Preparation, Chemical Investigation of Organic Ligands from Isatin

Rajaa Abdul Ameer Ghafil, Department of Chemistry, Faculty of Education for Girls, Kufa University, Iraq.

Nadia Hussein Obaid, Department of Chemistry, Faculty of Education for Girls, Kufa University, Iraq.

Manar Ghyath Almosawy, Lecturer in Chemistry, Imam Jafar Al-Sadiq University, Najaf, Iraq.

Dr. Nagham Mahmood Aljamali, Department of Chemistry, Faculty of Education for Girls, Kufa University, Iraq.*
E-mail: Dr.Nagham_mj@yahoo.com

Abstract--- This work discuss methods of preparation a series of organic is at in ligands via imination process, diazotaion reaction , cyclization reaction in types of conditions to synthesis many ligands from is at ine derivatives like (is at in-thiadiazole , is at in- triazole, is at in- azo , is at ine –anil). All present organicis at ine ligands were characterized by spectral identification with types of techniques (Uv.Vis , FT.IR ,H.NMR, C.NMR)– spectrophotometric.

Keywords--- Isatin, Thiadiazole, Triazole, Azo, Imine, Schiff Base, Cyclization.

I. Introduction

Is at inwith many biological applications and activities. Is at in compound (2,3-dioxindole) is an important part ofheterocyclic compounds(1-6)and is an indole derivative. Recently, is at in derivatives have attracted strong interest in synthetic chemistry(7-15),pharmaceutical chemistry because of their biological and medical(16-23)activities.

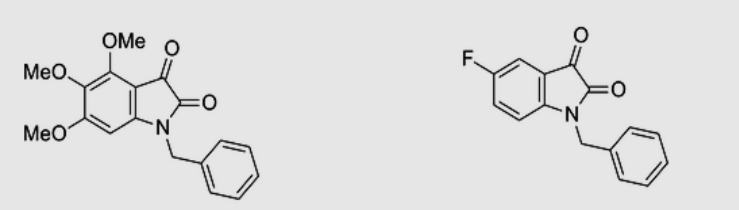

Fig. 1: Is at in Derivative as Antifungal Compounds

Is at in molecule is considered as important type of bioactive molecules(24-32)as antibacterial(33-38), ant proliferative, anti-inflammatory, analgesic, anticonvulsant activity antiviral.

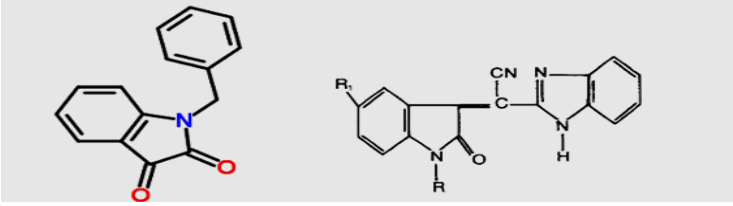

Fig. 2: Is at in derivative as Antibacterial Compound

The literatures showed antitumor effect on breast cancer, and some their derivatives(37-40)have chemotherapeutic activities and other bio-applications(41-55).

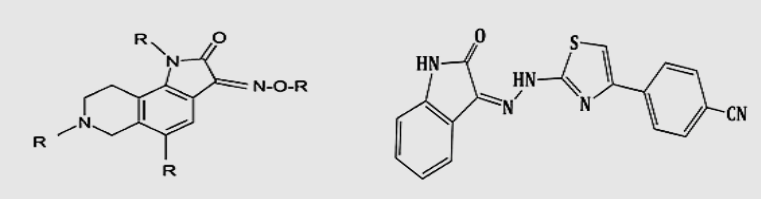

Fig. 3: Is at in Derivative as Antitumor Compound

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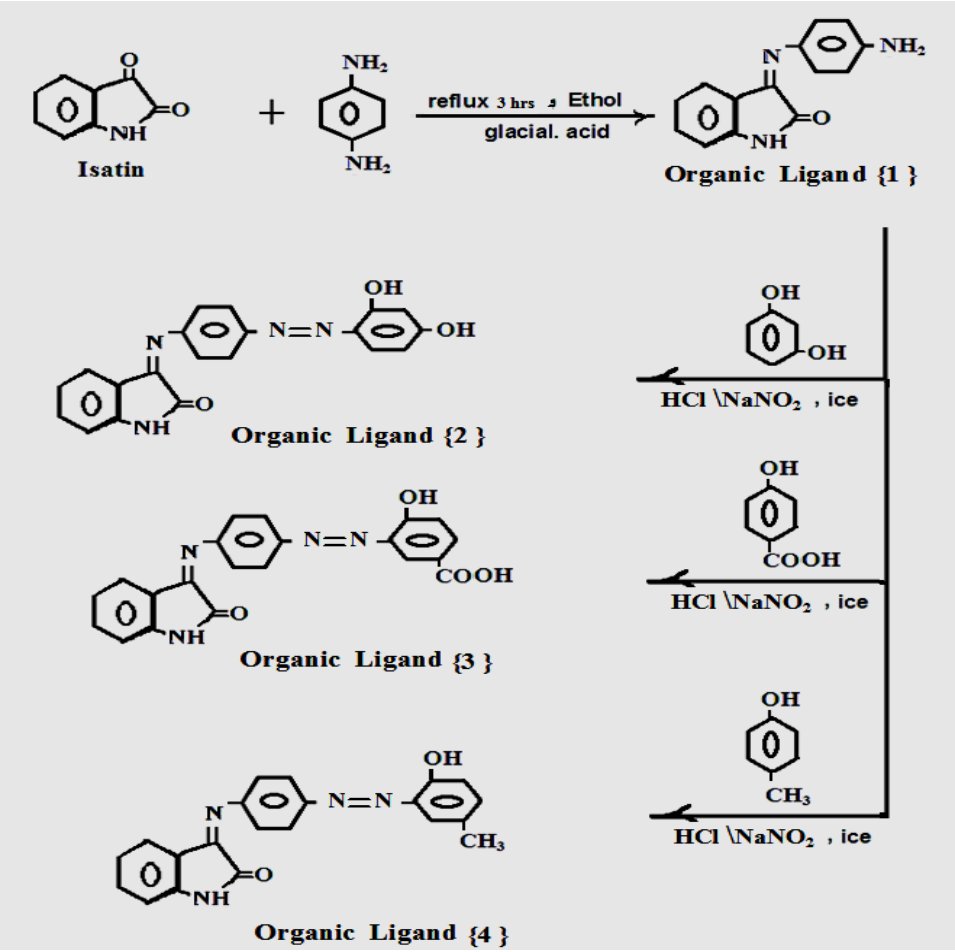
II. Experimental Part

We reported in this paper the formation of eight organic ligands from is at ine(41-44) derivatives like (cyclization products, anil, azo,)according to studies(45-48), the derivatives investigated with techniques: FT-IR spectra (FT-IR 8300 Shimadzu) through the range (400-4000) cm-1 as KBr discs. **1**H.NMR– Spectra and **13**C.NMR in DMSO–solvent.

III. Methods of Preparation



Scheme 1: Formation of Organic- Is at in Ligands {1 - 4}

Formation of Organic Ligand{1}

Is at in compound (0.01mole) heated in condensation reation with para-aminoaniline (0.01mole) for (3hrs) according to procedures(29-32) with (drops)of glacial acetic acid, to produce precipitation, filtered, dried and recrystallized to obtainanil-is at ine ligand{1}.

Formation of Organic Ligand {2}

Organic ligand {1} (0.01mole) dissolved in (3 ml) concentrated hydrochloric acid with solution of sodium nitrite in cold medium with ice to yield diazonium salt, then ethanolic solution of resorcinol was added according to procedures(45-47),to produce precipitation, filtered, dried and recrystallized to obtain anil azo- is at ine ligand{2}.

Formation of Organic Ligand {3}

Organic ligand {1} (0.01mole) dissolved in (3 ml) concentrated hydrochloric acid with solution of sodium nitrite in cold medium with ice to yield diazonium salt, then ethanolic solution of para-hydroxy benzoic acid was added according to procedures(45-47), to produce precipitation, filtered, dried and recrystallized to obtain anil azo-is at ine ligand{ 3}.

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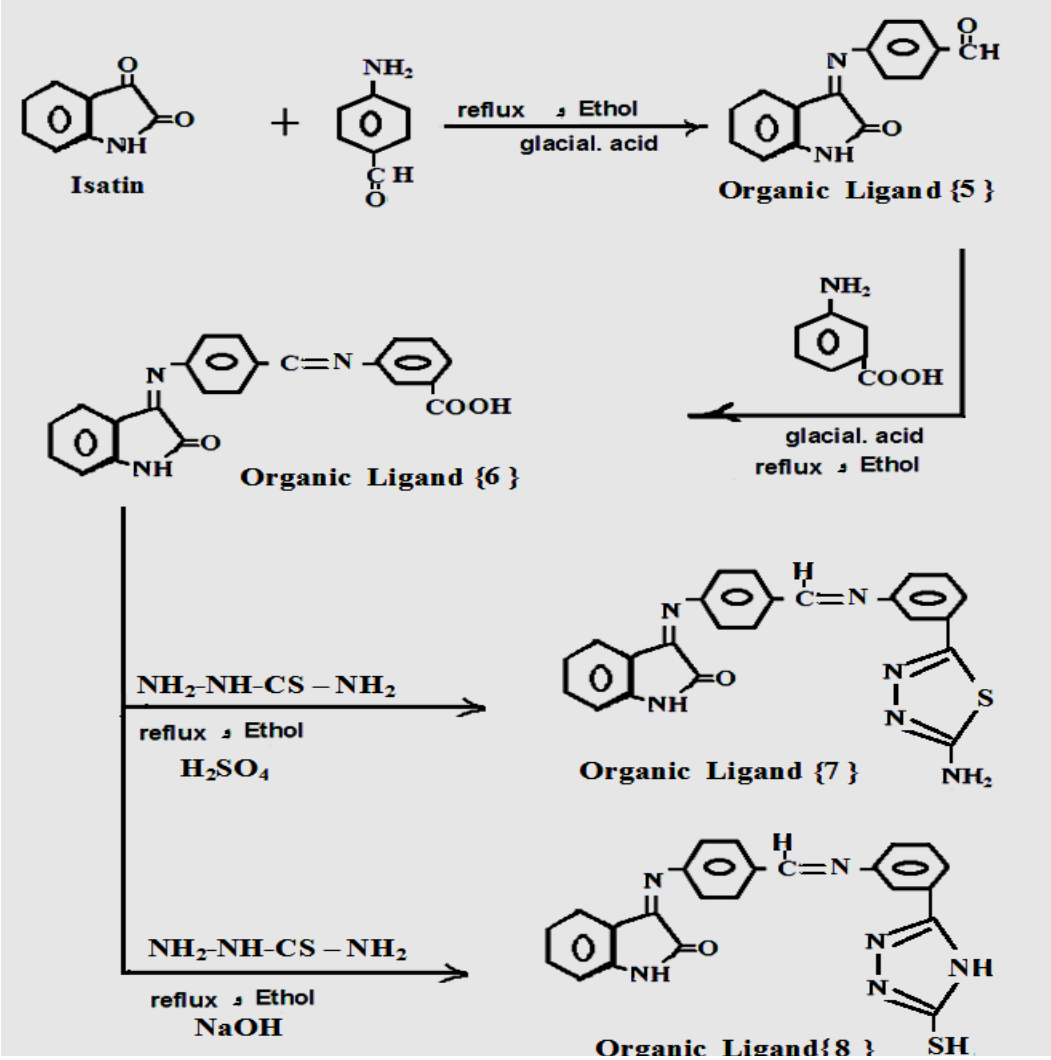
Formation of Organic Ligand {4}

Organic ligand {1}(0.01mole) dissolved in (3 ml) concentrated hydrochloric acid with solution of sodium nitrite in cold medium with ice to yield diazonium salt, then ethanolic solution of para-methyl phenol was added according to procedures(45-47) ,to produce precipitation, filtered , dried and recrystallized toobtain anil azo- is at ine ligand{ 4}.



Scheme 2: Formation of Organic- Is at inLigands{5 - 8}

Formation of Organic Ligand {5}

Is at in compound (0.01mole) refluxed in condensation reaction with para-formalaniline (0.01mole) for (3hrs) according to procedures(32,47) with (drops) of glacial acetic acid ,to produce precipitation, filtered , dried and recrystallized to obtain anil- is at ine ligand{ 5 }.

Formation of Organic Ligand {6}

Organic ligand{5}(0.01mole) refluxed in condensation reaction with meta-aminobenzoic acid (0.01mole) for (5 hrs) according to procedures(30, 47) with (drops) of glacial acetic acid ,to produce precipitation, filtered , dried and recrystallized to obtain anil- is at ine ligand{ 6 }.

Formation of Organic Ligand {7}

Organic ligand{6} (0.01mole) refluxed in condensation reaction with thiosemicarbazide (0.01mole) for (19 hrs) according to procedures(32,46) with (drops) of sulfuric acid, to produce precipitation, filtered, dried and recrystallized to obtain Thiadiazole- is at ine ligand{ 7 }.

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Formation of Organic Ligand {8}

Organic ligand{6}(0.01mole) refluxed in condensation reaction with thiosemicarbazide (0.01mole) for (19hrs) according to procedures(32,46) with (drops) of sodiumhydroxide, to produce precipitation, filtered, dried and recrystallized to obtain Triazole- is at ine ligand{8}.

IV. Resultsand Discussion

Our organic ligandscharacterized with many spectral methods like (FT.IR,H.NMR,C.NMR) spectra:

Uv. Vis Spectral of Ligands

The spectra of ligands in figs(4-11)

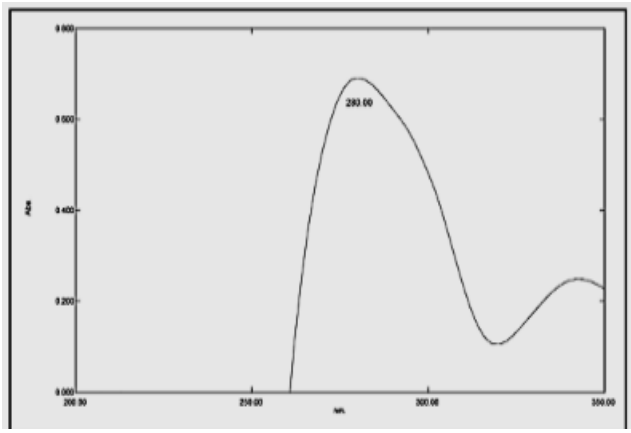

Fig. 4: Uv. Vis of Ligand {1}

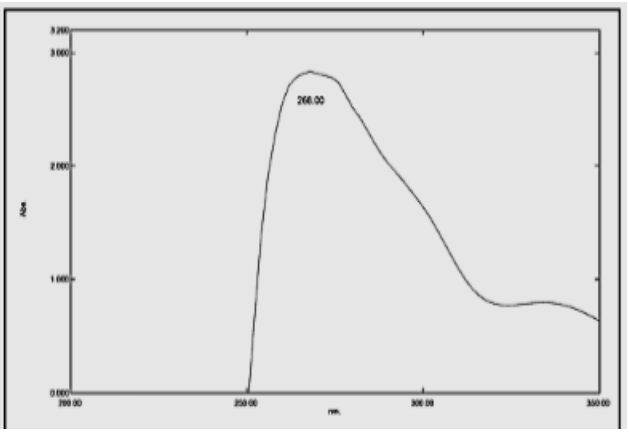

Fig. 5: Uv. Vis of Ligand {2}

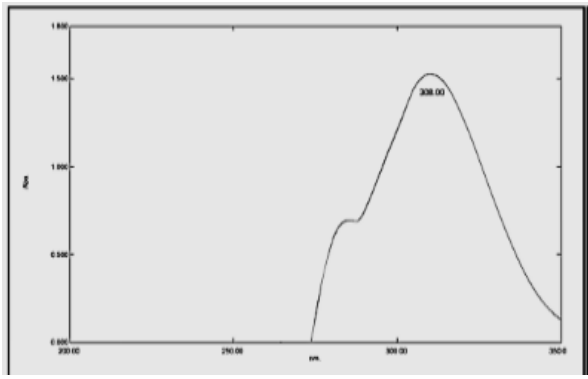

Fig. 6: Uv. Vis of Ligand {3}

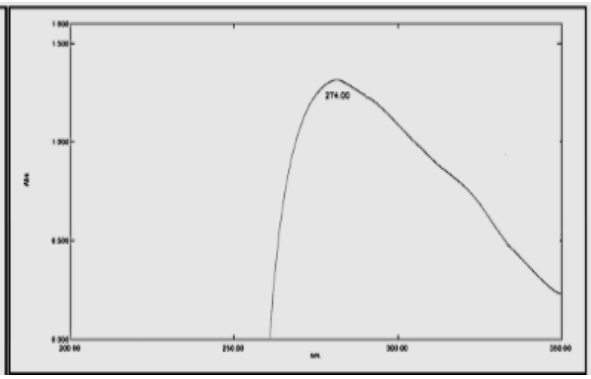

Fig. 7: Uv. Vis of Ligand {4}

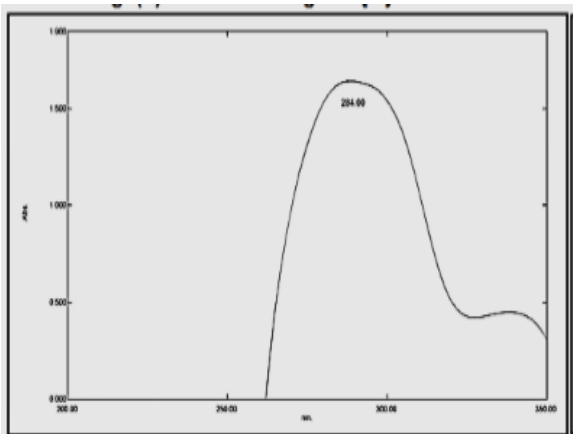

Fig. 8: Uv. Vis of Ligand {5}

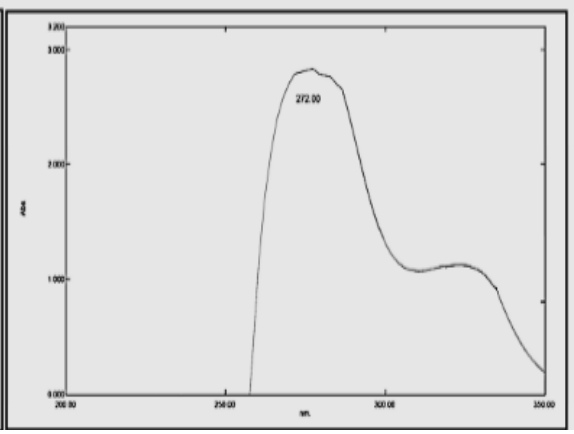

Fig. 9: Uv. Vis of Ligand {6}

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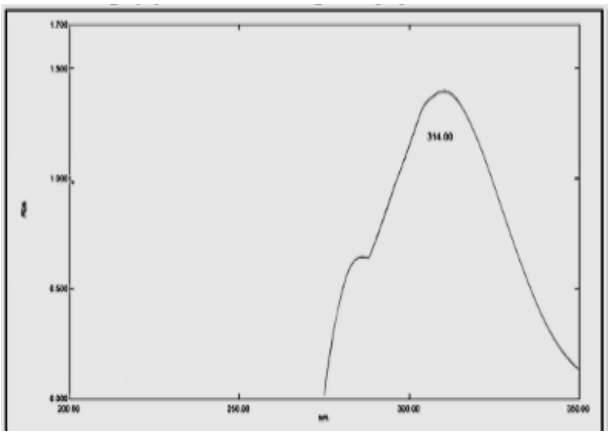

Fig. 10: Uv. Vis of Ligand {7}

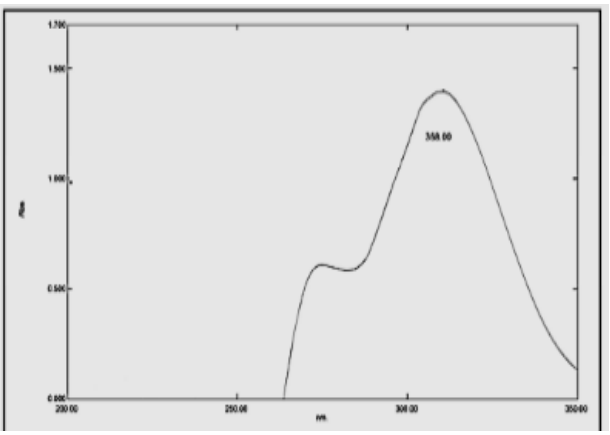

Fig. 11: Uv. Vis of Ligand {8}

Spectral Characterization

FT.IR- Spectraof Ligands: The spectra gave many absorption bands at regions(C=N) Imine group: 1612., (CO-N-) carbonyl of amide: 1670.,(NH) amide: 3210., (NH2) amine group: (3300, 3340) in ligand {1}, but other bands appeared in ligand{2} at ((C=N-) Imine group: 1625., (CO-N-) carbonyl of amide: 1690.,(NH) amide: 3188., (OH) of phenol:3327., (N=N) of azo: 1438, there are other bands likeat ((C=N-) Imine group:1622., (CO-N-) carbonyl of amide:1690.,(NH) amide: 3230, (OH) of phenol:3414, (OH) of carboxylic acid: (2642-3034), (N=N) of azo:1500in ligand {3}., the spectrum of ligand {4} gave bands ((C=N-) Imine group: 1620., (CO-N) carbonyl of amide: 1678.,(NH) amide: 3192., (OH) of phenol: 3340., (N=N) of azo: 1498, (CH) aliphatic: 2987., Other bands gave ((C=N-) Imine group: 1619., (CO-N) carbonyl of amide: 1688., (NH) of is at in: 3255, (CO-H) carbonyl of aldehyde: 1705 inligand {5}., but in ligand {6} showed other bands such as((C=N-) Imine group: 1624., (CO-N) carbonyl of amide:1683., (NH) of is at in: 3242, (CO-O) carbonyl of carboxyl group: 1723, (OH) of carboxylic acid: (2608-3055).,bands in ligand {7} at (C=N-) Imine group: 1615., (CO-N-) carbonyl of amide:1686., (C=N-) endocycle: 1651,(NH2) amine group: (3311 , 3329)., while in last ligand {8} showed at (C=N-) Imine group: 1610., (CO-N-) carbonyl of amide:1693., (C=N-) endocycle: 1664, (NH)in triazole: (3328)., (NH) of is at in: 3276, (SH): 2396.,figs (12, 13).

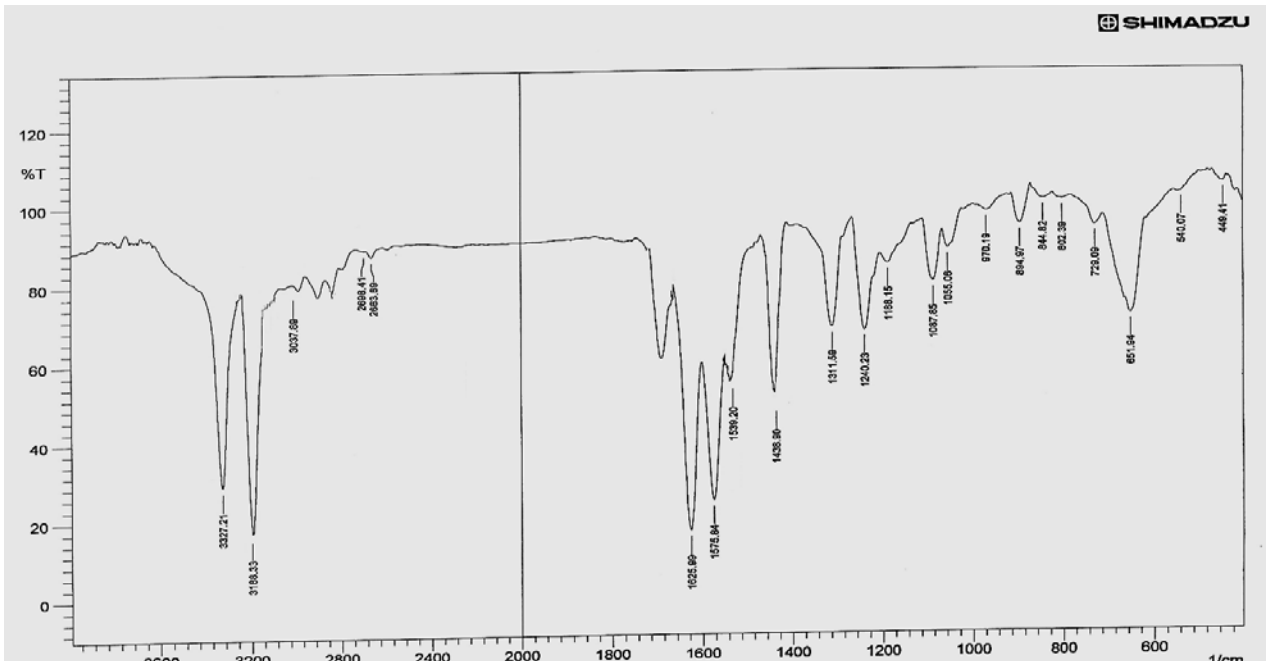

Fig.12: I.R Spectrum of Ligand {2}

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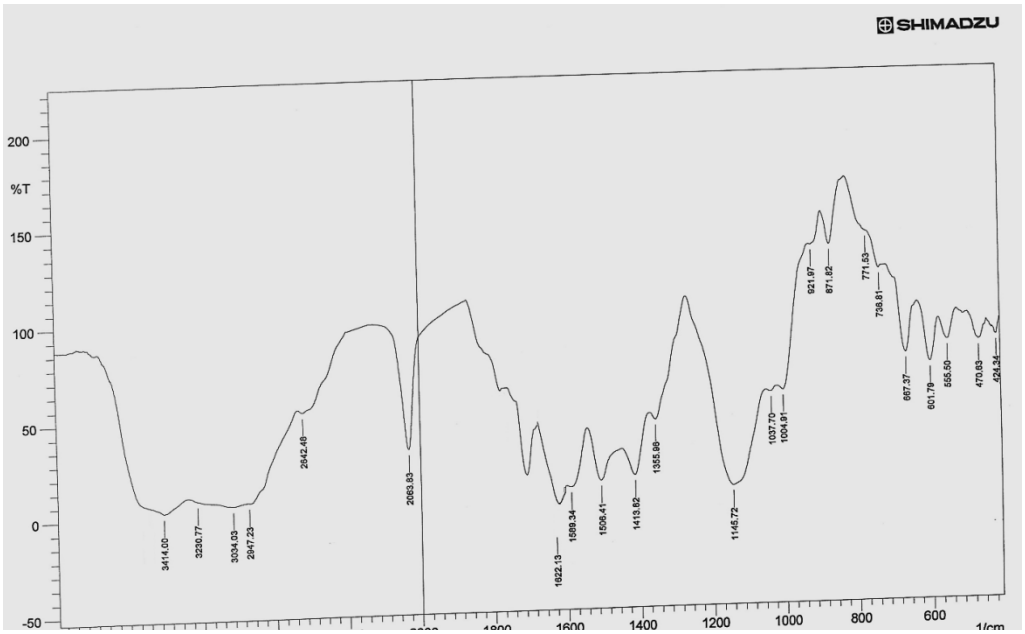

Fig. 13: I.R Spectrum of Derivative {3}

1H.NMR- Spectraof Ligands: All spectra gave good signals indicate to our ligandsat ɓ (NH2)Protons of amine group: 5.23., (CO-NH-) proton of amide in isatin: 9.40., Protons of Phenyl ring: (7.00-7.43) in Ligand {1}., but ɓ (OH)Proton of phenol: 10.42., (CO-NH-) proton of amide in is at in: 9.33., Protons of Phenyl ring: (7.15-7.82) in Ligand {2}., while ɓ (OH) Proton of phenol: 10.50., (CO-NH-) proton of amide inisatin: 9.30., Protonsof Phenyl ring: (7.66-7.77), (OH)Protonofcarboxylic acid: (12.13)inLigand {3}., alsothe spectrumofligand{4}gavepeaksat ɓ (OH)Protonofphenol: 10.08., (CO-NH-)protonofamide in is at in: 9.14., Protons of Phenyl ring: (7.22-7.63), Protonsofmethyl group: (0.91)., whileɓ (C=O-H)Protonofaldehyde:11.85.,(CO-NH) proton of amide in is at in: 9.17., Protons of Phenyl ring: (7.23-7.65) in ligand{5}.,Butothersignalsappearedɓ (N=CH)Protonofiminegroup: 8.43.,(CO-NH)protonofamideinis at in: 9.11., ProtonsofPhenyl ring: (7.20-7.72), (OH)Protonofcarboxylicacid: (12.27)inligand{6}.,other peaks appeared at (N=CH)Protonofimine group: 8.51.,(CO-NH)protonofamideinis at in: 9.24., ProtonsofPhenyl ring:(7.18-7.98), (NH2)Protonofaminegroup: (5.21)inligand{7}., the last spectrum appeared peaks at (N=CH) Protonofiminegroup: 8.29.,(CO-NH)protonofamideinis at in: 9.15., ProtonsofPhenyl ring: (7.26-7.85), (NH) Protonoftriazolering: (5.56), (SH) proton: (13.89) inligand{8 }.,figs (14, 15).

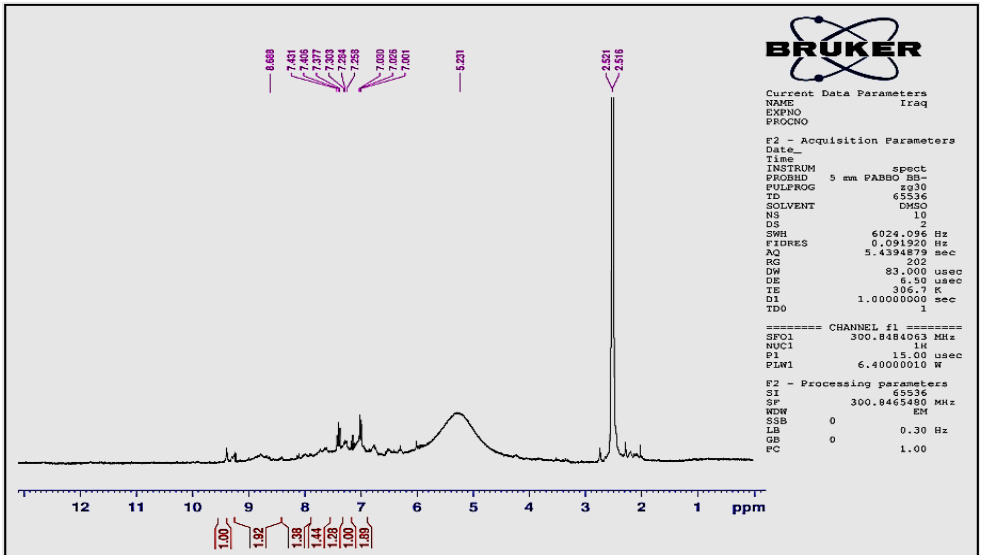

Fig.14: H.NMR of Derivative {1}

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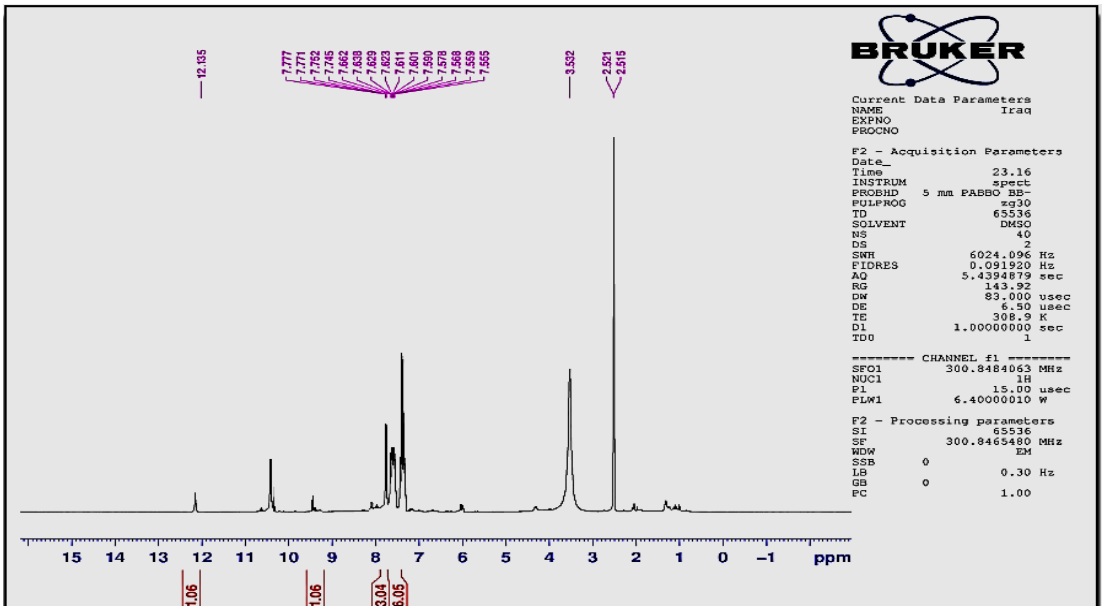

Fig.15: H.NMR of Derivative {3}

The 13C.NMR spectral of Ligands:Our spectra gave new peaks indicate to formation of ligands and new formatted groupsin these work, figs (16, 17)., in ligand{1}there are many peaks appeared at (40.0) for solvent(DMSO).,(169) for (C, amide group CO-N)., (122.0 -135.0) for (C, Aromatic ring)., (151.0) for (C, carbon ofimine groupC=N).,but in ligand {2} showed (165) for (C, amide group CO-N)., (120.0 -131.0) for (C, Aromaticring)., (153.0) for (C, carbon of imine group C=N)., there are peaks in ligand {3}at (167) for (C, amide group CO-N)., (119.0 -148.0) for (C, Aromatic ring)., (151.0) for (C, carbon of imine group C=N), (173) for (C, carboxylgroup COO).,while in ligand{4} at (166) for (C, amide group CO-N)., (124.0 -143.0) for (C, Aromatic ring)., (155.0) for (C, carbon of imine group C=N), (12.0) for (C, methyl group -CH3)., Other signalsinligand{5}at(163) for (C, amidegroupCO-N)., (121.0 -146.0) for (C, Aromaticring)., (152.0) for (C, carbonofimine group C=N), (187.0) for(C, carbonyl group of aldehyde-CO-H).,Other peaksinligand{6}at(168) for(C, amidegroupCO-N)., (126.0 -144.0) for (C, Aromaticring)., (154.0) for (C, carbonofiminegroup C=N), (187.0) for(C, carbonylgroup ofcarboxyl -COO)., peaksinligand{7}at (164) for (C, amide group CO-N)., (121.0 -147.0) for (C, Aromaticring)., (154.0) for (C, carbonofiminegroupC=N).,lastligand{7} appearedpeaksat(165) for(C, amidegroupCO-N)., (118.0 -140.0) for (C, Aromaticring)., (150.0) for (C, carbonofimine groupC=N).

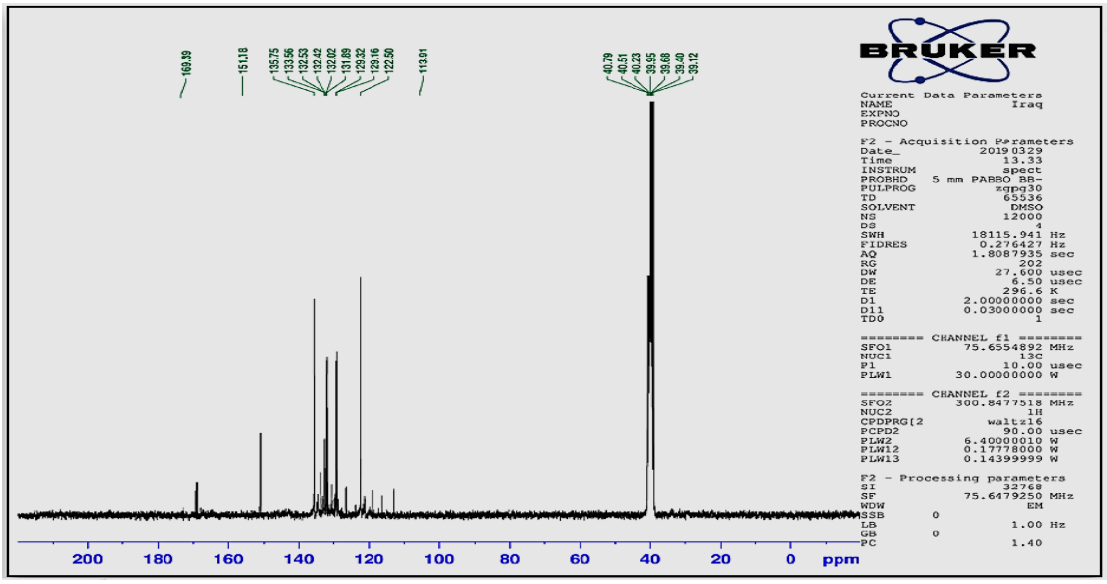

Fig. 16: 13C.NMR of Ligand {1}

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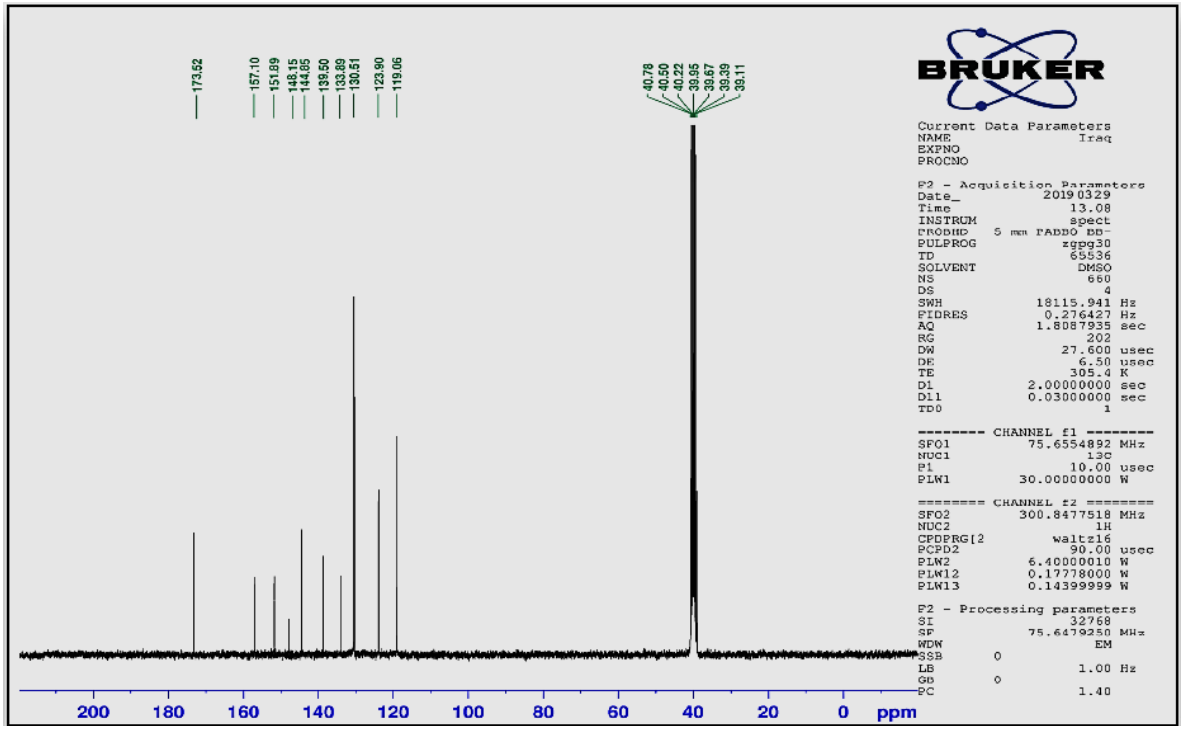

Fig. 17: 13C.NMR ofLigand {3}

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