	73
II.2.1.2.1. the antioxidant power of $O_2^{\cdot-}$ using cyclic voltammetry	73

II.2.1.2.1.a. the study of the interaction of DPPH-PDT01	78
II.2.1.2.1.b. the study of the interaction of DPPH-PDT02	82
II.2.1.2.1.c. the study of the interaction of DPPH-PDT03	86
II.2.1.2.1.e. the study of the interaction of DPPH-PDT05	89
II.2.2. spectroscopic technique	89
II.2.2.1. experimental	89
II.2.2.1.1. material and methods	90
II.2.2.2. results and discussion	
Second chapter: the study of antimutagenic activity	
I. evaluation of antimutagenic activity	94
I.1.isolation of DNA	94
I.2. salvation of DNA	96
I.3. the quantitative and qualitative estimation of DNA	96
II. the study of the antimutagenic activity	98
II.1.electrochemical technique	98
II.1.1. experimental	98
II.1.1.1. material and methods	98
II.1.1.2. results and discussion	99
II.1.1.2.a. the study of PDT05-DNA interaction	100
II.1.1.2.b. the study of PDT04-DNA interaction	105
II.1.1.2.c. the study of PDT02-DNA interaction	109
II.1.1.2.d. the study of PDT01-DNA and PDT03-DNA interaction	113
II.2.spectroscopic technique	117
II.2.1. experimental	117
II.2.1.1. material and methods	117
II.2.1.2. results and discussion	118
II.2.1.2.a. the study of PDT05-DNA interaction	118
II.2.1.2.b. the study of PDT04-DNA interaction	120
II.2.1.2.c. the study of PDT02-DNA interaction	122
II.2.1.2.d. the study of PDT03-DNA interaction	124
II.2.1.2.e. the study of PDT01-DNA interaction	125
II.3. molecular docking	129
II.3.1. instrumentation and software	129
II.3.2. procedure	129
II.3.3.results and discussion	131
Conclusion general	135