INNOVARE JOURNAL OF SCIENCES

Vol 1, Issue 1 , 2013

Research Article

SYNTHESIS AND IDENTIFICATION OF 6, 7-MEMBERD CYCLES OF EPANE AND EPINE FROM (DIAZ, DIOX, DITHI ,DISELEN)

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Received:25 April 2013, Revised and Accepted:28 April 2013

ABSTRACT

This research involve , synthesis of six and seven-memberd saturated and unsaturated compounds[1-12] of (diazepane , dithiepane , dioxepane , diselenepane) ,which contain two or more hetroatoms (N, S ,O and Se) by several steps via condensation reactions. All synthesized compounds have been investigated using melting points and different chemical techniques (elemental analysis (C.H.N), H.NMR–spectra , FT.IR–spectra).

Keywords: selenium,sulphur,azepane;seven-membered ring

INTRODUCTION

Hetrocyclic compounds are essential to life in various field,becase of variety of microbial activities associated with structure of these compounds, which considered as intermediate of many reactions and synthesis of new compounds..

Some of these compounds which containing sulphur or nitrogen atom were used as analgesic and in other medicinal applications

(1-5)Hetroatom–epane and epine compounds are one a class of organic hetrocyclic compounds containing a six or seven-member saturated and unsaturated ring structure composed of two hetroatoms (selenium , sulphur ,nitrogen , oxygen), which are named by addition of suffix (-epane) such as (selen epane ,thiepane ,azepane ,oxepane) in this paper, some of these compounds contain two lactam groups which explain their biological applications[6-12]and pharmaceutical drugs,these activities due to the presence of (-N=C–S) moiety and lactam cycle in these compounds .

So many attempts were carried out every where to incorporate structural modification in order to get compounds of potential activity .

These properties predetermine them inter alia for the preparation of wide spectrum of medicinal drugs[13-18] .

METHODOLOGY

All chemical used were supplied from Fluka and BDH – Chemical Company
Apparatuse:all measurements were carried out by :

Melting points :electro thermal 9300, melting point engineering LTD, U.K

FT.IR-spectra :fourrier transform infrared shimadzu 8300–(FT.IR), KBr disc was performed by CO.S.Q.C. Iraq

Elemental Analysis (C.H.N) :EA-017

H.NMR-spectra: (300MHZ) in DMSO as solvent.

Synthesis of hetro atoms –epane cycles compounds

[1-4]A mixture of (0.01mole, 1.6g) of diethyl malonate was refluxed with one of compounds [(0.01mole,0.6g) of ethelyne diamine .,(0.01 mole ,0.94g) of ethylene dithiol .,(0.01mole,0.62g) of ethylene glycol] respectively for (2hrs),the precipitate was filtered off and recrystallized to produce (86%,84%,87%) of compounds [1-3] respectively .While (0.01 mole ,1.6 g)of diethyl malonate was reacted with(0.02mole ,2.05g) of NaHSe ,the precipitate was filteredoff then (0.01mole ,2.73g) from this precipitate was reacted with (0.01mole ,0.99g) of ethylene dichloride ,the precipitate was filtered off and recrystallized to produce 86% of compound [4]:
Compound [1]: 1,4-diazepane -5,7-dione .
Compound [2]: 1,4-dithiepane-5,7-dione .
Compound [3]: 1,4-dioxepane-5,7-dione.
Compound [4]: 1,4-diselenepane-5,7-dione.

Synthesis of 2,2-(ethane-1,2-diyl)bis(4H-1,3,4-thiadiazine-5(6H)-one)

[6]A mixture of (0.01 mole, 1.74 g) of diethylmalate and (0.02 mole, 0.64 g) of hydrazine were refluxed for (2 hrs) , after cooling , the precipitate was filtered off, then (0.01 mole, 1.46 g) from this precipitate[5] was reacted with (0.02 mole, 2.21 g) of thi acetyl chloride by cyclocondensation, after cooling, the precipitate was filtered off and recrystallized to produce 87% of compound [6].

Synthesis of 1-(2-benzo[d]thiazol-2-yl thio)-1,4-diazepane–2,5-dione)

[9]mole , 1.67 g) of 2-thiol benzothiazol was condensed with (0.01 mole , 0.79 g) of 2-aminoethylene chloride in filtered off, then (0.01 mole, 2.1g) of this precipitate [7] was reacted with (0.01 mole, 0.93 g) of amino acetoyl chloride for (2hrs) refluxing, the precipitate filtered off , then (0.01 mole, 1.9 g) of compound[8] was cyclized with (0.01 mole ,1.6 g) of diethyl malonate upon heating, the precipitate was filtered off and recrystallized to give 83% of compound [9]

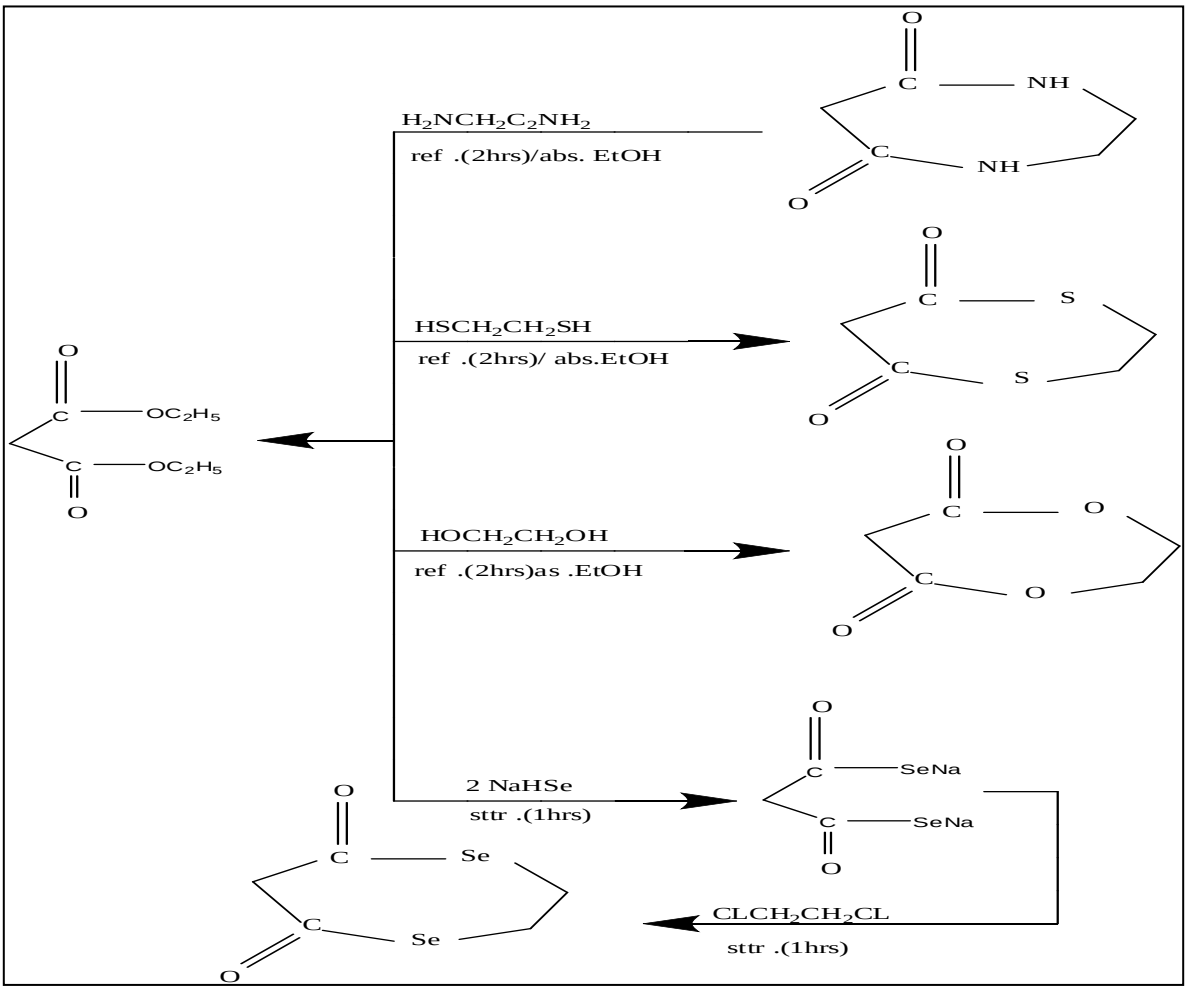
Synthesis of 5,7-(diphenyl)2,4-dihydro-1,4-thiazepine [10] :

(0.01 mole, 1.68g) of dibenzoyl methylen was reacted with (0.01 mole, 0.7g) of thiol amino ethylene in refluxing absolute ethanol , the precipitate formed and filtered off , recrystallized from ethanol to yield 85% of compound [10]

Synthesis of 3-methyl-6-tolyl-2,7-dihydro-1,4,5-thidiazepine

[12]compound[12] was also formed by heating of (0.01 mole, 1.6 g) of toluiyl chloride with (0.01 mole, 0.9g) of thio acetone for (2hrs) in presence of ethanol, after cooling , the precipitate [11] was filtered off, then (0.01 mole, 2.2g) of this precipitate [11] was cyclised with (0.01 mole, 0.32g) of hydrazine, the precipitate was filtered off and recrystallized to produce 86% of compound [12]

Reaction Scheme



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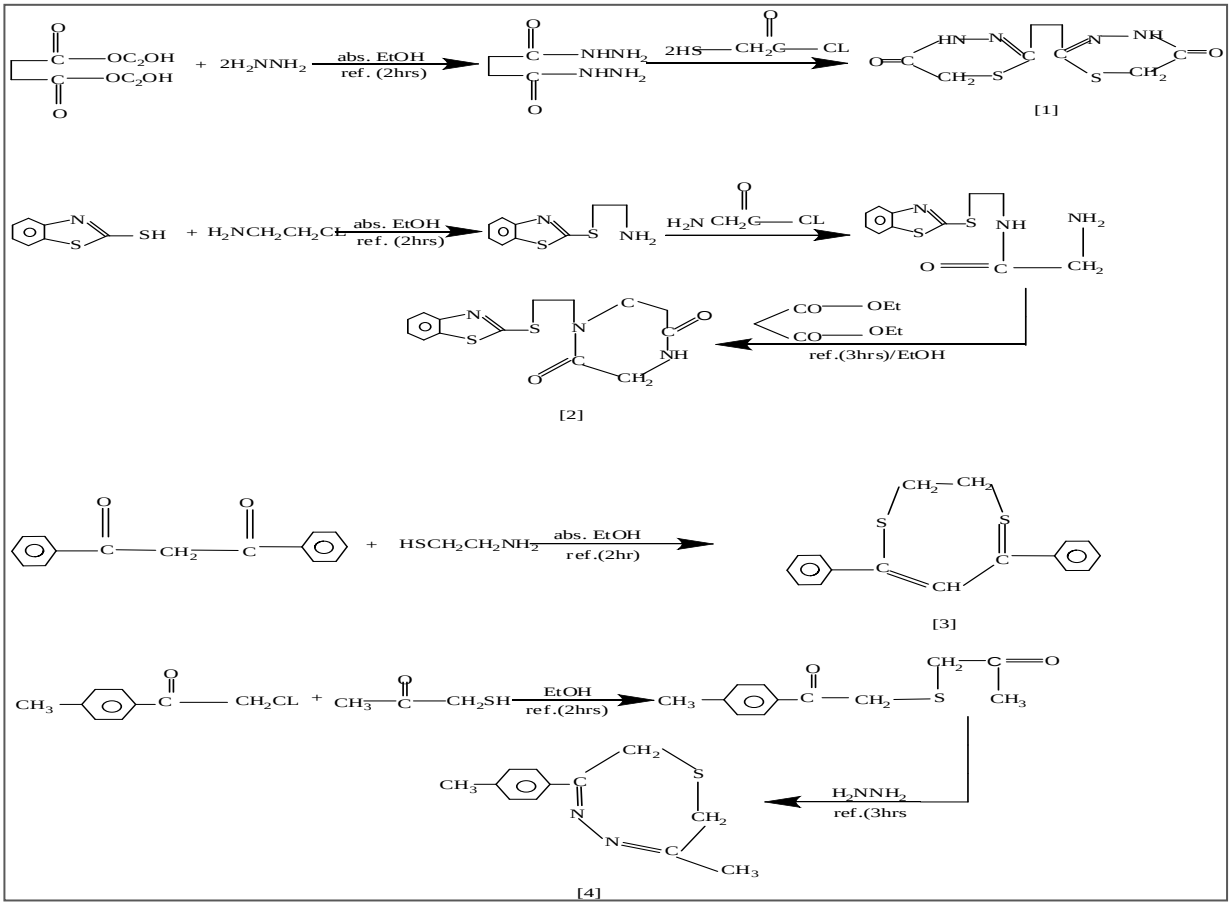
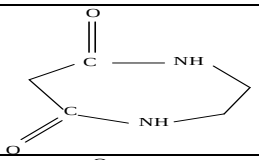
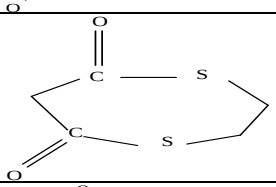
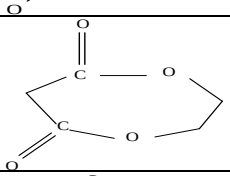
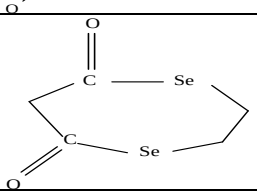


Table (1): FT.IR data (cm^{-1}) of compounds [1-12]

Comp No.	Structural formula	(C-H) Aliphatic	O ‖ —C–NH	O ‖ —C–S–C–O—C–Se ‖ ‖ ‖ O O O	N-H	C-S	C-Se	C=N
[1]		2910	1695	--- ---- -----	3276	----	----	----
[2]		2990	----	1660 ----- ----	----	663,1436	-----	----
[3]		2908	----	---- 1711 -----	----	----	----	----
[4]		2960	----	---- ----- 1686	-----	----	1610	----

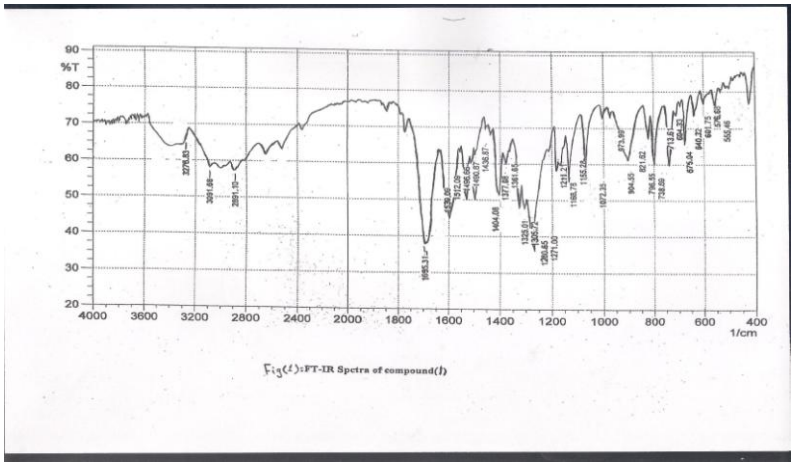
[6]	2908	1685	-----	------	-----	3355	661	-----	1460
[9]	2908	1681	-----	-----	-----	3340	682	-----	1537
[10]	2970	-------	-----	-----	-----	-------	642	-----	1615
[12]	2920	----	-----	-----	----	-----	-----	-----	1615

Table(2):H1.NMR-data(ppm) of compounds[1-12]

Comp. No.	Proton of (NH-CO-)	Proton of (S-CH_2)	Proton of (Se-CH_2)	Proton of (O-CH_2)	Proton of N-CH_2CH_2-	(C=CH) Alkene	Phenyl rings
[1]	9.32	----	---	---	4.62	---	----
[2]	----	4.3	----	----	----	---	-----
[3]	---	----	----	4.73	-----	---	-----
[4]	----	----	4.90	----	---	---	----
[6]	9..82	----	----	----	3.35	---	7.267
[9]	9.96	----	--	----	3.55	----	7.26 ,7.79 ,7.82
[10]	----	-----	----	----	3.80	1.95	6.34 , 6.37 ,7.26
[12]	---	3.65	----	---	---	----	6.34 , 6.37 ,7.26

Tabl(3) :melting points, M.F & (C.H.N)–Analysis of compounds[1-12]

Comp. No.	M.F	M.p (C°)	Calc./ Found C%	H%	N%
[1]	$C_5H_8N_2O_2$	198	46.875 /46.718	6.290 / 6.122	21.860 / 21.734
[2]	$C_5H_6O_2S_2$	224	37.020 / 36.958	3.730 / 3.617	------
[3]	$C_5H_6O_4$	215	46.160 / 46.107	4.650 / 4.506	------
[4]	$C_5H_6O_2Se_2$	236	23.460 /23.316	2.360 / 2.225	------
[6]	$C_8H_{10}N_4O_2S_2$	178	37.200 / 37.096	3.900 / 3.724	21.690 / 21.626
[9]	$C_{14}H_{15}N_3O_2S_2$	223	52.320 /52.057	4.700 / 3.982	13.070 / 12.904
[10]	$C_{17}H_{15}NS$	220	76.940 / 76.837	5.700 / 5.489	5.280 / 5.115
[12]	$C_{12}H_{14}N_2S$	215	66.020 / 65.909	6.460 / 6.284	12.830 / 12.677



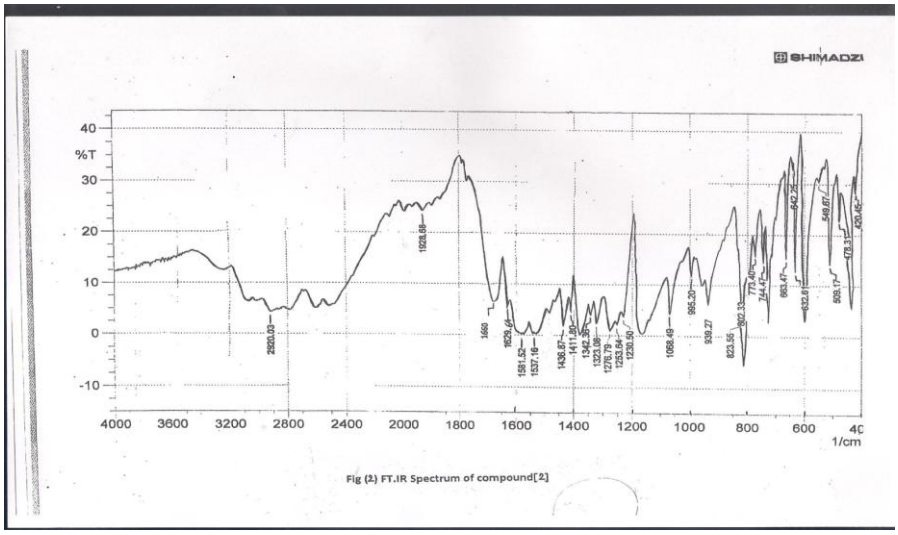


Fig (2) FT.IR Spectrum of compound[2]

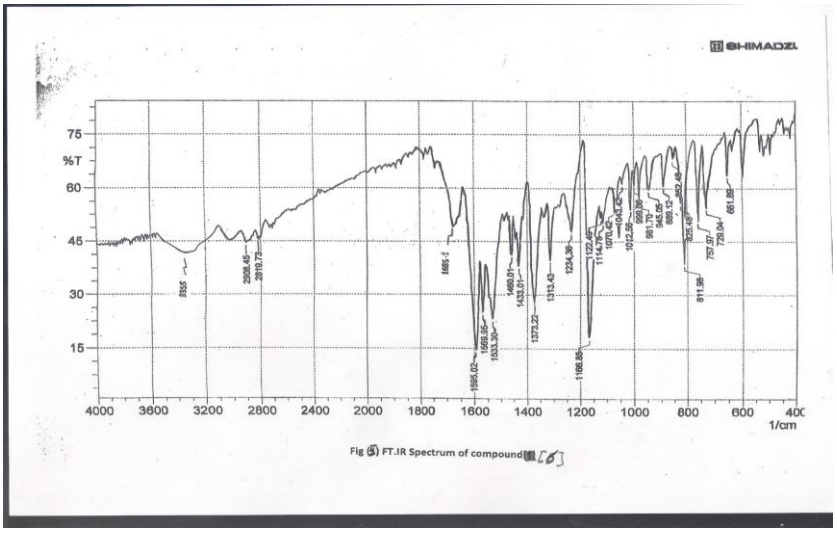


Fig (5) FT.IR Spectrum of compound[6]

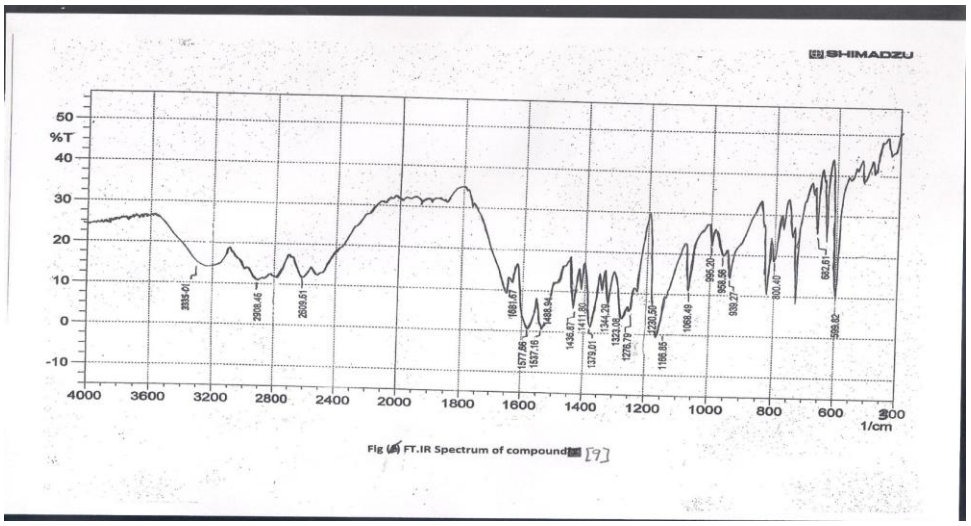


Fig (9) FT.IR Spectrum of compound[9]

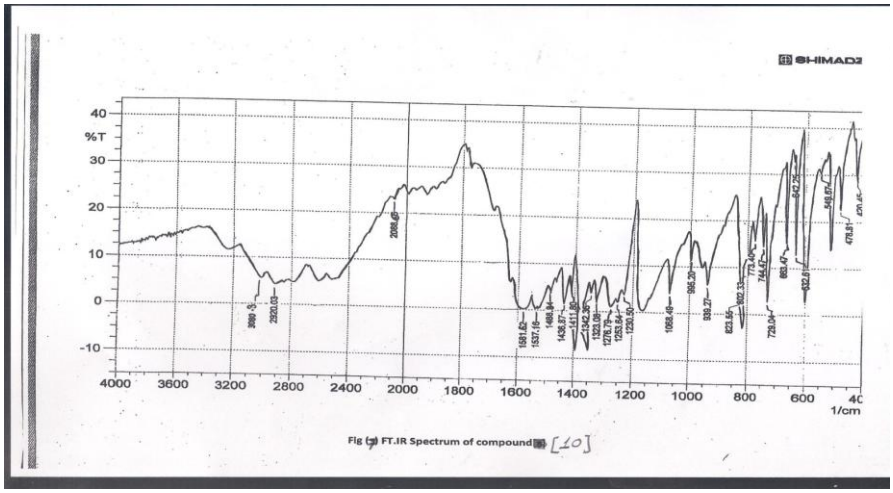


Fig (10) FT.IR Spectrum of compound [10]

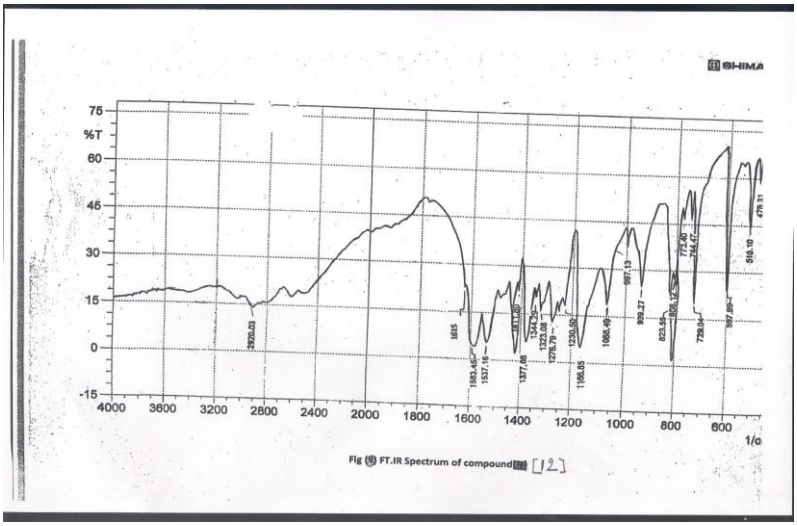


Fig (11) FT.IR Spectrum of compound [12]

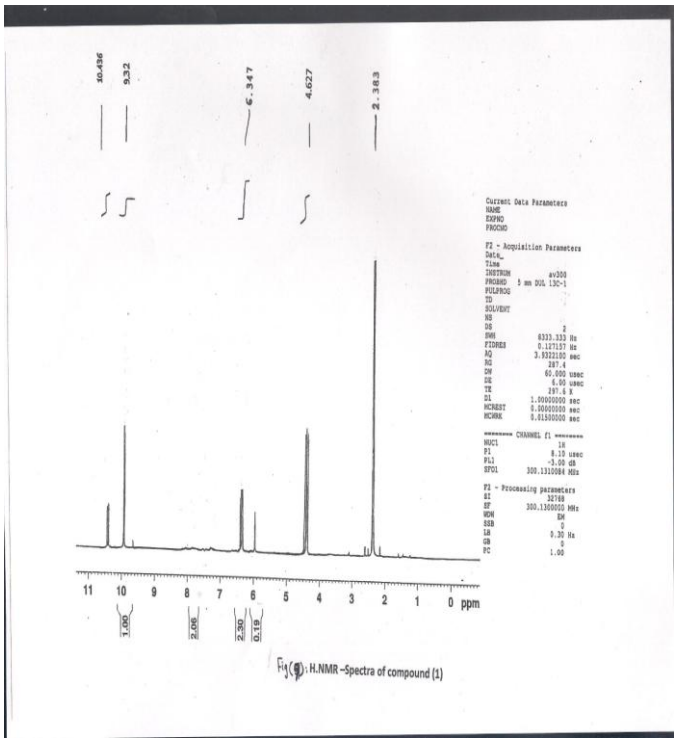
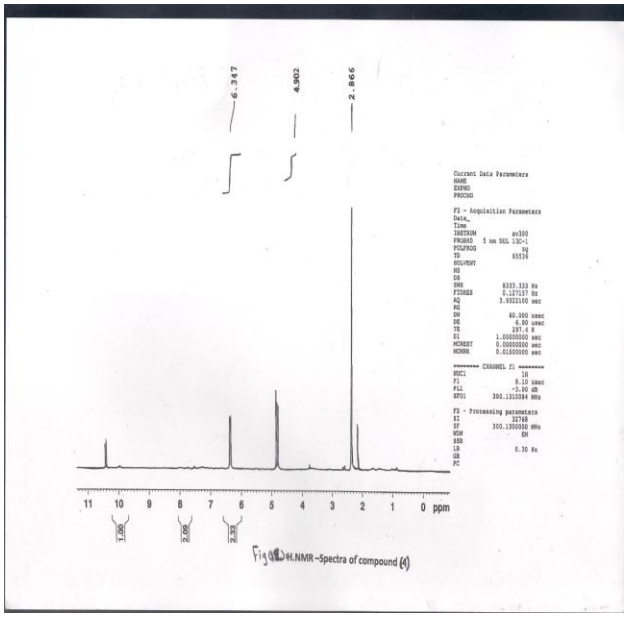


Fig (12): H.NMR –Spectra of compound (1)



Fig(1) H.NMR –Spectra of compound (4)

RESULTS AND DISCUSSION

Thisresearch contained synthesized two series ,one series synthesized from treatment of diethyl malonate with ethylene dihetro atom derivatives gave 1,4-diepane. 5,7-dione derivatives(1-4) as shown in schem(1) in (84-87)%. The structures of these products[1-12] were established from their melting points and spectroscopic methods(FT.IR- spectra, (C.H.N)-analysis H.NMR-spectra)

FT.IR-Spectra

All FT.IR spectra showed in figure(1-8). All the I.Rspectra showed a peak at(1660-1710)cm^{-1}

Which a ppeared due to carbonyl group (-C=O)stretching.In compound[1] the FT.IR-spectra showed a peak at (3276)cm^{-1} due to amide group .while the (C-S)[14]stretching in compound[2] showed at (663)cm^{-1} .The compound [3] showed peak in (1166)cm^{-1} due to (C-O) stretching. In compound[4]showed peak in (1610)cm^{-1} due to (C-Se) [14]The two series contained synthesized compounds[6,9,10 and 12] as shown in scheme (2) in (87 ,83 ,85 and 86)% respectively .the structures of these products were established from their spectroscopic methods (FT.IR- spectra, (C.H.N)-analysis H.NMR-spectra): all the I.R-spectra showed a peak at (1681-1685)cm^{-1} due to carbonyl group in compounds[6,9] .while the (N-H) stretching[14-16] showed at (3340-3355)cm^{-1} in compounds[6,9] .the (C=N)stretching showed in (1537-1615)cm^{-1} in compounds [6,10 and 12]and (CH=CH) at (3080)cm^{-1}in compound[10].while other peaks explain in table(1).

H^1.NMR- Spectrum

All the H^1.NMR-Spectra showed in figures(9-16)and table(2) .all the H^1.NMR-Spectra of diepane compounds[1-4] by the presence of protons at (9.32-9.9)ppm since the proton of (N-H) of amide group .the CH_2 protons in compounds[1-4] showed singlet signal whith in the region (4.3-4.9)ppm .the four protons of (CH_2-S) endo cyclic[14] showed singlet signal in the region (3.35)ppm .the protons of CH_2in (S-CH_2-CH_2-N) group showed two bands ,one band showed triplet signals within the region (3.5-3.8)ppm due to (S-CH_2) group in compounds[9,10] .The (CH_2) protons in (-CH_2-CH_2-) group exocyclic showed singlet signals in the region 2.3 ppm .

(C.H.N)– Analysis

(C.H.N)-analysis ,from compared the calculated data with found data of these compounds , the results were comparable, the data of analysis, M.F, names and melting points are listed in table(3) .

CONCLUSION

All results of spectra studies are evidences of synthesized compounds via shift of frequency of some bands of reactant compounds and formation of other bands in formatted compounds.

Acknowledgement:

I would like to express my thanks for Mr. Audaifor providing {(C.H.N)-element analytical ,H.NMR-spectra and Melting points} and Zaidan Company for supplied of materials.

REFERENCES

1. Aarsenyan . P, Rubina .K, Shestakova .I and Domracheva .I.,(2007).,"Synthesis of hetrocyclic compounds having biological activity", Eur.J. Med . Chem ., 42,635-40.
2. Aly . A and Ayed . R .,(2006),"Synthesis of oxazol derivatives and study microbial activity" Chem , 60 ,1 , 56 - 60.
3. Baht .B, Dhar.K, Puri. S and Saxena .A.,(2005).,Bioorg .Med .Chem .Lett., 15,3177-3180.
4. Chen .T, Zheng .W, Wong .Y and Yang .F .,(2008)., Biomed . Pharmacother ., 62, 77-84 .
5. Ghozlan . S , Khadija . O and Ismail .A.,(2007) Beilstein J. Org. Chem ., 3 , 15.
6. Huang . X and Xu . J . ,(2003)., Hetero at . Chem. , 14 , 564 .
7. Jiao . L , Liang . Y and Xu . J ., (2006)., J . Am . Chem. Soc , 128 , 6060 .
8. Jiao .L, Liang . Y, Zhang .Q, Zhang .S and Xu.J., (2006).,Synthesis .,659.
9. Kapubalu.S., Kovvuri.T ,.V,Gudaparthi.O and Dubey.P., (2001),"Synthesis and characterization of som novel isoxazoles via chalcone intermediate"..,J.Der.Pharma.Chemica, 3,5,113-122.
10. Kbass . M and Hassan . A .,(2003) , Chem. Pap ., 57 , 4 , 267 - 277.
11. Kiyota . H ., (2006),Topics Heterocycl . Chem , 6 , 181.
12. Lei .L, Leilei . Z, Gang .L and Jiaxi .X ., (2008)..,Arkivoc ,(XVI),318-326.
13. Liang . Y , Jiao . L , Zhang . S and Xu . J .,(2005)., J. Org . Chem , 70 , 334.
14. Nagham.M.Aljamali.,(2012),"Synthesis and identification of 8- and 9-membered rings via alkylation reaction" ,Pharm.Inn.J., 1,12,17-23.
15. Leonid.G, Voskressensky.A., (2012),"synthesis of poly cyclic imidazole thiazine derivatives by an anrorc domino reaction".,Eur.J . Org . Chem ., 6124-6126..,Cited by IVSL of Iraq.

16. Maria.Garcia and Tomas .T .,.,(2006).,"heterocyclic chemistry ofsulfur chlorides –fast ways to complex heterocycles" .,Eur.J . Org . Chem ., 849-861. .,Cited by IVSL of Iraq.
17. Singh .G., (2003)..,Tetrahedron ,59,7631 .
18. Xu –J , Wang . C and Zhang . Q ., (2004).,Chin . J . Chem , 22 , 1012.
19. Xu.J, Zuo .G and Chan .W., (2001)..,Hetero at . Chem ., 12, 636.
20. Zhanel . G , Wiebe . R , Dilay . L , Thomson . K , Rubinstien . E , Hoban . D , Noreddin . A and Karlowsky .(2007)., J ., Drugs , 67 , 1027.