Synthesis and Chemico-Biological Studying of Various Organic Compounds

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Abstract

In this work ,synthesis of variety of organic compounds [1-6] such as thiol compound , oxazepine (oxazepam) ,diazepine (diazepam) ,macrocyclic Schiff base ,azo compound which contains electron donating group and azo compound is containing electron with drawing group and identification of their structures by {(C.H.N) microanalysis , ^{1}H-NMR spectra and (FT-IR) – spectrum } and study of their biological activities , the data obtained give good supported for synthesized compounds[1-6]

تحضير ودراسة كيميائية- بايولوجية لمركبات عضوية مختلفة

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مفتاح البحث **:الثايول ،الديازيبام ، قاعدة شف الحلقية**

الخلاصة :

تم في هذا البحث تحضير مركبات عضوية متنوعة[1-6]تمثلت بـ (مركب الثايول ،الديازيبام ،الأوكسازيبام ،قاعدة شف الحلقية ، مركب آزو مرتبط بمجموعة دافعة ، وأخر مرتبط بمجموعة ساحبة للألكترونات . وأجرينا دراسة كيميائية للمركبات المحضرة هذه لتشخيصها كيميائياً بأستخدام عدة تقنيات هي (التحليل الدقيق للعناصر ،طيف الرنين النووي المغناطيسي ،طيف الاشعة تحت الحمراء) . ثم أُجريت دراسة بايولوجية لمعرفة فعاليتها ، ومن نتائج التشخيص تم التأكد من تكوين المركبات .

Introduction

In this paper ,we have used Schiff base condensation as the ring –closing step to synthesize macrocycle[1] ,oxazepine [2],diazepine [3], thio compound [4], the heteroatoms in there structure such as (S, N ,O)explain variety of applications(1-4), antitumor(5,6), in the biological engineering (7) and in other field (8-18) of their specific structures. Also azo-compounds are synthesized in this research ,it is known that aromatic azo compounds are widely used because of azo group (-N=N-)in their structures explain to their activity and variety of applications in several fields (19-23).

Experimental

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

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

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

3 – Elemental Analysis (C.H.N) :EA-017 mth in center lab–institute of earth and environmental Science, Al-Byat University ,Jordan .

4 -H-NMR spectra & (C.H.N)-analysis : in centre lab –institute of earth and environmental science , AL–byat university , Jordon .

Synthesis of compound [1] :

The preparation starts with the reaction between p-cresol (0.01mole ,1.08 gm) and formaldehyde(0.02mole ,0.6gm) in presence of sodium hydroxide ,after (48 hrs), the precipitate was filtered off and dried ,which (0.01 mole ,1.64 gm)of it was refluxed with(0.02mole ,1.2gm) of ethylene diamine for(4hr),the precipitate was filtered off then (0.01mole ,2.48gm) from this precipitate was refluxed with (0.01mole , 1.64gm) of 2,6-diformyl- cresol for (5 hrs), to precipitate 83% compound [1]

Synthesis of compounds [2-4] :

Refluxing mixture of (0.01mole , 1.36gm) of p-methoxy benzaldehyde with [(0.01mole,1.44gm) of 2-amino quinoline were refluxed for (4hrs) ,after cooling the precipitate was filtered off & dried, (0.01 mole ,2.62 gm)of this precipitate was condensed with(0.01mole ,0.98gm) of maliec anhydride for (6hr),the precipitate was filtered off to produce 81% of compound [2] ,which (0.01mole ,3.34gm) from it was reacted with one of [(0.01mole,1.23gm) of p-methoxy aniline ., (0.01 mole ,1.4gm) of p-methoxy benzene thiol] respectively for (8hrs) ,after cooling the precipitate was filtered off & recrystallized to produce (80%, 83%) of compounds [3]and[4] respectively.

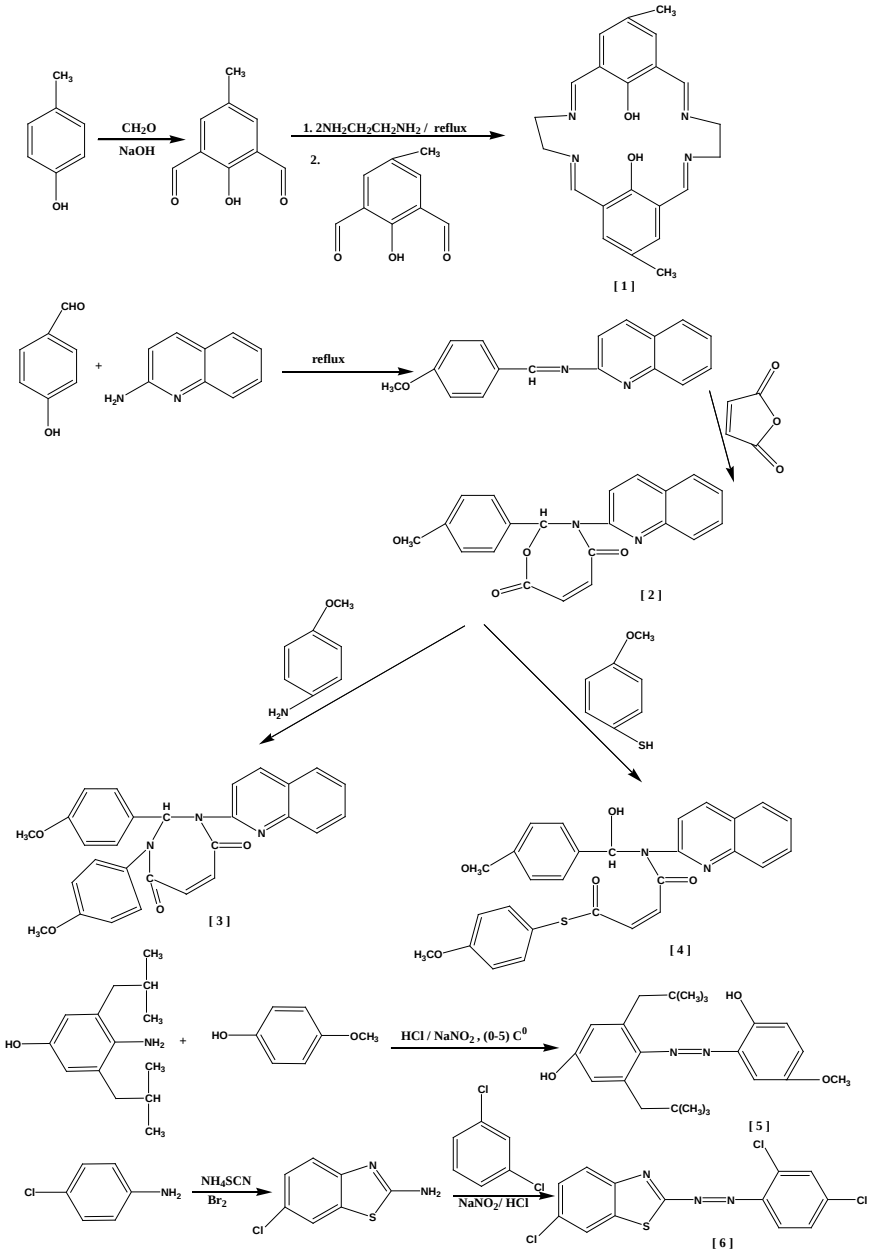
Synthesis of compound [5] :

(0.01mole, 2.21gm) of 3,5-di isopropyl-4-amino phenol was dissolved in 2 ml of hydrochloric acid and (0.7gm) of sodium nitrite in ice medium (0-5)C˚ ,after that ,the ethanolic solution of p-methoxy phenol(0.01mole ,1.24gm) adds to reaction mixture with solution of sodium hydroxide, the precipitate was filtered off and recrystallized to produce (87%) of compounds [5].

Synthesis of compound [6] :

Amixture of (0.01mole, 1.25gm) of p-chloro aniline and(0.01mole,0.76gm) of ammonium thiocyanate in glacial acetic acide with bromine addition from burete drop by drop , the precipitate was filtered off and dried, which dissolves (0.01mole, 1.83gm) in 2 ml of hydrochloric acid and (0.7gm) of sodium nitrite in ice medium (0-5)C° ,after that ,the ethanolic solution of m-di chloro benzene(0.01mole ,1.45gm) added to reaction mixture with solution of sodium hydroxide, the precipitate was filtered off and recrystallized to produce (86%) of compound [6].

Reaction Schem:



Results and Discussion :

All synthesized compounds [1-6] have been characterized by their melting points and spectroscopic methods (FT.IR- spectra, (C.H.N)-analysis H.NMR-spectra) with biological studies.

FT.IR-Spectra:

In FT.IR spectra ,the reaction is followed by appearance of: absorption band at (1630)cm-1 due to azomethine group(3) (-CH=N-)and band at (3420)cm-1 due to hydroxyl group (-OH)of phenol in compound[1]. Appearance of absorption band at (1680)cm-1 due to carbonyl group (C=O) lactame(4) (C=O) , absorption band at (170 0)cm-1 due to carbonyl group (C=O) of lacton (C=O) in compound [2], which disappeared and other bands are appear at (1675)cm-1 due to(4) carbonyl of lactame (NH-C=O) of diazepine in compound [3] and two bands at (3418 ,1436)cm-1due to hydroxyl group (-OH) and aryl sulphide (Ar-S) respectively in compound [4]. Appearance of band at (1537)cm-1 due to azo group (-N=N-)and band at (3481)cm-1 due to hydroxyl group (-OH)in compound[5], where as compound [6] appeared band at (1536)cm-1 due to azogroup(20,21) (-N=N-)and band at (811)cm-1 due to (C-S)endo cycle of thiazol , and other data of functional groups show in the following ,Table(1) and figures (4-6). Appearance of these bands are strong evidence to formation of compounds [1-6].

H.NMR- Spectrum :

H.NMR- Spectrum of compounds [1-6] showed : singlet signal at PPm 9.96 for one proton of azomethine group(-CH=N-) ,signal at PPm 10.62 for proton of hydroxyl group(-OH) of phenol, signal at PPm 3.88 for protons of (NCH2-CH2-N) in compound[1]. Signal at PPm 9.19 for proton of (O-CH-N) oxazepine cycle (4) ,signal at PPm 4.58 for protons(C-CH=CH-C) in oxazepine cycle of compound[2]. Signal at PPm 10.16 for proton of (N-CH-N) in diazepine cycle(4) ,signal at PPm 3.38 for protons of (C-CH=CH-C) in diazepine cycle ,doublet of doublet signal at PPm 6.77 for protons of phenyl group in diazepine in compound[3]. Signal at PPm 10.1 for proton of hydroxyl group (-OH) ,signal at PPm 5.2 for protons of (C-CH=CH-C) , signal at PPm 7.2 for protons of phenyl group of thiol in compound [4]. Signal at PPm 10.9 for proton of hydroxyl group (-OH) in phenol , signal at PPm 2.2 for protons of ($C(CH_3)_3$) , signal at PPm 3.4 for protons of methoxy group ($-OCH_3$) in compound [5]. Signal at PPm 6.5 for protonS of phenyl ring in benzothiazole , signal at PPm 7.2 for protons of phenyl ring on azo group in compound [6].And other peaks shown in the following ,figures(1-3).

(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 (2) .

Biolgical Effect of compounds[1-6] :

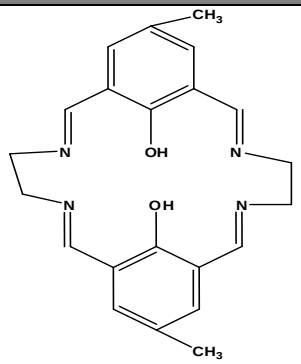
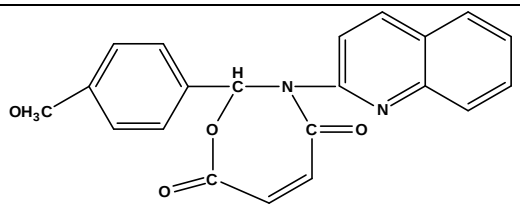
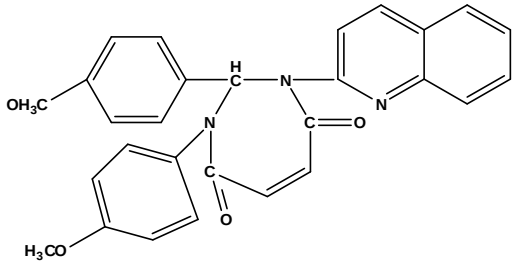
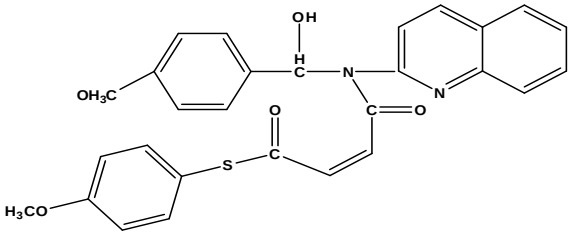
Antimicrobial activities of compounds [1-6] were tested using hole method at concentration ($1^{x}10$-3)M of compounds against two type of bacteria (Staphylllococcus aureus ,Klebsiella phenmonia) and two type of fungi (Fusoirium ,Aspergillus Nigar) which incubated at 37 C° for 24hrs .

All compounds[1-6] exhibit strong inhibition on growth of the bacteria by inhibition of cell wall synthesis ,disruption of cell membranes interference with protein synthesis or interference with nucleic acid synthesis (18) .While compounds[1-6] have no antifungal activity ,the obtained data shown in the following, Table(3), Pict.(1,2).

Acknowledgement:

I would like to express my thanks for Mr. Muhannad-Abu-Alsaod in Centre –Lab-Institute of Earth and Environmental Science Al-bayt University H.J.K in Jordan for providing {(C.H.N)-element analytical ,H.NMR-spectra and Melting points} and Zaidan Company for supplied materials.

Table (1) : FT.IR data (cm^{-1}) of compounds [1-6]

Comp. No.	Structural formula	Name of compound	Functional groups (Importance groups)
[1]		[10,21-dimethyl-3,6,14,17-tetra aza tri cyclo-tetra cosa-2,6,8,10,12,24,13,17,19,23,20,22-decaene-23,24-diol].	(CH=N)azomethine group:1630 (-OH):3420 ,(C-O):1232 (CH)aliphatic:2925 (CH)aromatic:3030
[2]		2-(p-methoxy phenyl)-2,3-(quinolone)-2,3-dihydro-[1,3]-oxazepine-4,7-dione.	(C=O)of lactame:1680 (C-N)endo cyclic: 1530 (C=O)of lacton:1700 (-OCH_3)2830
[3]		1-(p-methoxy phenyl)-2-(p-methoxy phenyl)-2,3-(quinolne)-1,2,3,-trihydro-[1,3]-diazepine-4,7-dione.	(C=O)of lactame:1675 (C-N)endo cyclic: 1535 (-OCH_3)2820
[4]		N-(p-methoxy benzyl alcohol)-4-(p-methoxy phenyl sulphide)-1,4-dion-2-(butene)-N-(2-quinolinyl) amine.	(C=O)of ammine:1671 (C-N)endo cyclic: 1535 (C=O)of:1700 (-OCH_3)2794 (Ar-S):1436 ,(-OH):3418

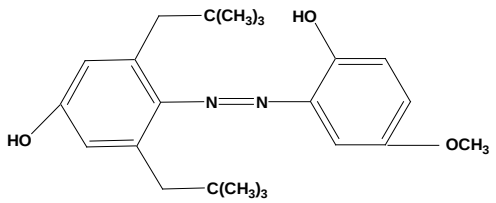
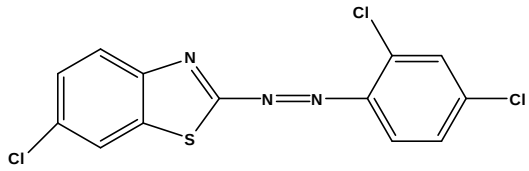
[5]		**4-(3,5-di iso butyl phenol azo)-anisol.**	**(-OH):3481** **(-OCH_3):2871** **(-N=N-):1537**
[6]		**2-(2,4-dichlorophenylazo)-6-chlorobenzothiozole**	**(C-Cl):729, (-N=N-):1536** **(C-N)endo cycle:1436, (C-S):811**

Table (2) : Melting points, M.F , & (C.H.N)- analysis of compounds [1-6]

No.	M.F	M.P C°	Calc./ Found C%	H %	N %
[1]	**$C_{22}H_{24}N_4O_2$**	**210**	**70.212** **69.948**	**6.382** **6.224**	**14.893** **14.617**
[2]	**$C_{21}H_{16}N_2O_4$**	**139**	**70.000** **69.869**	**4.444** **4.288**	**7.777** **7.518**
[3]	**$C_{28}H_{23}N_3O_4$**	**159**	**72.258** **72.127**	**4.946** **4.836**	**9.032** **8.879**
[4]	**$C_{28}H_{24}N_2O_5S$**	**187**	**67.200** **67.110**	**4.800** **4.520**	**5.600** **5.361**
[5]	**$C_{21}H_{28}N_2O_3$**	**174**	**70.786** **70.547**	**7.865** **7.716**	**7.865** **7.667**
[6]	**$C_{13}H_6N_3SCl_3$**	**183**	**45.547** **45.326**	**1.751** **1.616**	**12.262** **12.128**

Table(3):biological activity of ($1^{x}10^{-3}$)M of compounds[1-6]expressed as zone of Inhibition(mm)

Comp.No.	Bacteria		Fungi	
	S.aureus	K.pheumonia	A.spergillus niger	Fusoirium
[1]	21	16	------	-----
[2]	18	13	------	-----
[3]	23	15	------	------
[4]	25	18	-----	------
[5]	10	9	-------	-------
[6]	14	7	---------	---------

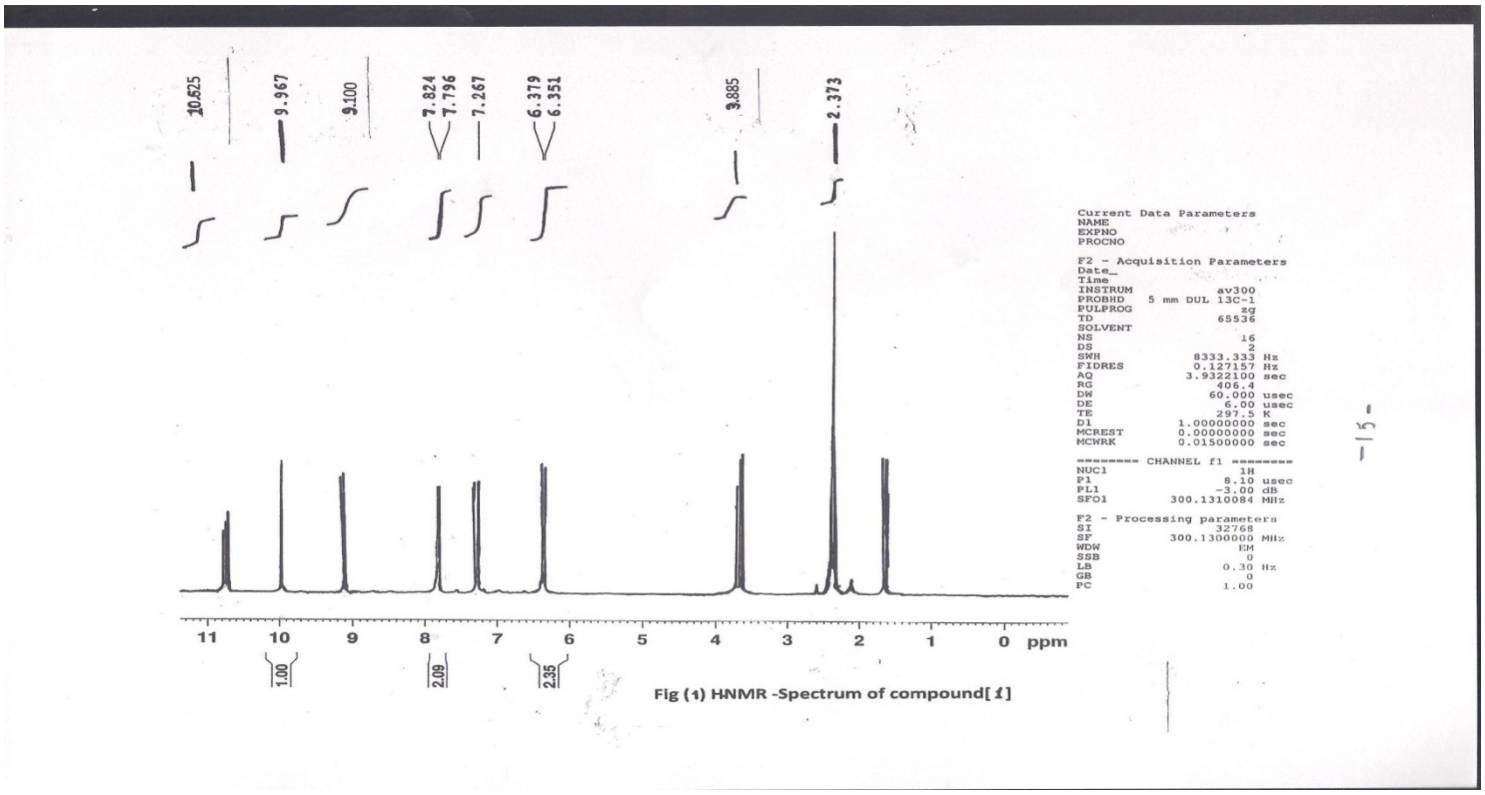
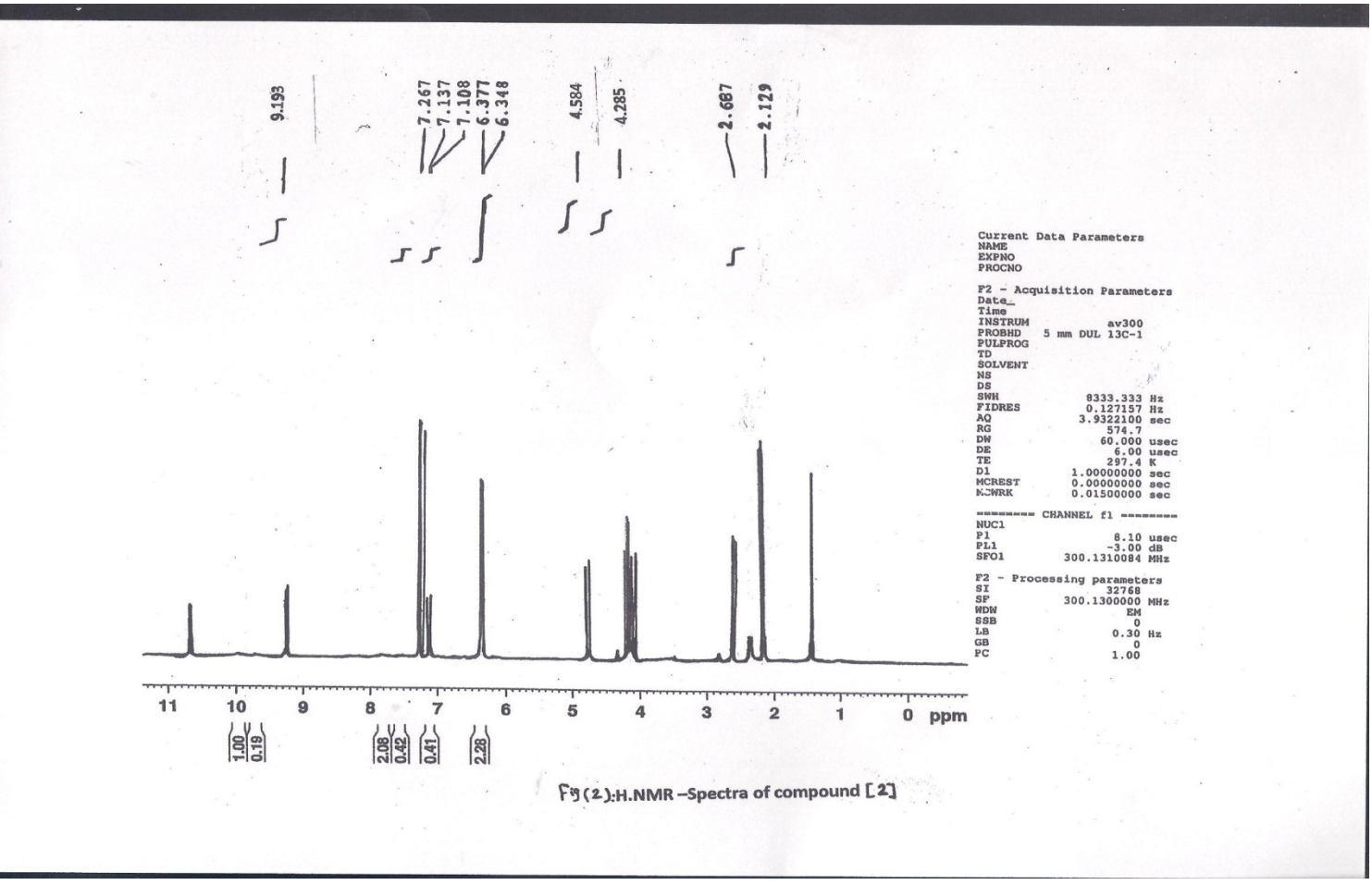
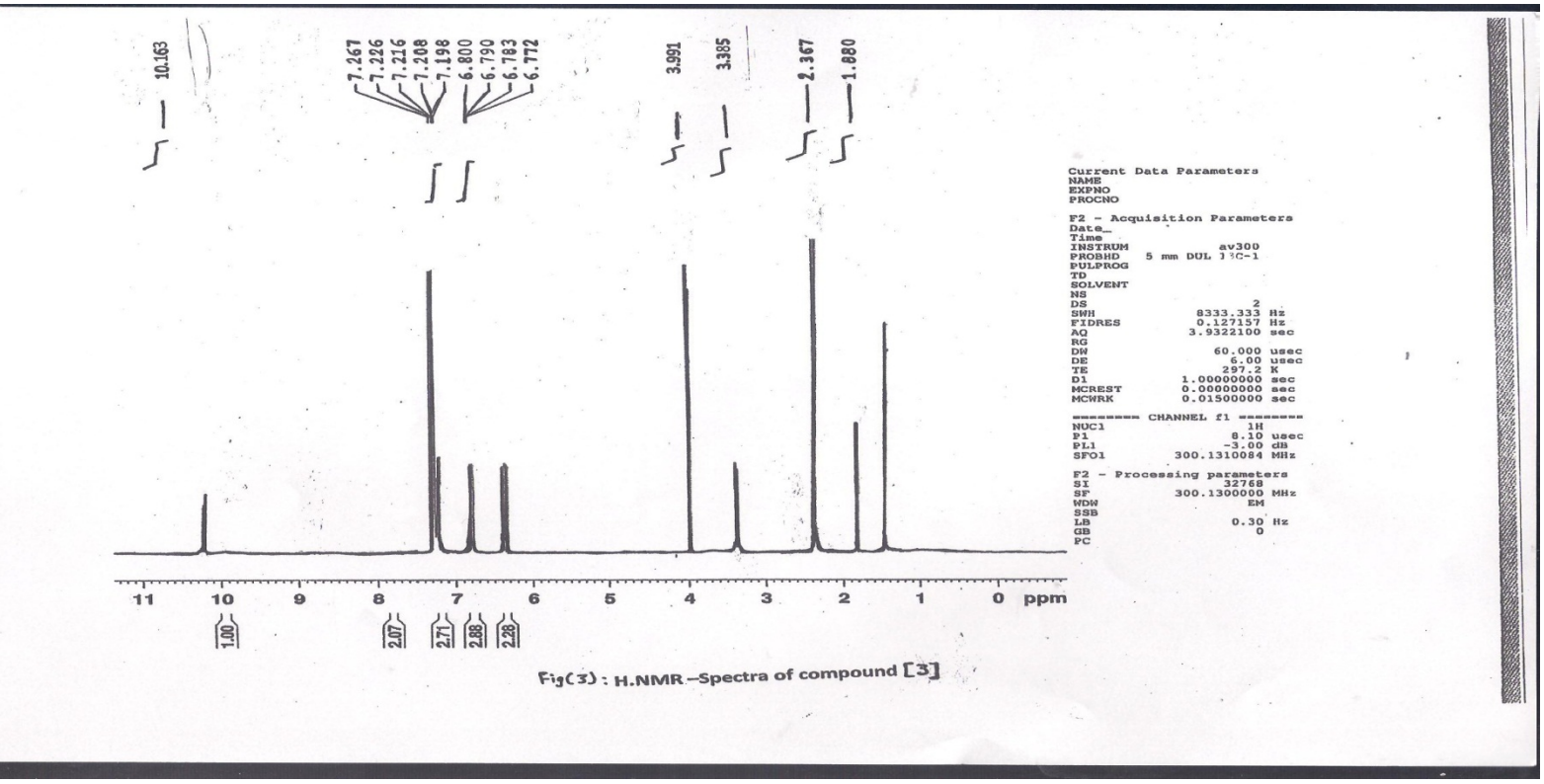


Fig (1) HNMR -Spectrum of compound[1]



Fig(2):H.NMR –Spectra of compound [2]



Fig(3) : H.NMR –Spectra of compound [3]

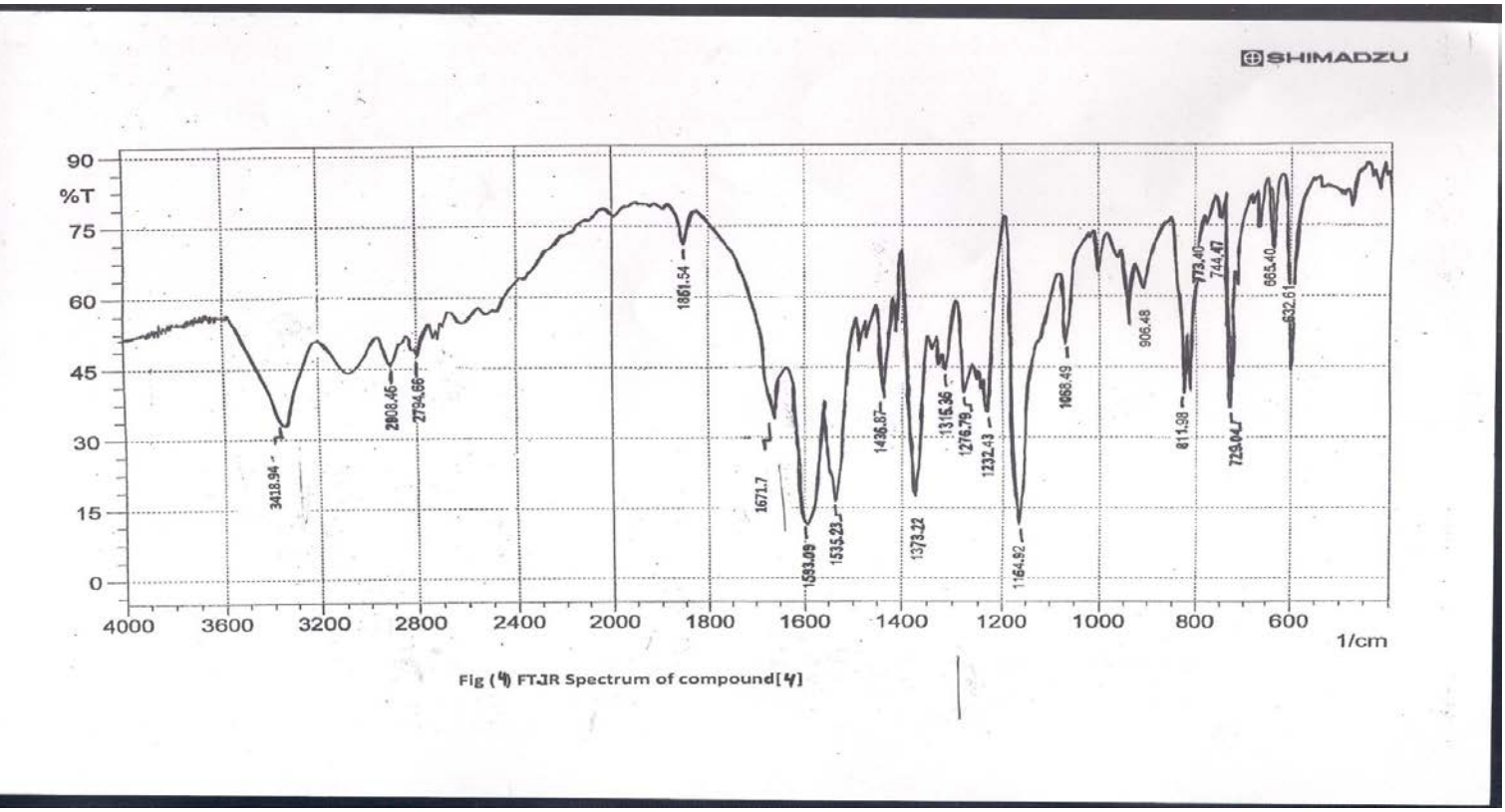


Fig (4) FTJR Spectrum of compound[4]

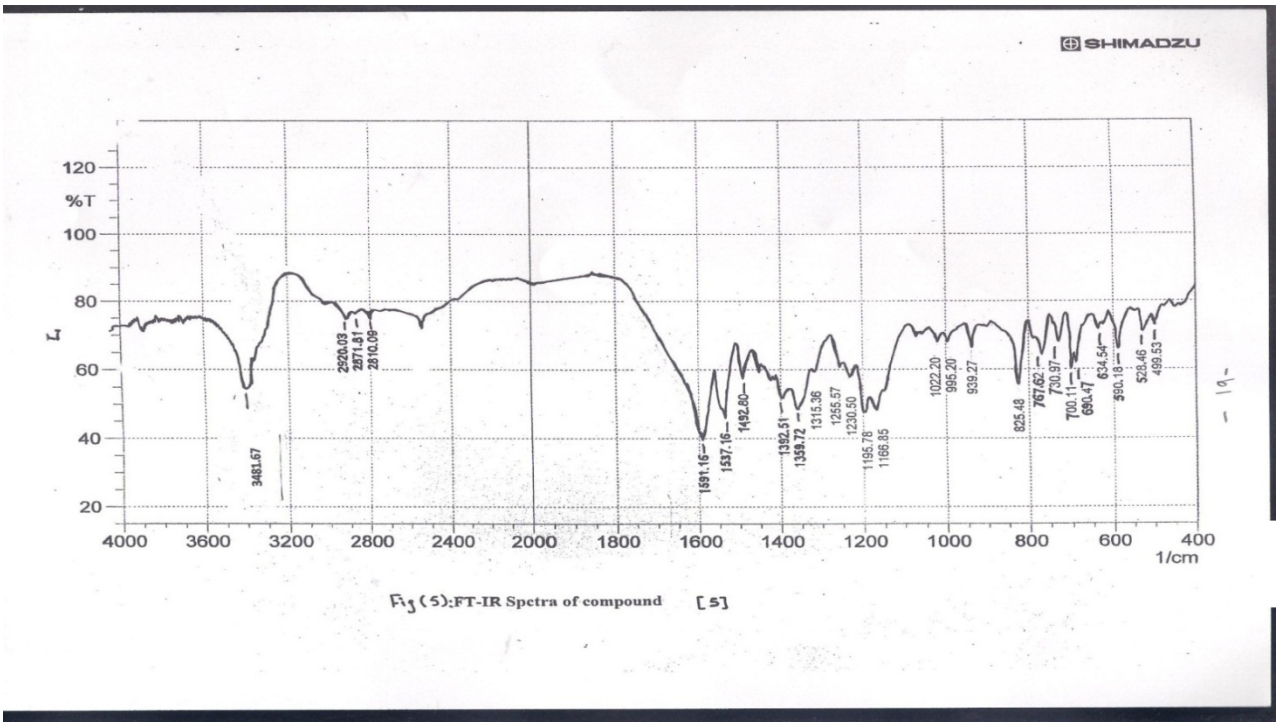


Fig (5):FT-IR Spctra of compound [5]

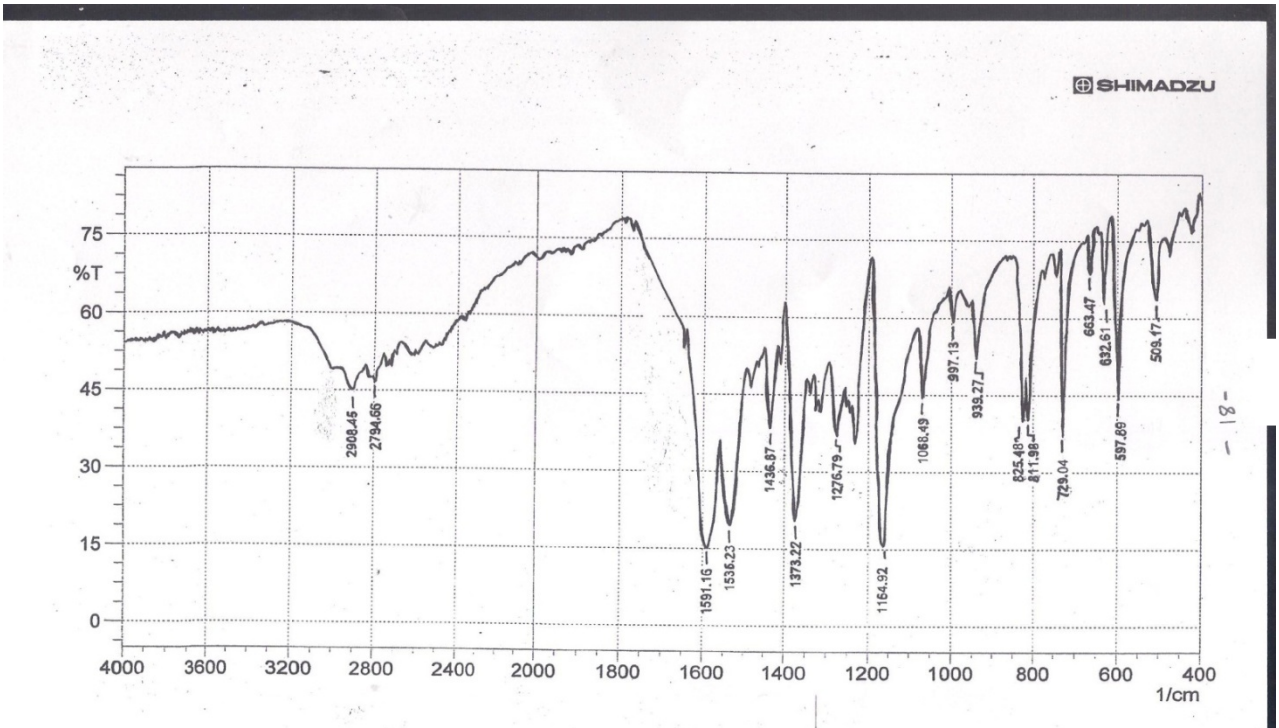


Fig (6) FT.IR Spectrum of compound[6]

References:

1.Amanda.J ,Joseph.K ,Federico.E, Yan.A and Mark.J., J.Org.Chem. 70,7936-7946(2005) .

2.Vigato.P and Tamburini.S .,Coord.Chem.Rev., 248,1717-2128(2004).

3.Nagham.Aljamali .,J.Alqadisiyah.Sci., 14,2,159-164(2009).

4.Nagham.Aljamali .,J.Kerbala.Ssi.,7,1,323-327(2009).

5.Rajavel.R, Senthel.M and Antitha.C., E-J.Chem.,5,3,620-626(2008).

6.Nikolai.M ,Artem.S ,Andrey.A, Mikhail.Y and Igor.V., J.Org.Chem.,72,9,3443-3453(2007).

7.Iqbal.N ,Javed.I and Muhammed.I .,J.Sci.Res.,XXXIX,1(2009).

8.Mohamed .G and Carmen.M. Sprec.Acta.Part.A.,Mo.r and Biomol.Spec,66,949-958(2007).

9.Raveendran.R and Pal.S., J.Organometallic.Chem., 692,824-83(2007).

10.Leroy.C., Annu.Rep.Prog.Chem., Sect.A, 99,289-347(2003).

11.Cezar.S, Maria.P and Cristian.T., Turk.J.Chem., 32,487-493(2008).

12.Asiri.A ,Khadija.O., Molecules, XX,XXXX(2007).

13.Alyaa.A., Phosphorous.Sulfur.Silicon.Related Element., 178,199-210(2003).

14.Alan.R, Yong.J and Ying.Y., Advanced Article on Web(2002).

15.Yildiz.M, Askin.K and Basaran .D., J.Serb.Chem.Soc. .72,3,215-224(2007).

16.Lei.L, Leilei.Z, Gang.L and Jiaxi.X., Arkivoc,XVI,318-326(2008).

17.Andrea.S, Daniel.V ,Andre .L and Lubomir.F., Arkivoc,Vi,122-128(2001).

18.Nagham.Aljamali., J.Babylon., 11,3,452-458(2006).

19.Zolfaghar.R, Leili.R, Kamellia.N and Seyed.M., Acta.Chem.Solv., 51,675-686(2004).

20.Nagham.Aljamali., J.Kerbala., 6,4,Scientific(2008).

21.Nagham.Aljamali., J.Kerbala., 7,1,Scientific(2009).

22.Raad.K ,Hussain.J and Majed.J ., J.Kerbala., 7,1,Scientific,100-105(2009).

23.Hussain.K, Haitham .d and Ahmed . F., J. Kerbala .Scientific., 7 ,1,70-71(2009)