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Studying Characterization of Some New Heterocyclic Derivatives that Synthesized from 2-Aminobenzothiazole Derivatives

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ABSTRACT

This research including preparation new derivatives for heterocyclic compounds are (1,3 benzothiazole), (1,3oxazpine) ,and(imidazolidin-4-one). The process synthesis in us research divided into two major pathways.: First , synthesis 2-amino benzothiazole derivatives [6-acetyle -2-amino benzothiazole (A1)and [6,'6]biphenyl thiazolyle [2,2']di amine (B1)] from p-amino acetophenone and benzidine respectively .Second pathway , with some aldehydes subsisted ,amin group of benzothiazole reacted to form Schiff's base compounds that enter reaction with phathlic anhydride to produced (1,3 Oxazpine) derivatives (As3,As4,B3), and with (valine) amino acid to form imidazolidin-4-one heterocyclic (As5).The reactions followed up by using Thin Layer Chromatographic method (TLC) to perform the reaction ,as well as, characterizing new derivatives by using FT-IR and (C.H.N.S) measurements **for these compounds.**

Introduction **:**

Fused heterocyclic compounds are very important compounds partially because of their pharmacological properties which include wide applications in medicinal chemistry [1]. Substituted 1,3-benzothiazole derivatives are an important class of fused heterocyclic compounds.

2-Amino benzothiazole constitute an important class of heterocyclic compounds. In recent year analogues attracted strong interest due to their useful biological and pharmacological properties, such as anti-tumor, anti-microbial, anthelmintic, anti-leishmanial, anti-convulsant and anti-inflammatory [2,3] . The chemistry of the carbon-nitrogen double bond plays a vital role in the progress of the chemistry science[4]. Benzothiazole compounds that contain Schiff's base have been used as fine chemicals and medicinal substrates and because their electronic coordination properties expressed very important class of ligands in complexes chemistry [5].

As well as ,(1,3Oxazpine) cyclic is important class of seven membrane heterocyclic compounds exactly, which prepared from Schiff's base and Anhydrides by cycloaddtion method to imino group (-N═CH-) [6].In this work we synthesized new heterocyclic derivatives contained benzothiazole ring and (1,3)oxazpine or (imidazolidin-4-one)ring.

Experimental Section

All the chemicals used were supplied by Merck, Fluka and BDH chemicals. FTIR spectra were recorded on SHIMADZU – FTIR 8400 Fourier transform infrared spectrophotometer using KBr discs. Melting point were determined in open capillaries on Thomas Hoover apparatus and were uncorrected .Finally, used C.H.N.S measurements .

Synthesis Methods:

Line 1

Preparation 2-amino benzothiazole derivatives:

1-preperation 6-acetyle,2amino benzothiazole (A1) [7].

Dissolved (0.03 mole, 4.055gm) 4-amino acetophenone and (0.06 mole ,4.56 gm)from NH_4SCN in (70 ml) glacial acetic acid .Cooled the mixture to (0-9)^{o}c by ice bath ,then added drop - wise (1ml) Br_2 liquid that dissolved in 30 ml glacial acetic acid . The reaction was stirred with maintaining the reaction temperature bellow 10^{o}c.After the addition was complete leaved the reaction (2hr) with stirrer , and the progress of the reaction was monitored by (TLC) . Pall yellow precipitate appear in bellow of round . The solids were filtered off and then washed first with glacial acetic acid and then with water .The filtrate was dilute with 500 ml of water ,neutralized to pH 7 to 8 , and then cooled overnight in the refrigerator to allow the product to precipitate .The product was filtered ,washed with cold water and dread , recrystallized from ethanol and THF .Pale yellow product and yield % 78.12 (4.5gm) M.p:(244) ^{o}c.

2-Preperation [6,'6]biphenyl thiazolyle [2,2']di amine) (B1) [7].

Same the method that used above used in preparation this compound but , the Benzidine (0.01mole, 1.84 gm) , mole of NH_4SCN was double(0.04 mole, 3.o4 gm) and Br_2 (0.7 ml) after the addition was complete and the reaction performed by TLC technique ;the mixture was diluted with water . Then, NaOH solid added to make the mixture basic . The white –yellow precipitate will appear . Cooled overnight in the refrigerator to allow the precipitate to increase . Filtrated and washed with water to free from NaOH residue .Finally ,dried and recrystallized from benzene and ethanol (50:50). Yield % 73.8(2.2gm) M.p: (266)^{o}c [8] .

Line 2

General method of preparation of Schiff's base s. [9]

Preparation ((As1)),((As2))

Dissolved (0.5 g, 0.0026 mol) of 6-acetyle- 2-amino benzothiazole in (20ml) absolute ethanol and added 3drops of Glacial acetic acid .The aldehyde(0.0026 mol) that dissolved in(15 ml) was added and refluxed with stirring at (75^{o}c) for (8-10 hr). After the reaction was completed the precipitates were obtained by dried the solvent by vacuum freezing drier devise or by air. The Physics properties and yield percentage listed in the table (3) and (5).

Preparation N2,N2'-bis(4-(dimethylamino)benzylidene)-6,6'-bibenzo [d] thia -zole-2,2'-diamine ((B2))

The synthesis Schiff's base of compound (B1) is same the procedure above with same mole (0.0026 mole, 0.775gm) that dissolved in(20ml) of DMSO with (3) drops of G.A.A .Then refluxed with double mole of (4,N,N dimethyl benzaldehyde) (0.0052 mole, 0.774gm) that dissolved in(10 ml) DMSO . Dried solvent with frizzing drier devise .The orange precipitate was obtained by recrystallization from Benzene . FTIR and Physics properties and yield % listed in table (3)and (5).

Preparation of Oxazpine's compounds ((As3 , As4 , B2)) [12] :

Preparation (As3) , (As4) all oxazpine cyclic compounds in this work prepared by same the method : Dissolved (0.001mole) of Schiff's base and (0.001 mole) from Pathlic anhydride in (40 ml)of dry benzene and the mixture was refluxed (5 - 7 hr.) at (60 ^{o}c) . The compounds purified by recrystallization from ethanol . The compound (B2) was prepared in the same method but the mole of phathlic anhydride is double (0.002). FTIR and Physics properties and yield % listed in the table (3)and (5).

Preparation of 1-(5-acetylbenzo[d]thiazol-2-yl)-2-(2,4-dichlorophenyl)-4-methyl-1H-imidazol-5(2H)-one ((As5)) .[13]

A mixture of Schiff's base (As1) (0.001mol ,0.347gm) and valine (0.001mole, 0.089gm) in (20) ml absolute ethanol was refluxed for (12 hr.) then dried by air. The precipitate was purified by recrystallization from ethanol. FTIR and Physics properties and yield % listed in the table (3)and (5).

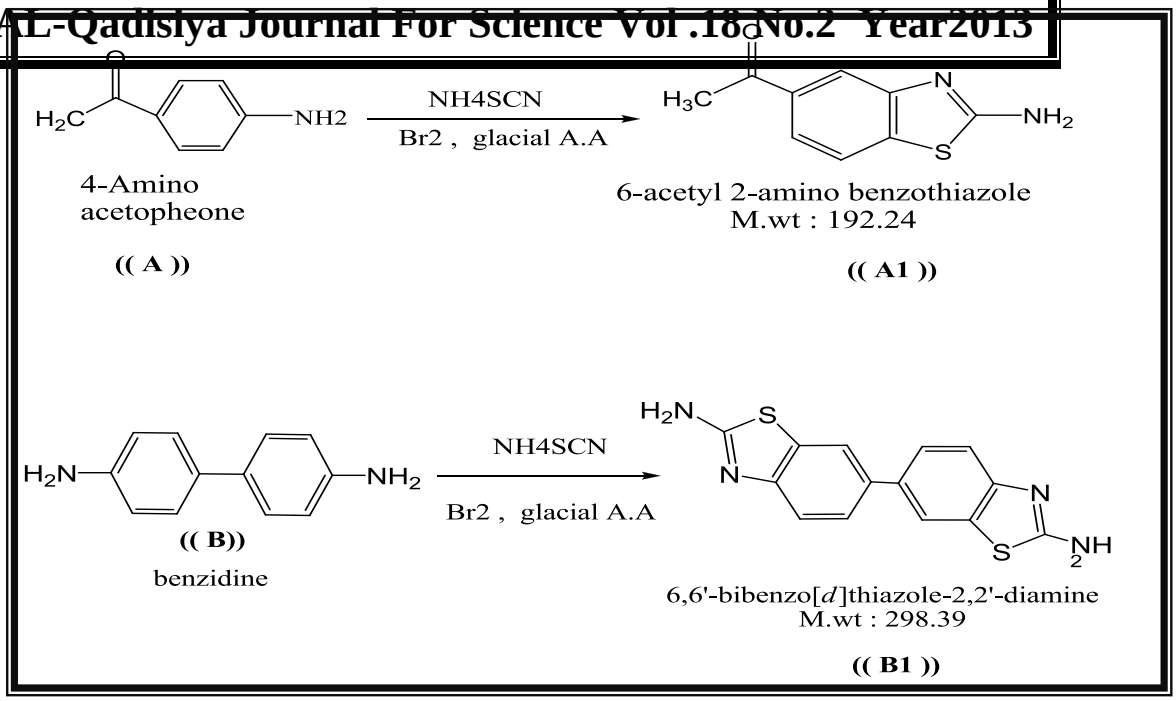
Results and Discussion :

Heterocyclic compounds that contains benzothiazole and pyrazole or oxazpine cycles are important class because their biological and industrial properties. .So that we prepeared this compound and identification by spectrum technician as FTIR spectrum and CHNS analyses additionally to Physics properties .

Line 1

Preparation and Identification of compounds (A1) and (B1) :

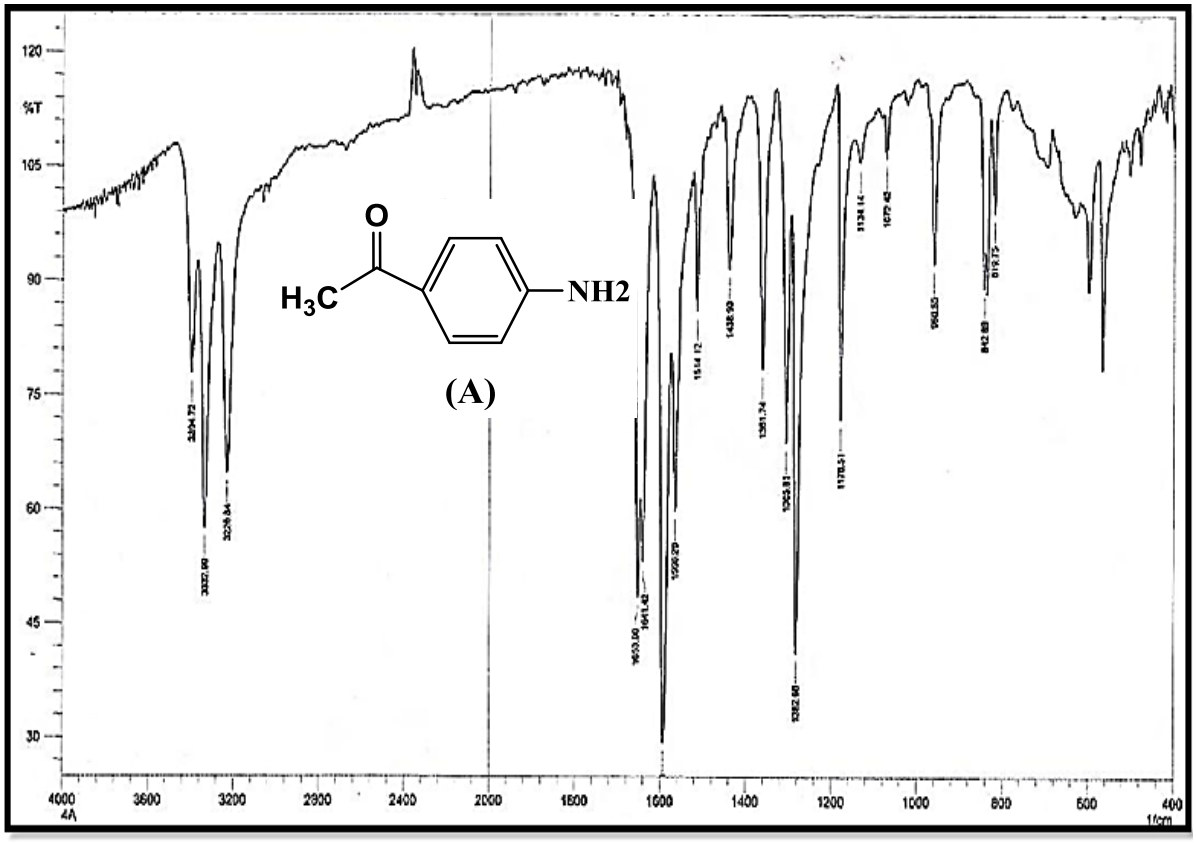
Synthesized amino benzothiazole derivatives (A) and (B) by Thiocyanogen [7] by used substituted aromatic primary amines (4-amino aceto phenone and benzidine) with ammonium thiocyanate and by exist the Br_2 liquid that dissolved in G.A.A . will occur the cyclization and produced (A)and (B) . FTIR spectra and physical properties of the prepared compounds in this work (line 1) are listed in table (1) and table (5).

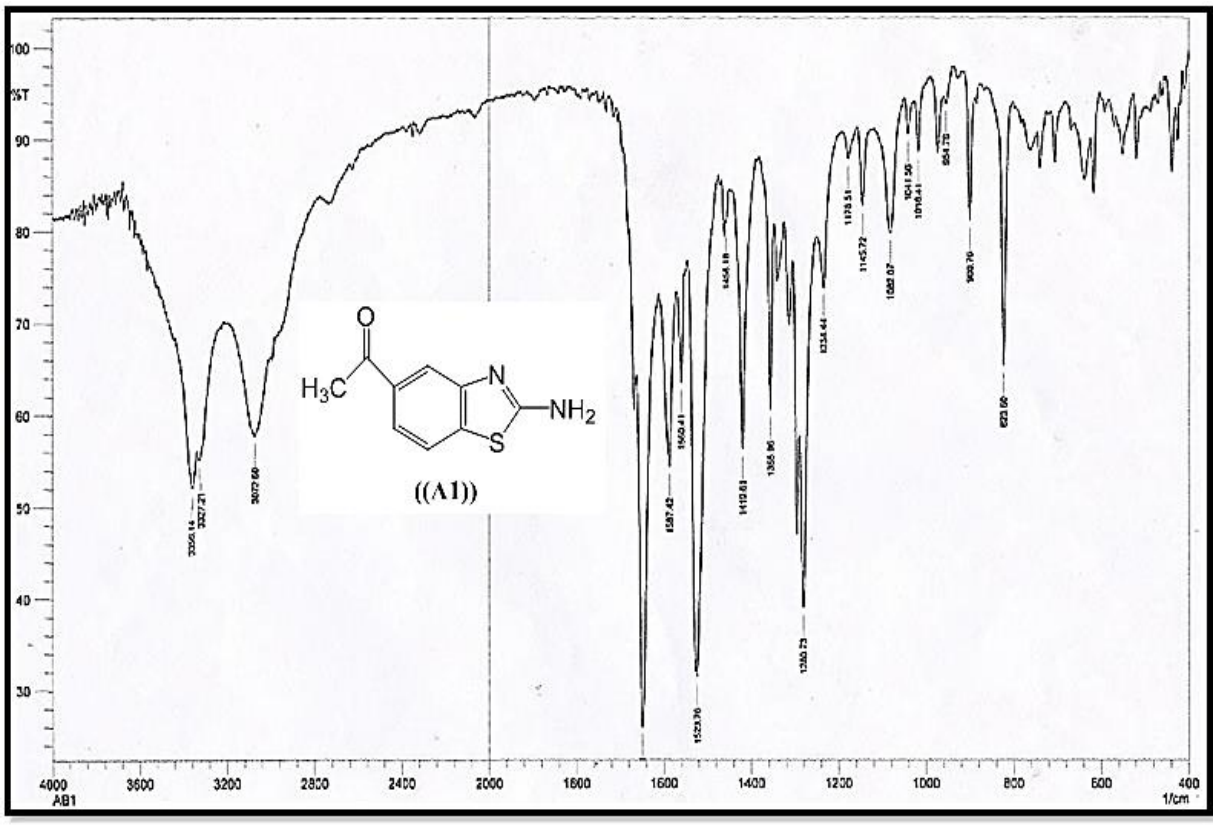


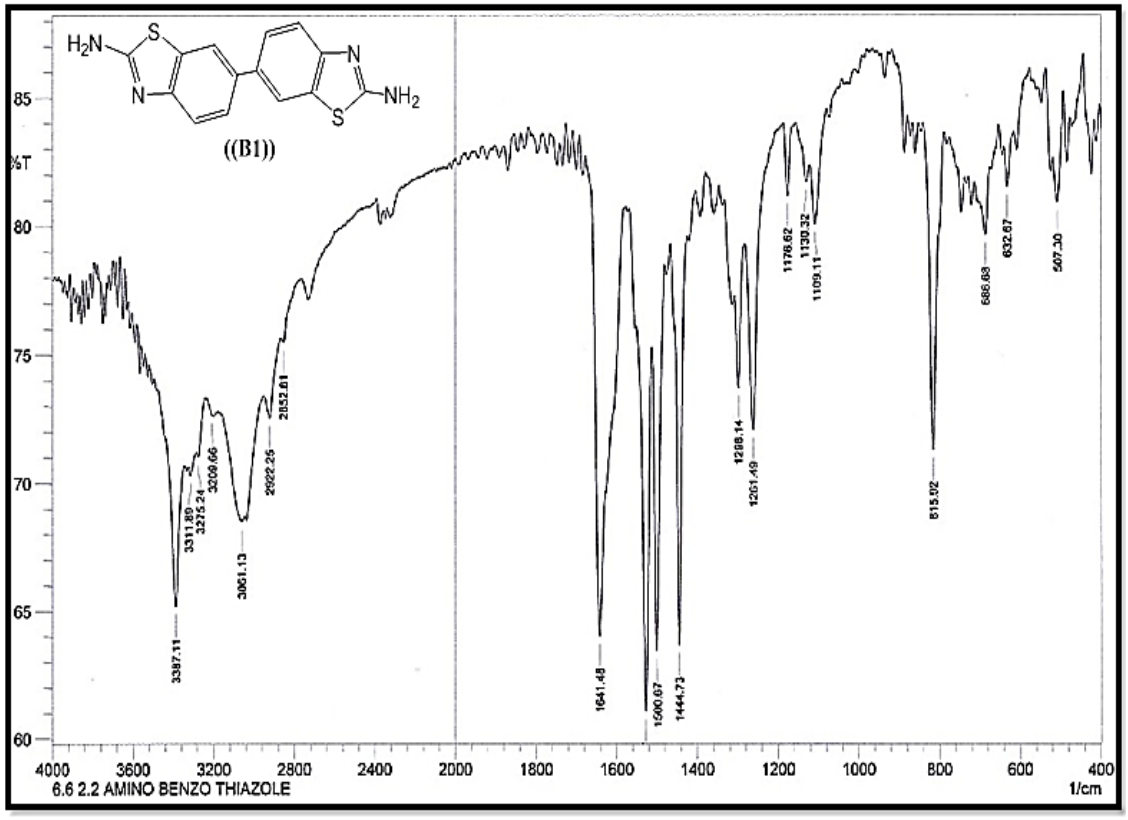
Scheme (1) :synthesis 2-amino benzothiazole derivatives

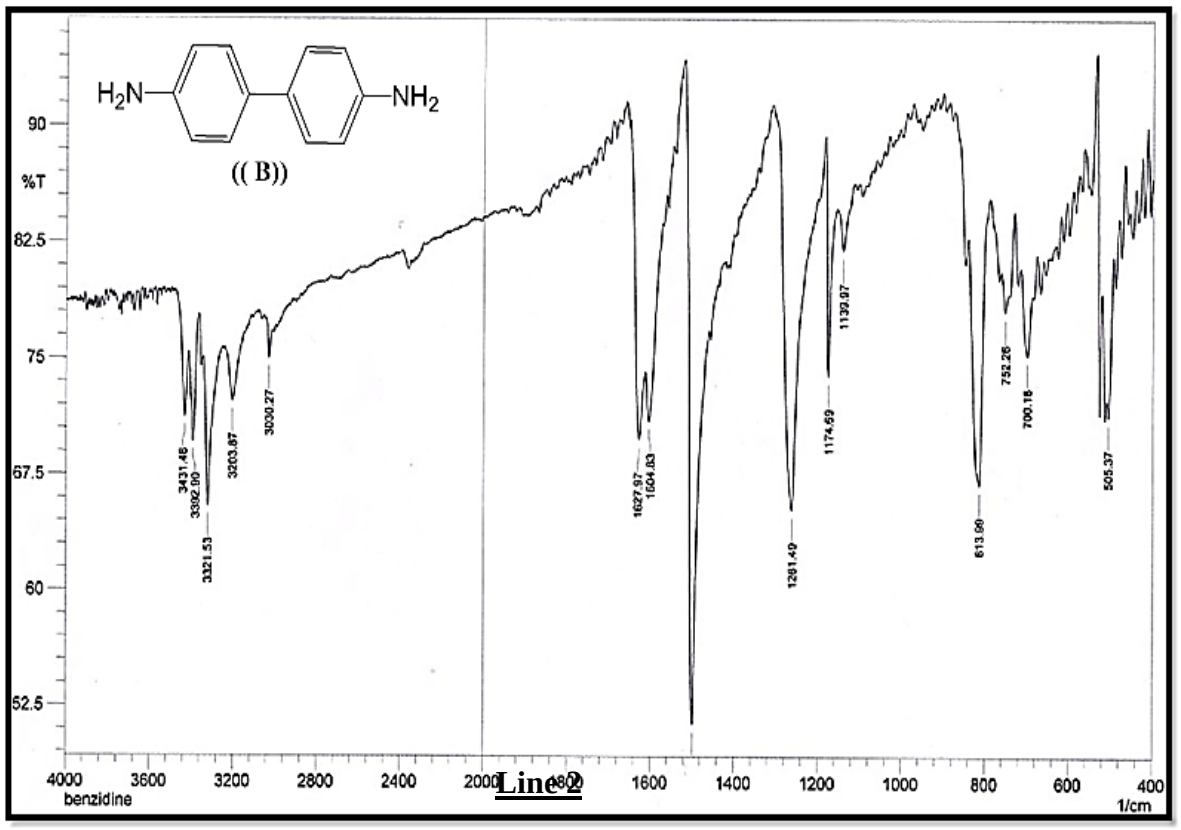
Table 1: FTIR of line 1 (cm^{-1})

Comp No.	ν (N- H)	Thiazole ν (C=N)	Aromatic ν(C=C)	Aromatic ν(C-H)	ν(C-S)	Other
A	3332 ,3228	-	1566-1597	3070-3040	-	ν (C=O) Keto 1641-1653
A1	3356 -3327	1523	1560 -1587	3072	1082	ν (C=O) Keto 1649
B	3431,3392,3332,3203	-	1500-1627	3030-3093	-	-
B1	3387,3311,3275,3209	1641	1444-1550	3061-3000	1109	-


%T
4000
3600
3200
2800
2400
2000
1800
1600
1400
1200
1000
800
600
400
1/cm
4A
O
H3C
NH2
(A)


%T
4000
3600
3200
2800
2400
2000
1800
1600
1400
1200
1000
800
600
400
1/cm
AB1
O
H3C
N
NH2
S
((A1))





Line 2

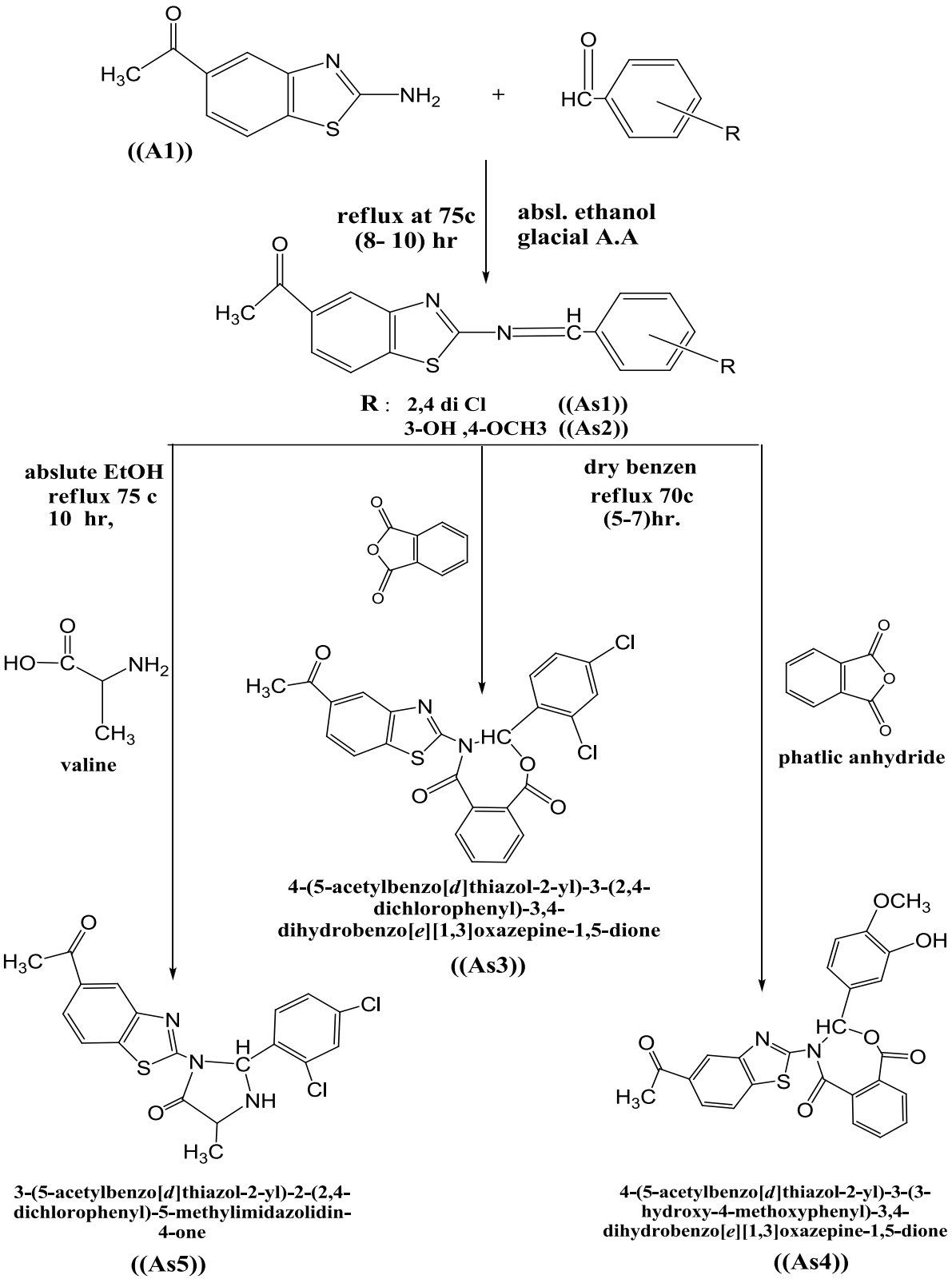
Preparation and Identification Schiff's base compounds (As1) ,(As2),(B1):

Schiff's base compounds that synthesized is produced by the condensation between the amino group of 2-amino benzothiazole derivativesand and substituted aldehydes by nucleophile substitution mechanism of carbonyl group the reaction represented by scheme (2).F.T.IR . of compounds of this line and Physics properties are listed in table (2) and (5).

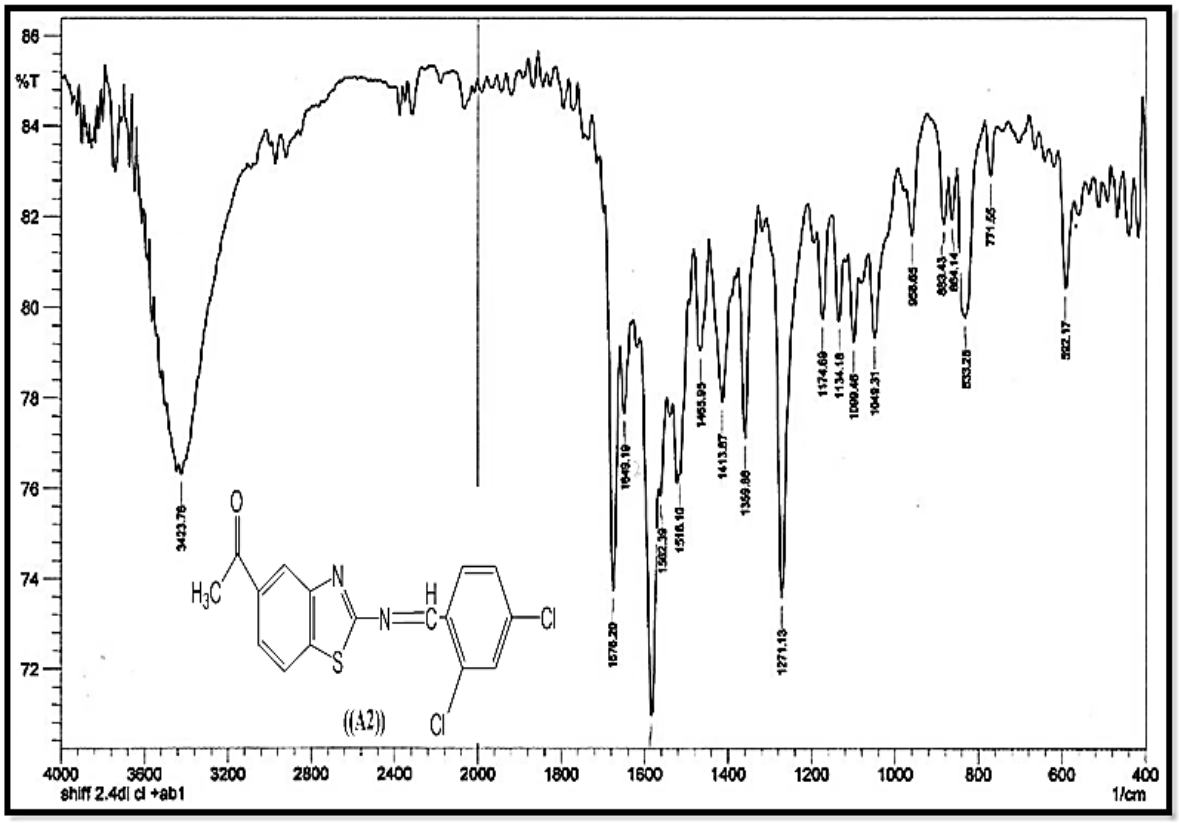
Note: There is toutomarism conversation (Keto form <==> Enol form) may be take place in 6-acetyle-2amino benzothiazole and their derivatives that prepared in this work because it has keto group and electron pair may be enter in resonance and resulted this state[5,12,8] .So the hydroxyl group appear in(3400~) in the FTIR spectrum .

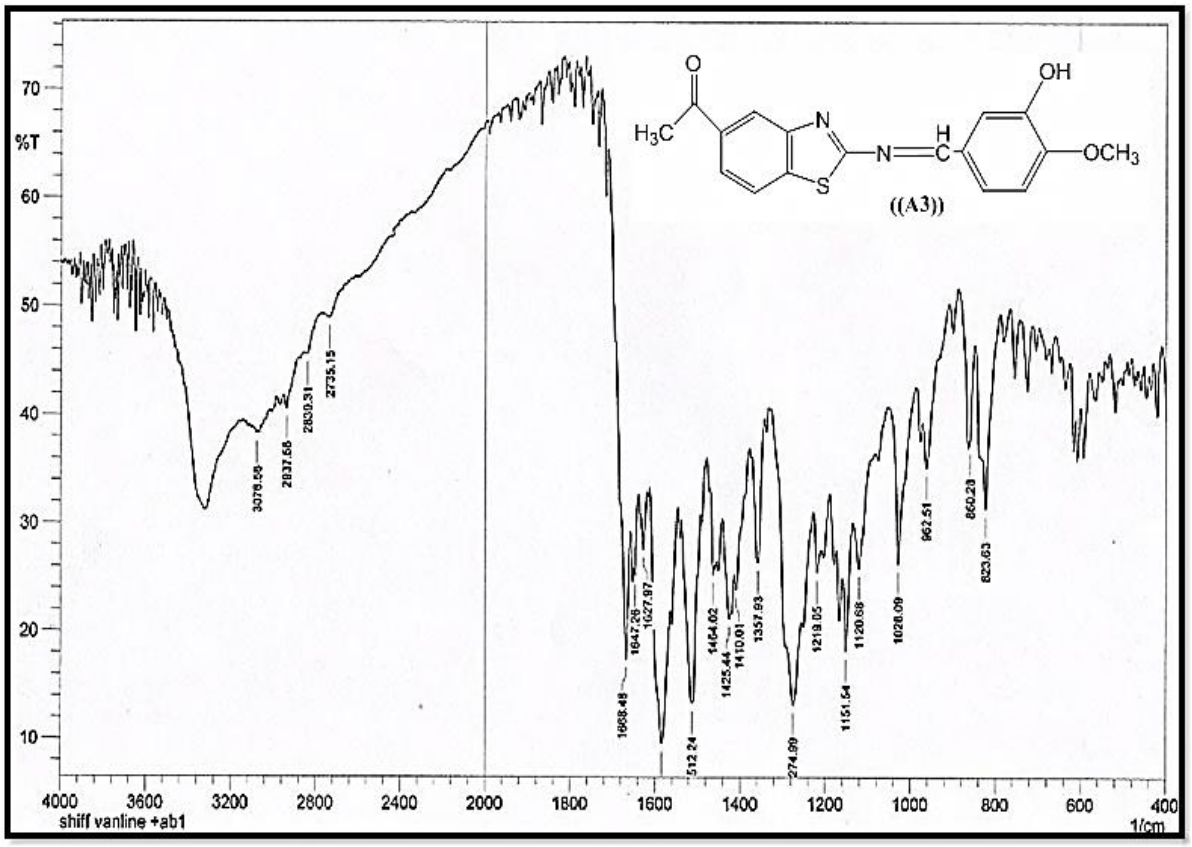
Comp No.	Imine ν(C=N)	Thiazole ν (C=N)	Aromatic ν (C=C)	Aromatic ν (C-H)	Aliphatic ν (C-H)	Keto ν (C=O)	Other
As1	1676	1516-1521	1562-1597	3010	2992	1649	833 ν(C-Cl)
As2	1668	1512	1562-1627	3070	2839-2937	1647	O-H)broad 3339 ν(1151 ς (C-O-C)
B2	1608	1649	1525 - 1600	3030	2854-2978	-	-

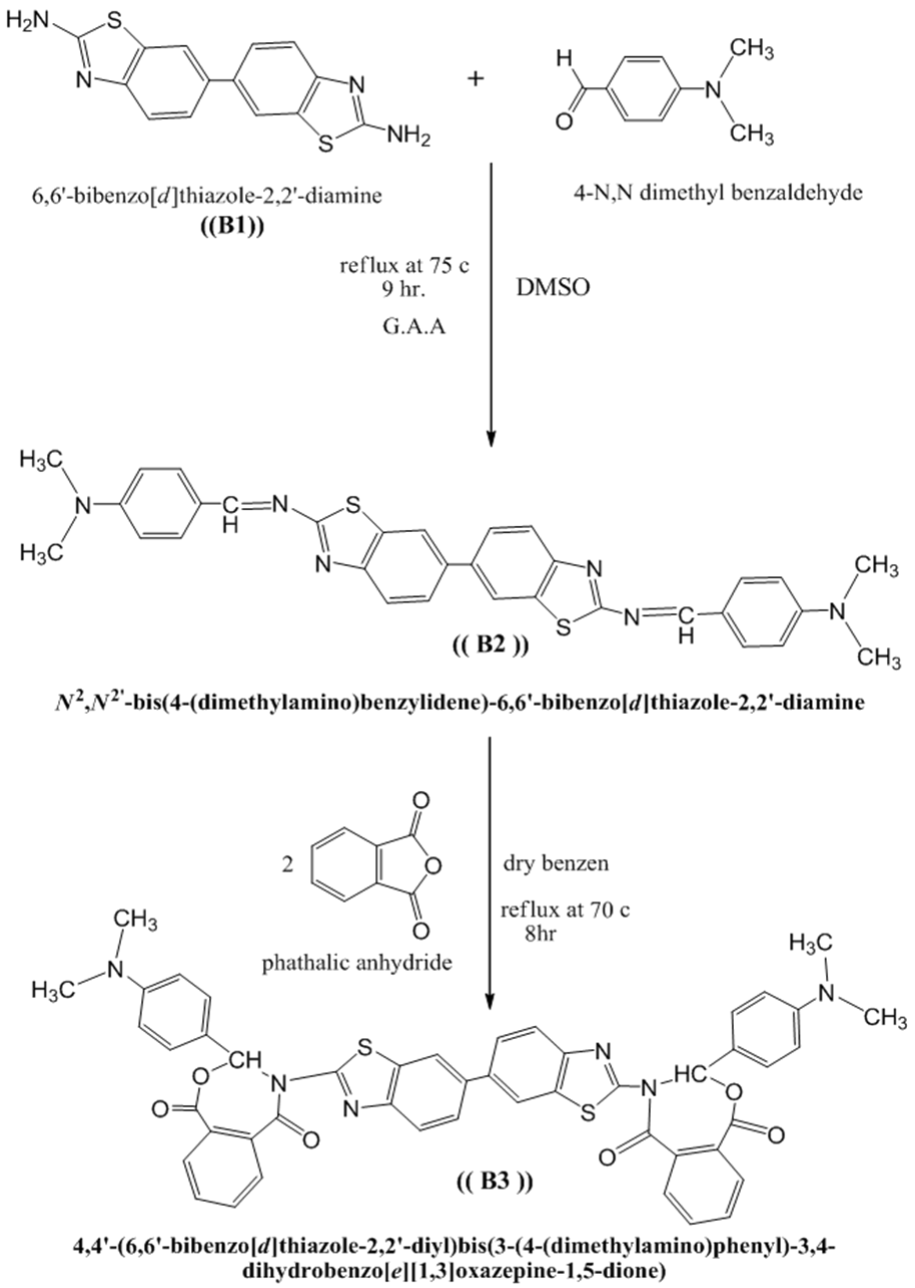
table 2 : FTIR of Schiff's base s compounds (cm^{-1})



Scheme (2):synthesis Schiff's base s and heterocyclic compounds


%T
shiff 2.4dl cl +ab1
1/cm
((A2))
3423.76
1676.20
1271.13
1174.69
1134.18
1049.31
958.65
853.43
664.14
553.28
522.17


%T
shiff vanline +ab1
1/cm
((A3))
3078.56
2937.68
2830.31
2735.15
1668.48
1647.26
1027.97
512.24
274.99
1464.02
1425.44
1410.01
1357.93
1219.05
1151.54
1120.68
1028.09
962.51
850.28
823.63



Comp No.	Lactone ν(C=O)	Amide ν (C=O)	Thiazole ν (C=N)	Aromatic ν (C=C)	Aromatic ν(C-H) / Aliphatic	Keto. ν(C=O)	ν(C-O-C)	Other
As3	1716	1674	1525	1562-1597	3101-3050	1647	1182	
As4	1716	1670	1523	1592-1560	3059-3182	1649	1182	ν (O-H) (s)3396
As5	-	1652 Coupled with 1647	1525	1508-1600	3053 / 2881-2976	1647	-	-
B3	1714	1662	1649 Coupled With 1662	1444-1550	3061-3000	1109	1166	-

Scheme (3): Synthesis Schiff'sbase (B2) and Oxazpine's heterocyclic compounds(B3).

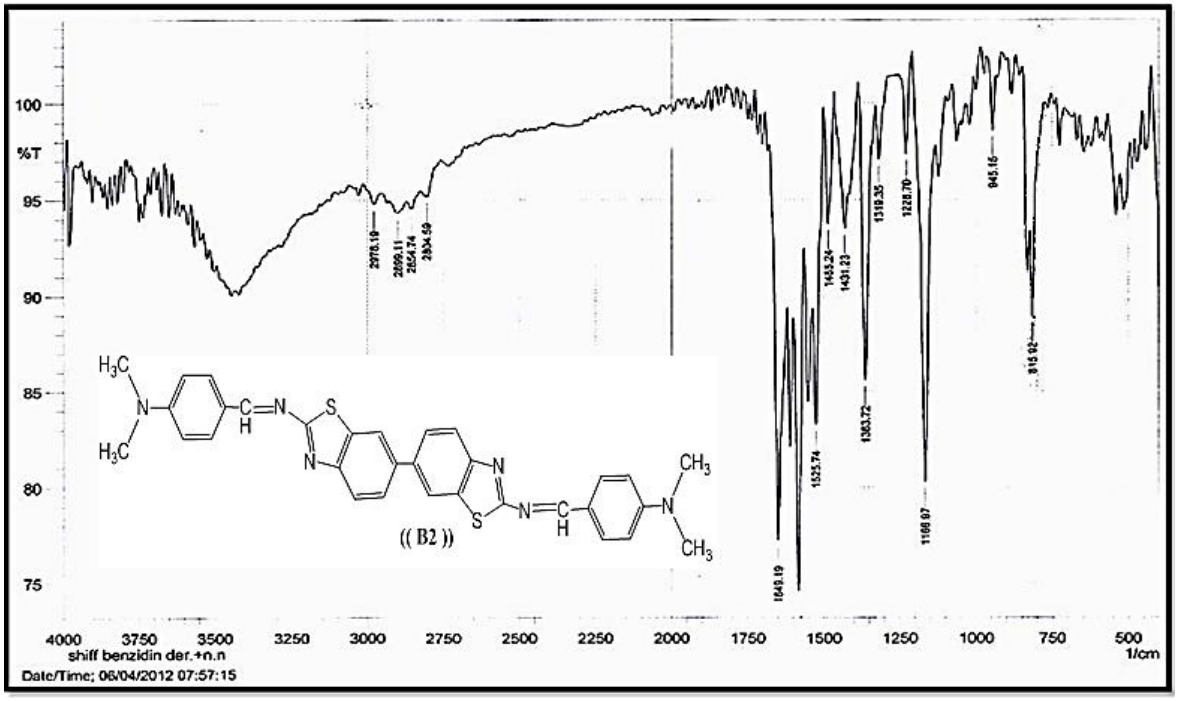
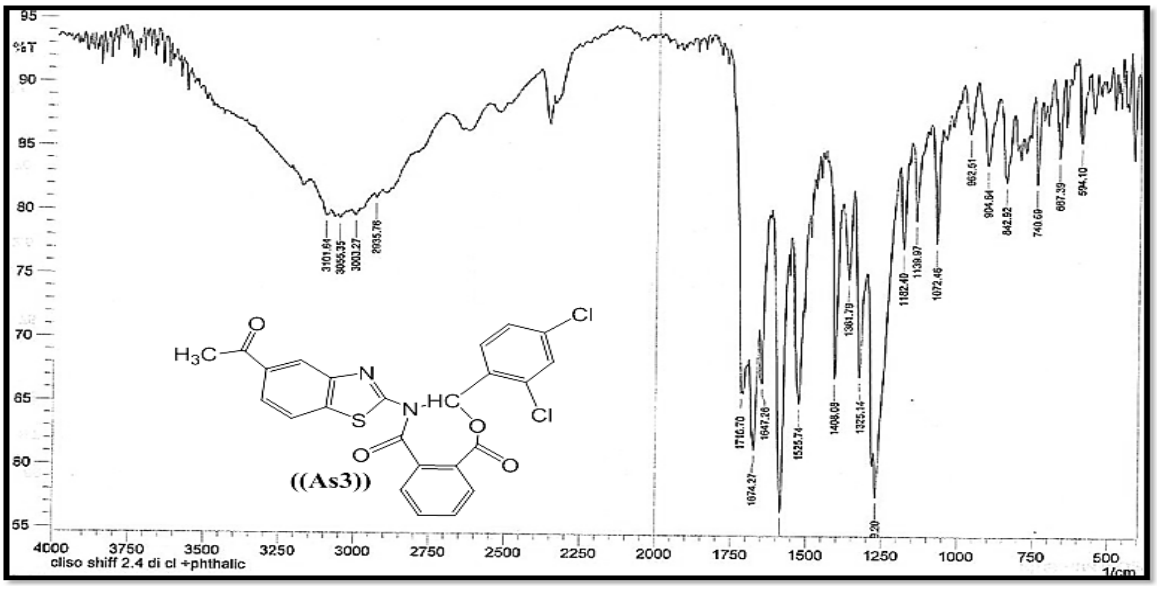
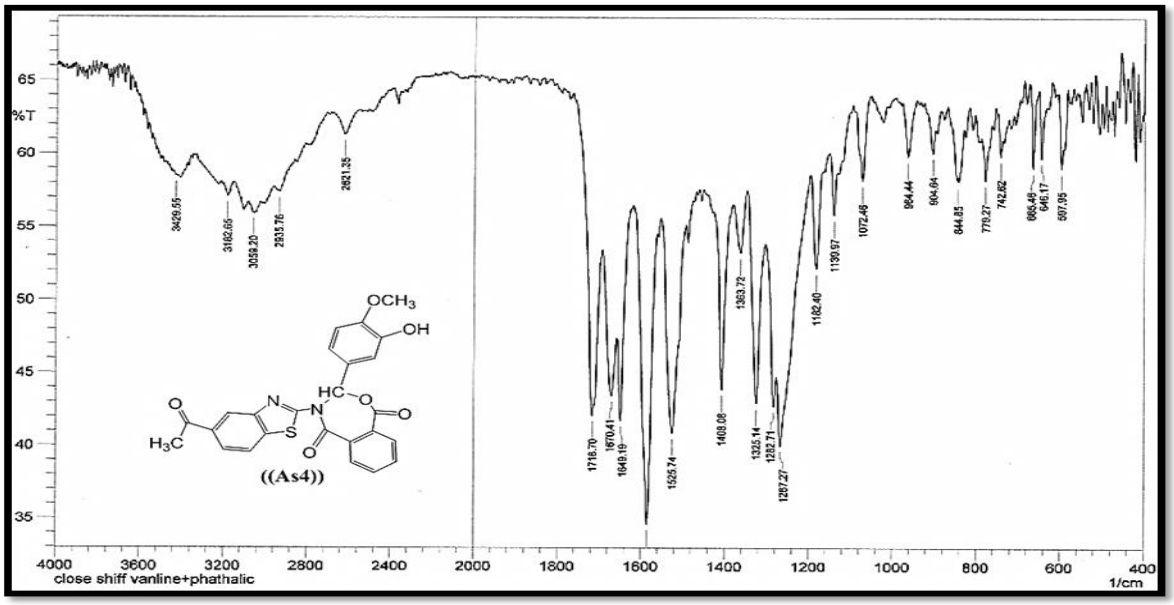


table 3:FTIR of heterocyclic (cm^{-1})

Preparation and Identification compounds (As3) (As4),(As5) and (B3) :

From Schiff's base that prepared ; synthesized new (1,3) Oxazpine by (2+5) cyclization with Phathalic anhydride ,and synthesized (imidazolidin-4-one) derivative by the reaction between Schiff's base (As1) with amino acid (Valine) to produce hetero cyclic compound (As5) contain imidazolidin-4-one ring as the Scheme (2) . F.T.IR . of compounds and Physics properties are lited in table (3) and (5).


%T
3101.84
3055.35
3003.27
2935.76
1716.70
1674.27
1647.26
1525.74
1408.08
1361.79
1325.14
1287.20
1182.40
1139.97
1072.46
962.51
904.64
842.82
740.69
667.39
594.10
((As3))
cliso shiff 2.4 di cl +phthalic
1/cm


%T
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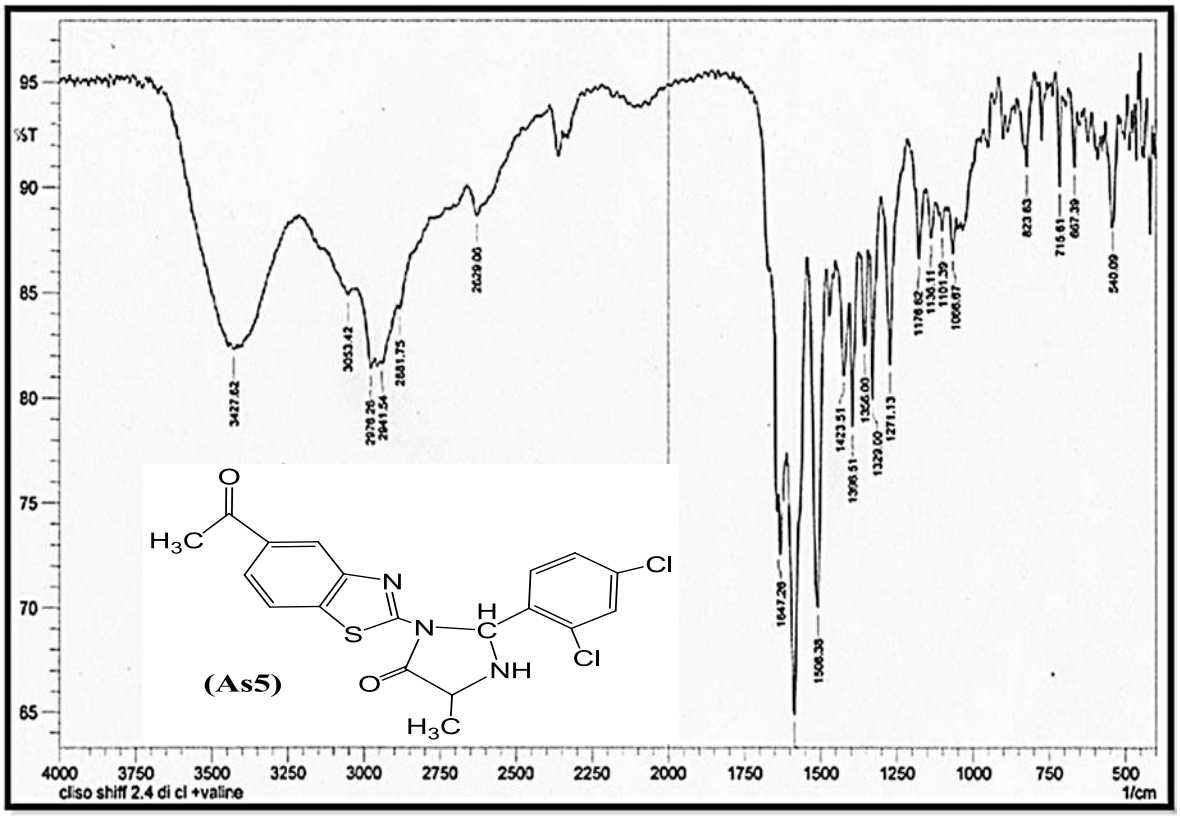
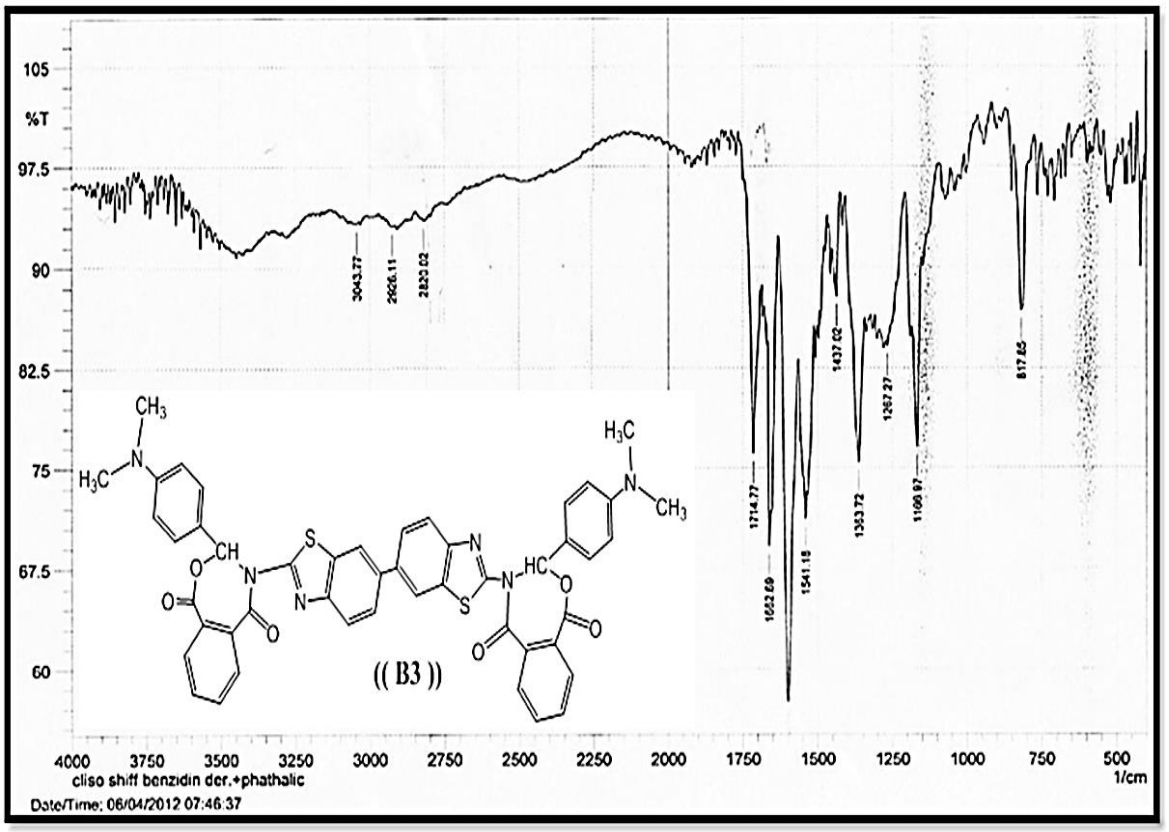
3059.20
2935.76
2621.35
1718.70
1670.41
1649.19
1525.74
1408.08
1363.72
1325.14
1282.71
1287.27
1182.40
1130.97
1072.46
964.44
904.64
844.85
779.27
742.82
666.48
645.17
597.95
((As4))
close shiff vanline+phathalic
1/cm


%T
95
90
85
80
75
70
65
3427.62
3053.42
2979.26
2941.54
2831.75
2629.00
1647.29
1508.39
1423.51
1366.00
1329.00
1271.13
1176.62
1136.11
1101.39
1066.67
823.63
715.61
667.39
540.09
(As5)
4000 3750 3500 3250 3000 2750 2500 2250 2000 1750 1500 1250 1000 750 500
cliso shiff 2.4 di cl +valine
1/cm


%T
105
97.5
90
82.5
75
67.5
60
3043.77
2926.11
2823.02
1714.77
1652.69
1541.18
1437.02
1383.72
1287.27
1166.97
817.85
((B3))
4000 3750 3500 3250 3000 2750 2500 2250 2000 1750 1500 1250 1000 750 500
cliso shiff benzidin der.+phathalic
1/cm
Date/Time: 06/04/2012 07:46:37

C.H.N.S Measurements:

The CHNS measurements of compounds that prepared are refer to correct suggested structure of this research compounds .
Note: some measurements CHNS of compounds which prepared contained sulfur element (As2) and (B2) ,but other compounds are measured without sulfur element because the stander of sulfur for the devise is finished so the devise become CHN only.

table 4: CHNS measurements

Calculated %							
Found %							
Comp. No.	As1	As2	As3	As4	As5	B2	B3
Chem. For. / % Element	$C_{16}H_{10}C_{l2}N_2OS$	$C_{16}H_{14}N_2O_3S$	$C_{24}H_{14}C_{l2}N_2O_4S$	$C_{25}H_{18}N_2O_6S$	$C_{19}H_{13}C_{l2}N_3O_2S$	$C_{32}H_{28}N_6S_2$	$C_{48}H_{39}N_6O_6S_2$
C	55.03	62.56	57.96	63.28	54.29	68.54	75.76
	55.37	62.001	57.921	63.315	54.83	68.57	75.408
H	2.89	4.32	2.84	3.82	3.6	5.03	4.77
	3.32	4.64	3.32	4.042	3.97	5.84	4.89
N	8.02	8.58	5.63	5.9	10.00	14.99	11.04
	8.42	8.89	5.63	5.884	10.52	14.612	11.746
S	9.18	9.82	6.45	6.67	7.63	11.44	8.043
		9.82				11.27	

Physics properties

Table (5) : physical properties of the prepared compounds in this work

Comp. No.	M.F	M.wt	m.p	Yield %	Color	Rf cm	Time (hr)
A	C_8H_9NO	135	106-108	-	White grey	0.75	-
A1	$C_9H_8N_2OS$	192	244-246	78.12	Light yellow	0.81	2
As1	$C_{16}H_{10}C_{l2}N_2OS$	347	256-258	74	Yellow	0.83	5
As2	$C_{16}H_{14}N_2O_3S$	326	138-140	88	Red brown	0.72	10
As3	$C_{24}H_{14}C_{l2}N_2O_4S$	722	198-200	80	Pale orange	0.78	5
As4	$C_{25}H_{18}N_2O_6S$	474	208-210	75	Pale yellow	0.82	7
As5	$C_{19}H_{13}C_{l2}N_3O_2S$	418	218-220	64	yellow	0.73	12
B	$C_{12}H_{12}N_2$	184	127	-	Grey	0.74	-
B1	$C_{14}H_{10}N_4S_2$	298	266	73	White -Grey	0.79	3
B2	$C_{32}H_{28}N_6S_2$	560	>300 (dec.268)	54	Orange	0.83	9
B3	$C_{48}H_{39}N_6O_6S_2$	856	>300 (dec.210)	81	Red	0.76	8

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دراسة تشخيصية لمشتقات حلقية غير متجانسة جديدة محضرة من مشتقات 2-امينو بنزوثيازول

علي فتاح ناصر الحسيني فائز عبد الحسين الرماحي

ali_fatah2007@yahoo.com

قسم الكيمياء/ كلية التربية للبنات/ جامعة الكوفة

الخلاصة :

تضمن البحث تحضير مشتقات جديدة لمركبات حلقية غير متجانسة هي (1،3 بنزو ثيازول)و(1،3 اوكزازبين) بالاضافة الى مشتق واحد من الايميدازولين-4-اون . اشتملت عملية التحضير في هذا البحث مسارين رئيسيين ،يتضمن اولها تحضير المركب (2-امينو- 6-استايل بنزو ثيازول)و [(6،6َ)باي فنل ثيازول (2،2َ) داي امين] من4 -امينو استو فينون والبنزدين على التوالي ، كما اشتمل المسار الثاني على تكوين قواعد شف من خلال تفاعل مجموعة الامين لمشتق البنزو ثيازول مع بعض الالديهايدات المعوضة والتي تدخل فيما بعد تفاعلات الغلق الحلقي بتفاعلها مع انهيدريد الفثالك في البنزين الجاف لتكوين حلقات سباعية غير متجانسة من نوع (1،3) اوكزازبين ومركب حلقي غير متجانس واحد من نوع الايميدازولين-4-اون بالتفاعل مع حامض الفالين الاميني . جميع التفاعلات تتبعت بواسطة كرومتغرافيا الطبقة الرقيقة (TLC) كما شخصت المركبات المحضرة بواسطةتقنية (FTIR) وقياسات التحليل الدقيق للعناصر (CHNS).