Received: 13 November 2022 | Revised: 09 December 2022 | Accepted: 20 December 2022
DOI: 10.22034/ecc.2023.369599.1552
Eurasian Chemical Communications
SAMI

FULL PAPER

Anti-corrosion and antioxidant activities of new synthesised oxazepine and thaizolidinone derivatives linking to imidazo/pyridine

Doaa Hashim Al-Abboodi* |**Naeemah Al-lami**

Department of Chemistry, College of Science, University of Baghdad, Baghdad, Iraq

In this work, 2-amino pyridine was mixed with biphenyl bromide under refluxed to give the product of 2-biphenyl imidazo [1,2-a] pyridine (1). Compound (1) was treated with 4-amino acetophenone with formaldehyde dissolved in absolute ethanol to yield Mannich base (2). Schiff bases [3I-3K] were also prepared by condensed compound (2) dissolved in absolute ethanol with few drops of glacial acetic acid and different aromatic amines. After that, Schiff bases were cyclized using three reagents such as marcapto acetic acid, succinic anhydride, and 3-Nitrophthalic anhydride dissolved in absolute ethanol under refluxed at certain temperature to form thiozolidinone (4I-4K), (1,3)oxazepine-4,7-dione (5K-5I) and 4-Nitro benzo (1,3) oxazepine-4,7-dione (6I-6K) compounds. All compounds were characterized by FT-IR, ^{1}H-NMR, and ^{13}C-NMR spectra. Some new compounds were evaluated as antioxidant and anticorrosion agents.

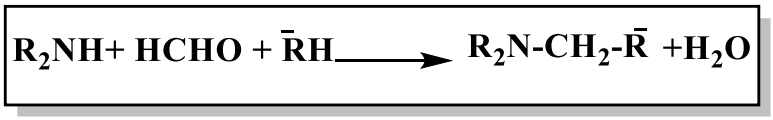
***Corresponding Author:**
Doaa Hashim Al-Abboodi
Email:doaa.hashem1105d@sc.uobaghdad.edu.iq
Tel.: +9647803313656

KEYWORDS

Imidazo (1,2-a) pyridine; Mannich base; Schiff base; thiazolidinone; oxazepine; antioxidant; anticorrosion.

Introduction

Imidazo [1,2-a] pyridine is a nitrogen bridgehead heterocyclic compound containing fused imidazole ring with pyridine moiety [1]. In 1965, Joseph G. Lombardino [2] had developed a new method to prepare imidazo (1,2-a) pyridine from 2- amino pyridine with ethyl bromo pyruvate in two steps to give ethyl imidazo(1,2-a) pyridine 2-carboxilat ethyl bromide. In 2016 with Congde Huo*, Jing Tang, Haisheng Xie, Yajun Wang, and Jie Dong [3] reported a novel transition-metal-free three-component reaction developed for the construction of imidazo[1,2-a]pyridines. Imidazo pyridine has a wide biological activity. It can play a crucial role in disease conditions. In recent years, the synthesis of imidazo pyridine was carried out using many catalysts. The present study aimed to analyse the best complete compilation on the synthesis and medicinal properties of imidazo [1,2-a pyridine] [1]. Mannich base reaction is a nucleophilic addition reaction contained three-compound condensation from hydrogen atom responds to formaldehyde and an N-H derivative with the removal of a water molecule. In 1960, Cummings *et al.* [4] synthesised mannich base from the combination of an aldehyde and formaldehyde with ammonia or primary and secondary amine, as shown in Equation 1.



Equation 1

Likewise, Mannich base acts as an important bioactive and pharmacophores lead which is further used to synthetize various potential agents of high medicinal value that possess aminoalkkyl chain such as ranitidine, bi-pyridine, pro-cyclidine [5]. Schiff bases are organic chemistry components with a very high importance. They were described via the German chemist, Hugo Schiff, in 1864, who prepared condensation aldehyde or ketone by primary amine with various biological actions such as antimicrobial, antimalarial, anti-tubercular, antifungal, antibacterial, and antiviral [6]. Thiazolidinone is a heterocyclic ring containing a five-membered ring including an atom of sulphur at position 1, nitrogen at position 3, and a carbonyl group at the 2, 4, or 5 positions such as 2-thiazolidinones, 4-thiazolidinones, 5-thiazolidinones [7]. All types of thiazolidinones have biological activities such as peroxisome proliferator-activated receptor γ binders, follicle-stimulating hormone agonists, cystic fibrosis transmembrane conductance regulator inhibitors, and antioxidants [8].

1,3 Oxazepine is a unsaturated contained seven-membered ring with oxygen at position 1 and nitrogen hetero-atoms at position 3 in addition to five carbon atoms. Some studies have shown the preparation of oxazepine compounds of cycloaddition of Schiff bases with acid anhydrides such as succinic, phthalic anhydride, and hydrazine [9]. Oxazepam is a class of medications called benzodiazepines, it is interesting with a wide spectrum of biological activity [10] and is used to treat many disease problems such as irritable bowel syndrome and relieve anxiety. The oxazepine derivatives were applied to exhibit various biological activities such as hypnotic muscle relaxant, inflammatory, antagonistic, and antibacterial [11].

Materials and methods

All the chemicals used in this study were purchased from Thomas Baker, Merck, BDH, GCC, Alfa Aesar, and Sigma-Aldrich companies. The melting point values (Stuart Germany) were determined by capillary method with hot stage Gallen Kamp apparatus. TLC plates 60F245(E.MERCK) was used to end all chemicals' purity that were coated by aluminium and iodine vapour was also used as a mobile phase. The FT-IR Shimadzu was used, KBr disk was used in 400-4000 cm^{-1} band, and NMR (^{1}H-NMR and ^{13}C-NMR). The spectral data were recorded on the spectrophotometer of Bruker model Ultra 500 Mega Hertz using DMSO as a solvent (Sharif University of Technology, Tehran, Iran).

Preparation of 2-bi phenyl imidazo (1,2-a) pyridine(1) [1]

(2.00 gm, 0.01 mol) of 2-amino pyridine was mixed with (2.5 gm, 0.01 mol) of biphenyl phenacyl bromide in (15 mL) of absolute ethanol in round bottom flask, and then it was reflexed for 7 hours, the end reaction was monitored for TLC. Next, the mixture was filtered, purified, and dried to give compound (1). All physical properties of compound (1) are listed in Table 1.

TABLE 1 Physical properties of the prepared compound (1)

Compound No.	M.F	Color	Yield	M.P	Re-crystsolvent
1	$C_{19}H_{14}N_2$	Off white	95%	175-177 °C	Ethanol

Synthesis of Mannich base(2) [12]

A mixture of compound (1) (2.7 gm, 0.01 mol) was dissolved in absolute ethanol, and then formaldehyde (0.4 mL, 37%) was added with few drops of conc. HCl and 4-amino acetophenone (1.35 g, 0.003 mol). Next, the resulting mixture was heated under reflux for 10 hours monitored by TLC .After that, the solution was cooled, filtered, and purified using re -crystallization with suitable solvent to give compound (2). All physical properties of compound (1) are presented in Table 2.

TABLE 2 Physical properties of the prepared compound (2)

Compound No.	M.F	Color	Yield	M.P	Re-crystsolvent
2	$C_{28}H_{24}N_3O$	Orange	85%	150-152 °C	Ethanol

Synthesis of Schiff base derivatives(3I-3K)[13]

A mixture of Mannich bases (0.5 gm, 0.01 mol) (2) dissolved in absolute ethanol (40 mL) with few drops of glacial acetic acid with (0.25 gm, 0.01 mol) of primary aromatic amine, and then refluxed for 7 hours monitored by TLC. After that, the solution was cooled, filtered, and re-crystallized to give compounds (3K-3I) [9]. All physical properties of compound (1) are provided in Table 3.

TABLE 3 Physical properties of the prepared compounds (3I-3K)

Compound No.	M.F	Color	Yield	M.P	Re-crystsolvent
3I	$C_{35}H_{29}N_4Cl$	Red	95%	207-210 ^{0}C	Ethanol
3J	$C_{35}H_{30}N_4O_2$	Yellow	90%	180-182 ^{0}C	Ethanol
3K	$C_{35}H_{30}N_4O_2$	Yellow	80%	103-105 ^{0}C	Chloroform

Synthesis of thiazolidinone derivatives(4I-4K) [7]

The Mercapto acetic acid (1 mL, 0.003 mol) was added to the mixture of Schiff bases (0.2 gm, 0.003 mol) dissolved in absolute ethanol (10 mL), and then refluxed for 6 hours monitored by TLC. After that, the solution was cooled, filtered, and re-crystallized to give compounds (4K-4I). All physical properties of compound (4) are indicated in Table 4.

TABLE 4 Physical properties of the prepared compounds (4I-4K)

Compound No.	M.F	Color	Yield	M.P	Re-cryst solvent
4I	$C_{36}H_{31}N_5O_4SCl$	Yellow	70%	270-272 °C	Ethanol
4J	$C_{37}H_{34}N_4O_3S$	White	88%	225-272 °C	Ethanol
4K	$C_{37}H_{34}N_4O_3S$	Deep yellow	88%	278-272 °C	Chloroform

Synthesis of oxazipime derivatives [14]

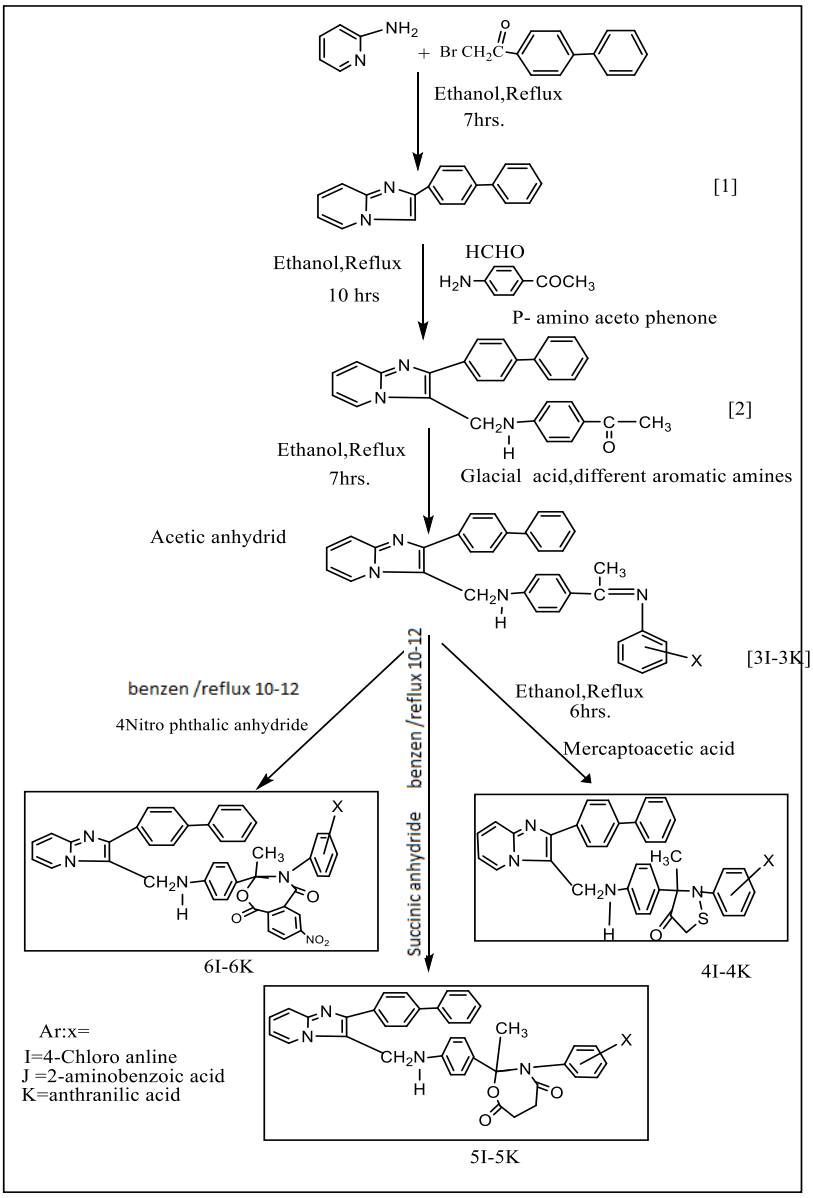
A mixture of Schiff bases (3I-3K) (0.5 gm, 0.001 mol) and (0.2 gm, 0.001 mol) of cyclic anhydride (succinic and phthalic) were dissolved in dry benzene (15 mL). The mixture was then refluxed for (10-12) hours. The products was cooled, filtered, and re-crystallized in suitable solvents to give compounds (5K-5I) and (6I-6K), respectively. All physical properties of compounds (5) and (6) are reported in Table 5.

TABLE 5 Physical properties of the prepared compound (5I-5K) and (6I-6K)

Compound No.	M.F	Color	Yield	M.P	Re-crystsolvent
5I	$C_{38}H_{32}N_4O_5$	Yellow	77%	280-282 °C	Ethanol
5J	$C_{37}H_{32}N_4O_3Cl$	White	80%	210-212 °C	Ethanol
5K	$C_{38}H_{32}N_4O_5$	White	75%	285-286 °C	Chloroform
6I	$C_{42}H_{33}N_3OCl$	Deep yellow	80%	300-302 °C	Ethanol
6J	$C_{43}H_{34}N_5O_5$	Brown	77%	200-202 °C	Ethanol
6K	$C_{43}H_{34}N_5O_5$	White	85%	230-233 °C	Chloroform

Results and discussion

The sequence of reactions led to the synthesis of final product is shown in Scheme 1.



SCHEME 1 Total synthesis of compounds (3-6)

2-(Bi-phenyl) imidazo (1,2-a) pyridinewas prepared by reacting 2- amino pyridine with 2- bi phenyl phencyl bromide characteristic bands at FT-IR spectrum of compound (1) was

showed at (1612 cm^{-1}) belonging to ν [C=N] in the imidazo pyridine ring, at 1352 cm^{-1} due to ν [C-N] as shown in Figure 1. Mannich base (2) was prepared by known procedure and identified by FT-IR spectrum, which showed stretching bands at 3197-3290 cm^{-1} to ν(NH) and appeared band at 1660 cm^{-1} due to carbonyl group, ν(C=N) at 1359 cm^{-1} due to ν (C-N) as shown in Figure 2. Schiff bases were also prepared by condensed compound (2) with different aromatic amines. These compounds were characterized by FT-IR which showed the disappeared band carbonyl and appearance imine group at stretching band (1637-1645) cm^{-1}. In compound [3I-3K], carbonyl group was disappeared at 1660 and imine group was appeared. Their bands vary between 1637 and 1645 as shown in Figure 3. All stretch bands to the prepared compounds are listed in Table 6.

TABLE 6 Characteristic absorption bands in FTIR spectra of Schiff base compounds in cm^{-1}

Compound No.	ν NH	ν(C-H) Aliphatic	ν C=N imine	ν C=N imidazo ring	ν C=C Arom.	Other bands
3I	3116-3207	2854-2983	1645	1614	1564	ν(C-H)Ar. 3029 ν(C-N) 1352 ν(C-C)956 ν(C-Cl)744 ν(C=O) 1677,
3J	3147-3292	2854-2939	1637	1614	1573	ν(OH)3465ν(C-H)Ar. 3029, ν(C-N) 1352, ν(C-C)937
3k	3120-3225	2870-2981	1645	1612	1575	ν(C-H)Ar. 3029, ν (C=O) 1677, ν(OH) 3469, ν(C-N) 1353, ν(C-C)935

Schiff bases (3I-3K) were also identified by ^{1}HNMR spectra and the results were as follows: compound 3I appeared singlet signal at δ(1.42) due to CH_3, at δ (4.81), singlet due to (CH_2), δ 4.83 (NH), and multiplied signal at δ(6.70-8.99) due to the aromatic ring, compound (3J) appeared singlet signal at δ(1.43) due to CH_3, at δ 4.71 appeared singlet due to CH_2 δ (4.73) belong to NH, multiplied signal at δ(7.13-8.61) due to aromatic ring, singlet signal at δ(9.04) due to COOH. Compound (3K) appeared singlet signal at δ(1.48) due to CH3, at δ 4.71 appeared singlet due to CH_2 δ (4.87) belonging to NH, multiplied signal at δ(6.55-8.56) due to aromatic ring, and singlet signal at δ(9.02) due to COOH.

In compound (4I-4K), imine group was suffering cyclization by mercapto acetic acid resulted that imine group was disappeared and new thiozolidinone rings were appeared as shown in Figure 4. All these compounds were subjected to FT-IR. All stretch bands to the prepared compounds are listed in Table 7.

Compound (4I) characterized by ^{1}HNMR and ^{13} CNMR were results as follows: singlet signal was appeared at δ(1.24) due to CH_3, at δ (3.62) due to (CO-CH_2-S), at δ (3.72) due to (CO-CH-N), at δ (4.21), singlet was appeared due to (CH_2), δ (4.71) singlet was appeared belonging to NH, multiplied signal at δ(6.53-8.52) due to the aromatic ring. In ^{13}CNMR, signal was appeared at 30.16 ppm belonging to CH_3, 40.72 ppm belonging to CH_2NH, (68.22) ppm belonging to (CH_2S), (68.55) ppm belonging to (CHN), at (120.52 -148.69) ppm due to (C=C) aromatic, 155 ppm due to C=N, and at (190.40-195.80) ppm belonging to carbonyl group. (4J) was characterized by ^{1}H-NMR and ^{13}CNMR. The results were as follow:

singlet signal was appeared at δ(1.23) due to CH_3, at δ (3.51) due to (CO-CH_2-S), at δ (3.81) due to (CO-CH-N), at δ (4.71) singlet was appeared due to (CH_2), at δ (4.73) singlet was appeared belonging to NH, multiplied signal at δ(7.33-8.56) due to the aromatic ring, at δ(9.00) due to COOH as shown in Figure 5. In CNMR, signal was appeared at 29.16 ppm belonging to CH_3, 40.76 ppm belonging to CH_2NH, (68.58) ppm belonging to (CH_2S), (68.59) ppm belong to (CHN), at (120.58-148.59) ppm due to (C=C) aromatic, 150 ppm due to C=N, at (190.42-195.84) ppm belong to carbonyl group as shown in Figure 6. Compound (4K) characterized by ^{1}H-NMR and ^{13} CNMR were results as follow: singlet signal was appeared at δ(2.00) due to CH_3, at δ (3.62) due to (CO-CH_2-S) at δ (3.32) due to (CO-CH-N), at δ (4.01) singlet was appeared due to (CH_2), δ (4.71) singlet was appeared belonging to NH , multiplied signal at δ(6.56-8.59) due to aromatic ring, and at δ(9.50) due to COOH. In CNMR, a signal was appeared at 30.56 ppm belonging to CH_3, 40. 22 ppm belonging to CH_2NH, (68.72) ppm belonging to (CH_2S), (68.50) ppm belonging to (CHN), at (120.55-148.70) ppm due to (C=C) aromatic, 158 ppm due to C=N, at (190.47-195.85) ppm belonging to carbonyl group. Schiff base was reacted with succinic anhydride and 3-nitro phthalic anhydride containing oxazipine ring (5I-5K) and 3-nitro benzo oxazipine ring (6I-6K) linking with the bi-phenyl imidazo pyridine. These compounds bands were characterized by FT-IR spectra as shown in Figures 7 and 8 and depicted in Table 8.

TABLE 7 Characteristic absorption bands in FTIR spectra of thiazolidinone compounds in cm^{-1}

Compound No.	ν NH	ν(C-H) Aliphatic	ν C=O	ν C=N imidazo ring	ν C=C Arom.	Other bands
4I	3178-3286	2854-2974	1703	1614	1560	ν(C-H)Ar. 3028, ν(OH) tout. 3460, ν(C-N) 1357, ν(C-C)925, ν(C-Cl)767
4J	3105-3209	2821-2906	1724	1614	1568	ν(C-H)Ar. 3031, ν(C=O) 1681 ν(OH) 3433, ν(C-N) 1352, ν(C-C)914
4k	3101-3225	2870-2937	1701	1614	1571	ν(C-H)Ar. 3001, ν(OH). 3454 ν(C-N), 1317 ν(C-C)904

TABLE 8 Characteristic absorption bands in FT-IR spectra of (1,3)oxazepine compounds in cm^{-1}

Compound No.	ν NH	ν(C-H) Aliphatic	ν C=O lacton lactam	ν C=N imidazo ring	ν C=C Arom.	Other bands
5I	3112-3299	2831-2968	1747 1716	1652	1591	ν(C-H)Ar. 3054, ν(C-N) 1317, ν(C-C)925 ν C-O-C 1298, C-Cl 767
5J	3257-3118	2981-2883	1745 1714	1640	1573	ν C=O carboxyl 1683, ν(C-H)Ar. 3072,

5K	3120-3292	2860-2962	1745 1701	1639	1539	ν(C-N) 1352, ν C-O-C 1276, ν(C-C)939, ν(CCl)742, ν(OH) 3502 ν(C=O) carboxyl 1683ν(C-H)Ar. 3029, ν C-O-C 1247
6I	3257-3116	2937-2858	1747 1714	1610	1573	ν(OH) 3429, ν(C-N) 1342, ν(C-C) 858 ν(C-H)Ar. 3072 ν(C=O)1683 ν C-O-C 1276 ν(NO_2) sym. 1352,asym .1521
6J	3227-3120	2981-2879	1760 1710	1633 1612	1573	ν(C-N) 1276, ν(C-C)925 ν(C-Cl)767 ν(C-H)Ar. 3080, ν(NO2) sym.56 1352,asym. 1521, ν (C=O) carboxylic 1716, ν(OH)3452, ν C-O-C 1230,
6K	3290-3157	2974-2848	1768 1716	1633 1612	1571	ν(C-N) 1352, ν(C-C)923, ν(CCl)742 ν(C-H)Ar. 3029 ν(NO2) sym.56 1352,asym. 1521 ν (C=O) carboxylic 1685 ν(OH) 3473 ν C-O-C 1255 ν(C-N) 1373 ν(C-C)912

Compounds (5I,5 K) were characterized by ^{1}H-NMR and ^{13}CNMR, respectively. For 5I compound characterized by ^{1}HNMR and ^{13}CNMR, results were as follow: at δ (1.00-1.02) singlet signal belonging to (CH_3), a triplet signal at δ (7.00- 8.00) due to (C=C) aromatic. In ^{13}CNMR, 26.70 ppm due to CH_3, at 47.58 ppm belonging to CH_2NH, (126.23-148.55) ppm due to C=C aromatic, at 150.93 ppm due to C=N in imidazo(1,2-a) pyridine, (166.01-170.60) ppm belonging to carbonyl groups.

The results of 5J compound were as follow: at δ (1.02-1.04) singlet signal belonging to (CH_3) and triplet single at δ (7.20 - 8.93) due to (C=C) aromatic. In ^{13}CNMR, 26.77 ppm due to CH_3, at 46.50 ppm belonging to CH_2NH, (126.40-148.50) ppm due to C=C aromatic, at 150.93 ppm, due to C=N in imidazo(1,2-a) pyridine, (168.39-170.60) ppm belonging to carbonyl groups.

The results of 5K compound were as follow: at δ (1.51 -1.95) singlet signal belonging to

(CH_3), triplet single at δ (7.28-8.98) due to (C=C) aromatic. In ^{13}CNMR, at 26.70 ppm due to CH_3, at 46.59 ppm belonging to CH_2NH, (126.49-148.55) ppm due to C=C aromatic, at 150.98 ppm due to C=N in imidazo(1,2-a) pyridine, (168.40-170.50) ppm belonging to carbonyl groups.

Compounds (6I and 6K) were characterized by ^{1}H-NMR and ^{13}CNMR, respectively. The results were as follow: for 6I, at δ (1.06-1.08) singlet signal belonging to (CH_3), triplet δ (7.08- 8.99) due to (C=C) aromatic. In ^{13}CNMR, the results are as follow: 26.76 ppm due to CH_3, at 47.38 ppm belonging to CH_2NH, (126.27-148.58) ppm due to C=C aromatic, at 150.90 ppm due to C=N in imidazo(1,2-a) pyridine, (166.39-170.47) ppm belonging to carbonyl groups .The results of 6J compound in ^{1}H-NMR are as follow: at δ (1.00-1.08) singlet signal belonging to (CH_3), triplet signal, at δ (7.08- 8.99) due to (C=C) aromatic. In ^{13}CNMR, the results as follow: 26.76 ppm due to CH_3, at 47.38 ppm belonging to CH_2NH, (126.27-148.58) ppm due to C=C aromatic, at 150.90 ppm due to C=N in imidazo(1,2-a) pyridine, (166.79-170.47) ppm belonging to carbonyl groups.

In ^{1}H-NMR for to 6K, the results were as follow: δ 1.23 belonging to (CH_3), δ 3.97 triplet singlet belonging to CH_2, at δ (8.90-9.00) ppm belonging to COOH. In ^{13}CNMR, the results were as follow: δ 40.25 ppm, singlet due to CH_2NH, at 150.98 ppm due to C=N ,δ 150.0 ppm aromatic ring (160.55-160.77) ppm due to carbonyl group.

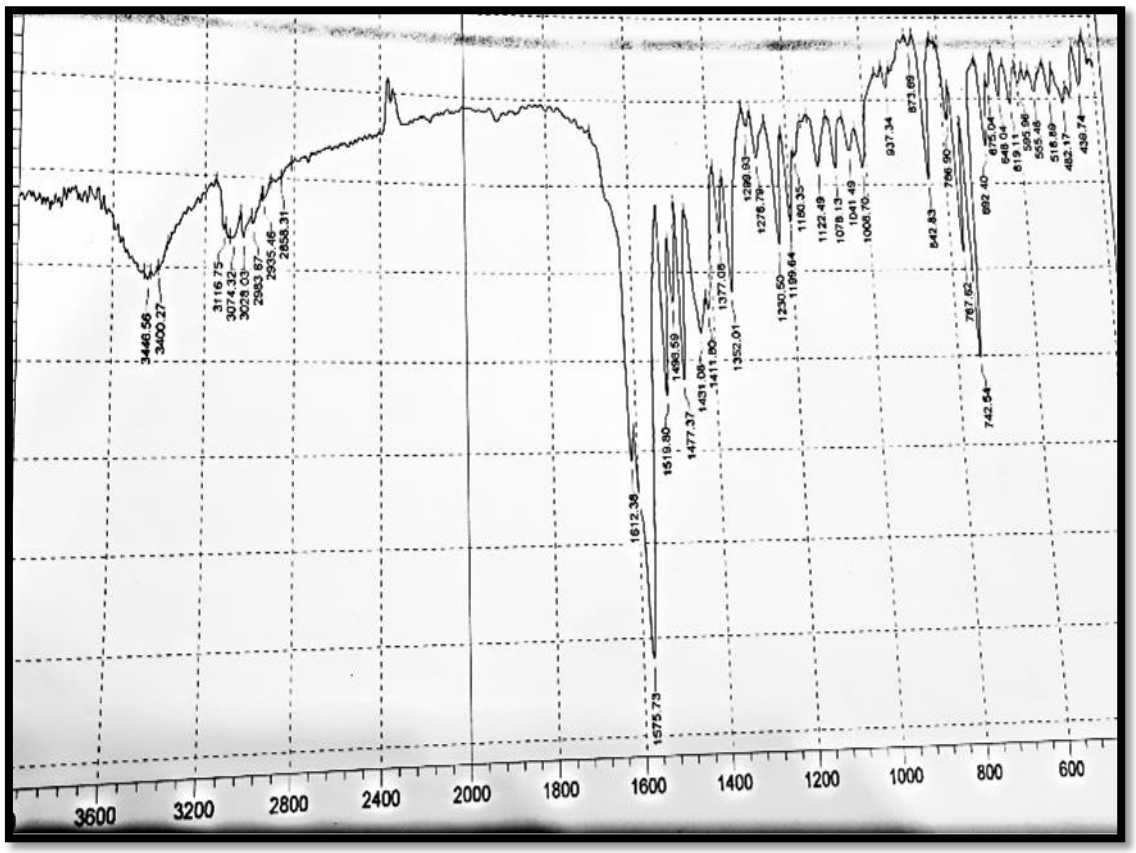


FIGURE 1 FT-IR spectrum for compound (1)

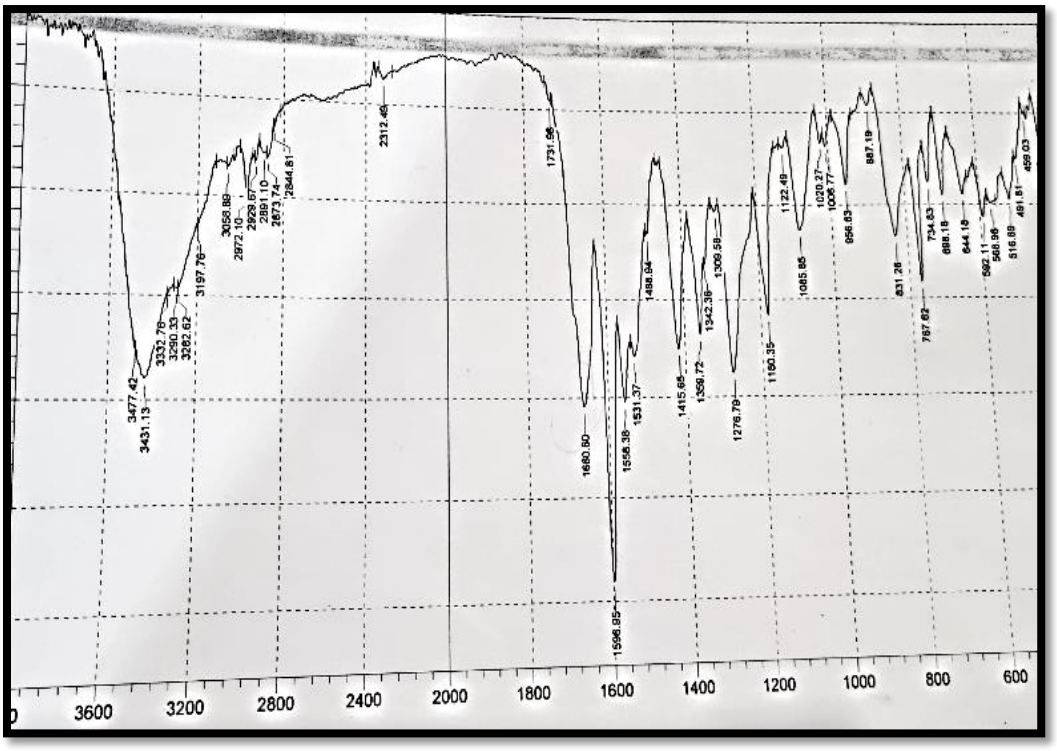


FIGURE 2 FT-IR spectrum for compound (2)

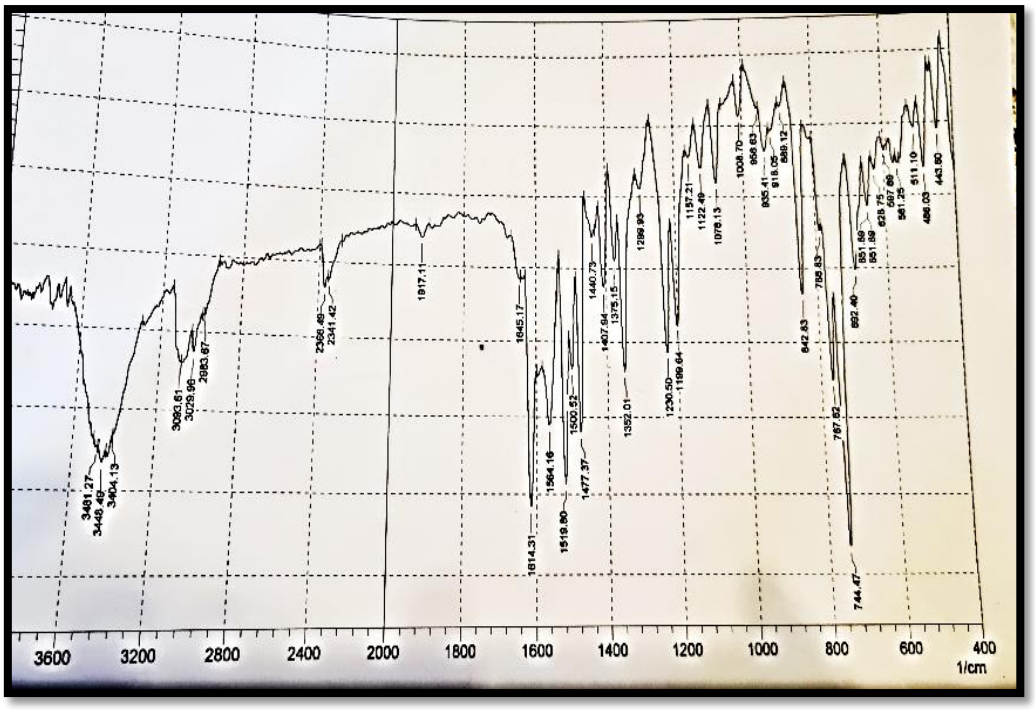


FIGURE 3 FT-IR spectrum for compound (3I)

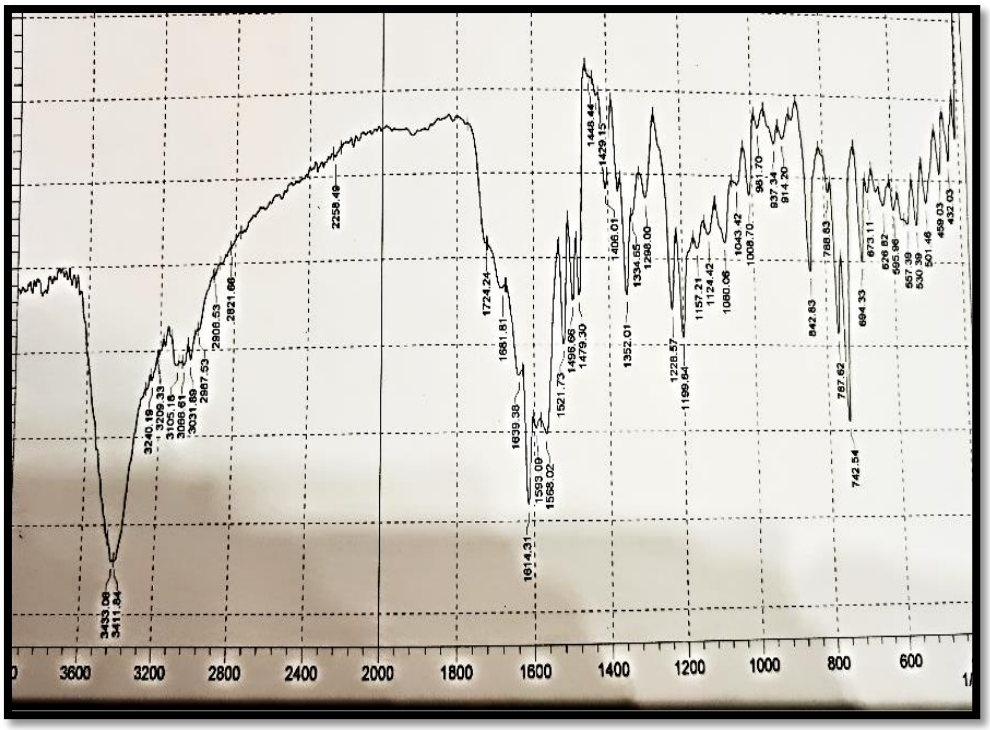


FIGURE 4 FT-IR spectrum for compound (4J)

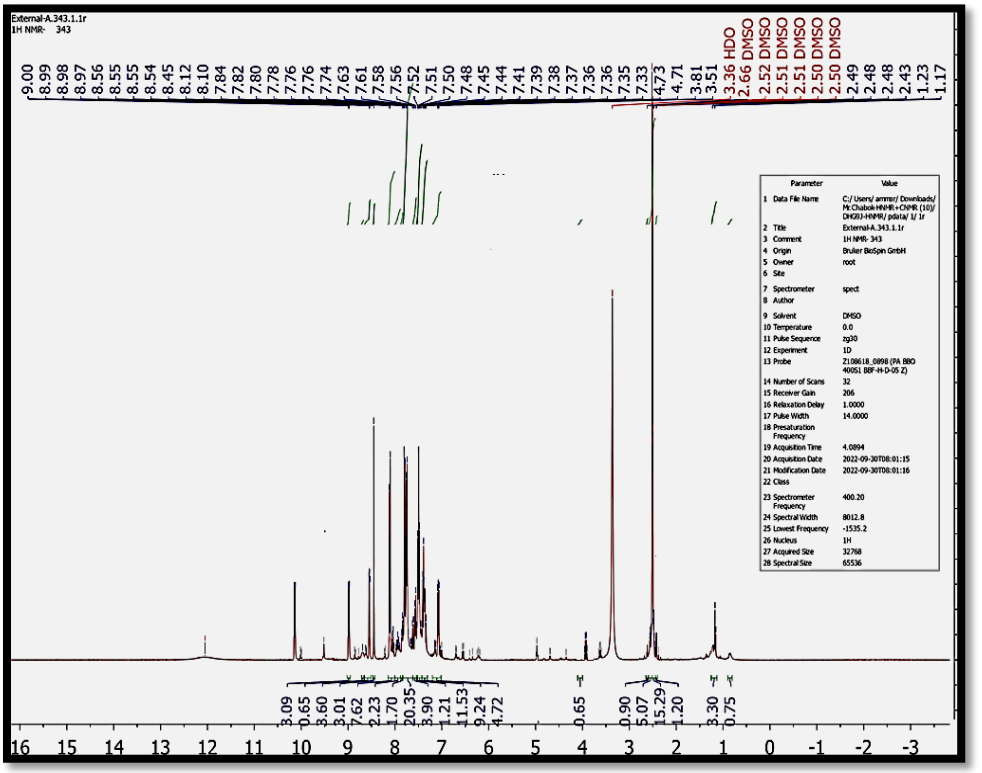


FIGURE 5 ^{1}H-NMRspectrum for compound (4J)

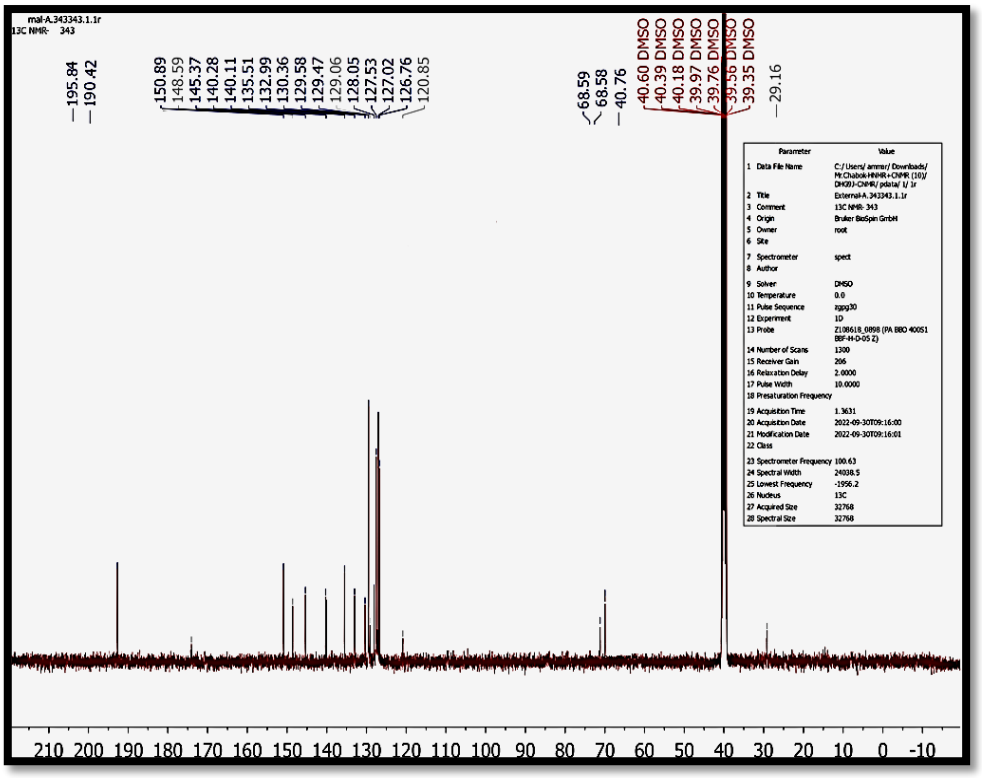


FIGURE 6 ^{13}C-NMR spectrum for compound (4J)

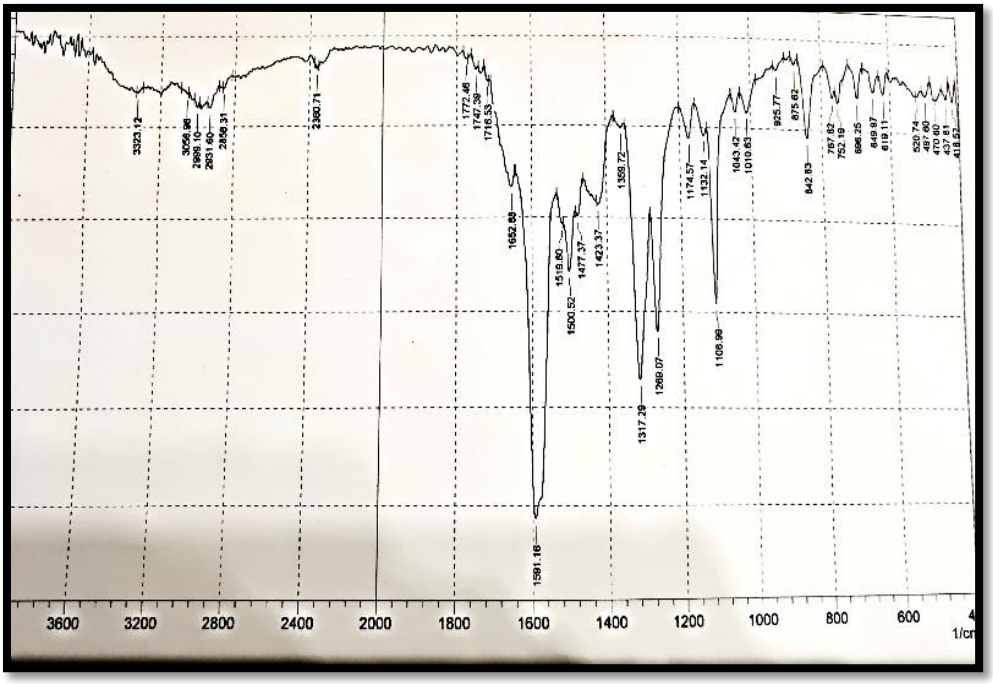


FIGURE 7 FT-IR spectrum for compound (5I)

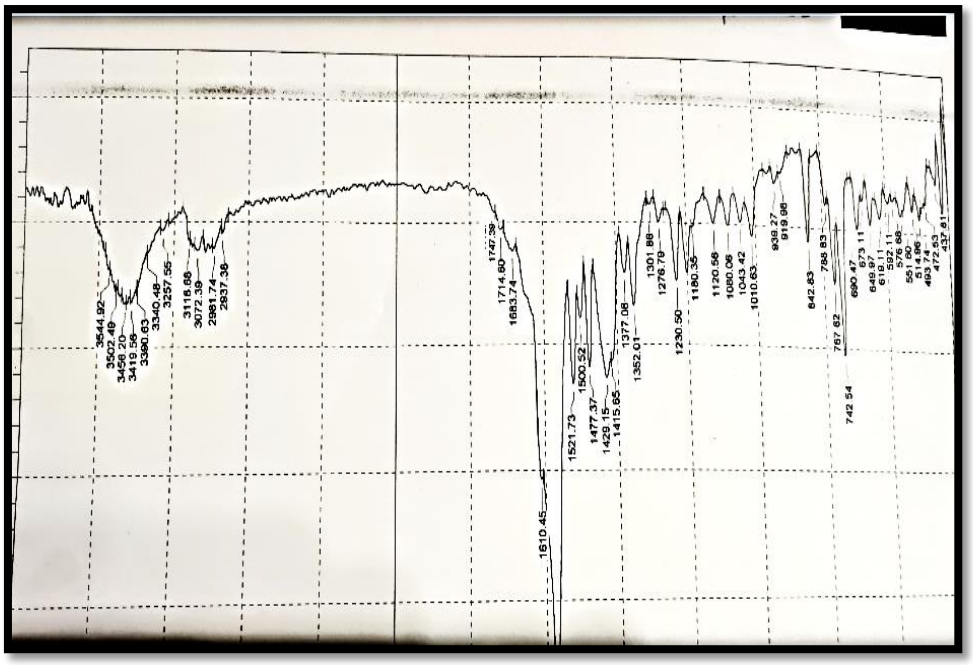


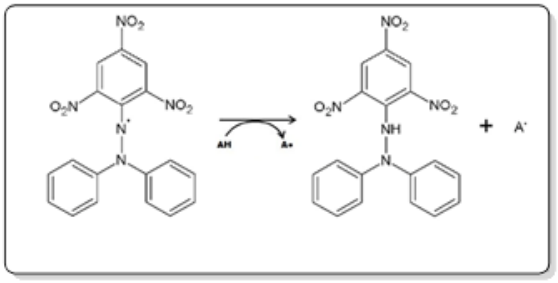
FIGURE 8 FT-IR spectrum for compound (6I)

Applications

Some synthesised compounds were tested in two different applications mentioned in the following:

Antioxidant activity[15]

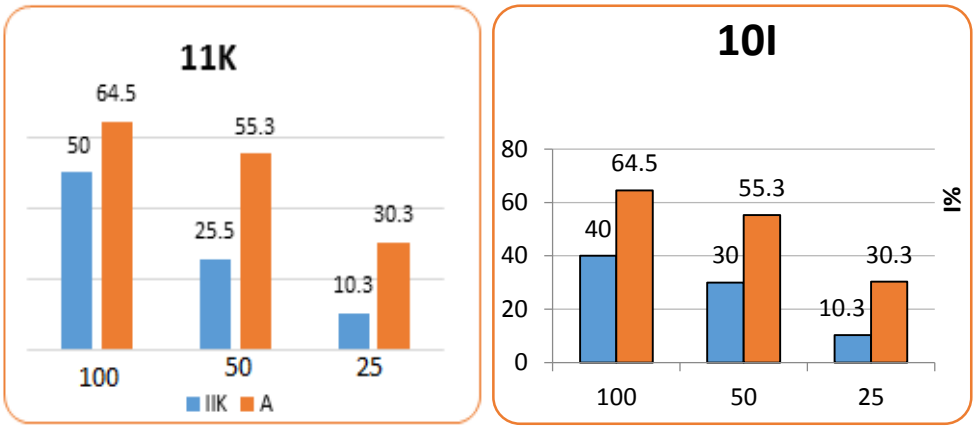
New synthesis compounds evaluated anti-oxidant by DPPH method using ascorbic acid as positive standard. (0.5 mL) of compound extract was added to 1 mL of DPPH solution (2 mL of 0.013 g/L DPPH) in methanol, and at 517 nm, the reduction of DPPH was measured at 30 min. These compounds showed excellent and moderate antioxidant activity. Equation 1 explains the mechanism of actions of antioxidant. All compounds are summarized in Table 11.



Mechanism of actions of antioxidant

TABLE 11 Values of antioxidant activity of some compounds

Compound	PPM	I%	IC50
10I	100	40	135.8
	50	30	
	25	10.3	
11K	100	50	131.17
	50	25.5	
	25	10.3	
A	100	64.5	85.68
	50	55.3	
	25	30.3	



Anticorrosion[16]

In this work, the corrosion phenomenon has effective, innovative, industrial, and mechanical applications. Therefore, it is necessary to have a corrosion inhibitor. Previous studies have proven a heterocyclic compound such as Imidazo(1,2-a) pyridine derivatives act as a good corrosion inhibitors.

In this work, compound thiazolidenone **9k** was selected that was linked with imidazo(1,2-a) pyridine due to the adsorption of compound with the followings:

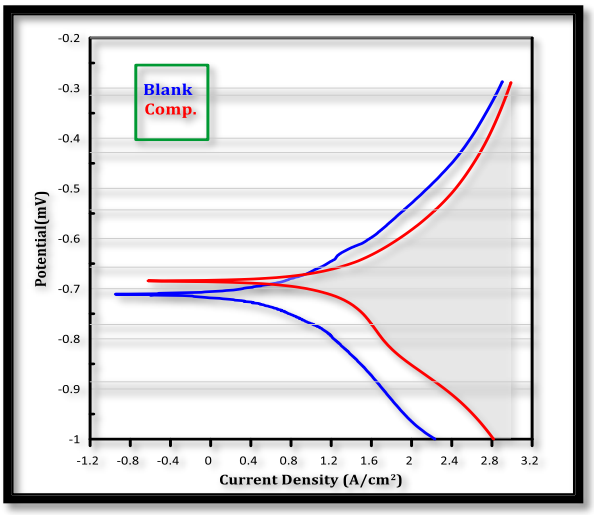
A: C-Steal in 3.5% Nacl, which determines that these atoms bind carbon surface atoms to protect them from corrosion, as depicted in the following tables and figures.

Chemical composition of carbon steel C45

Metal	C%	Si%	Mn%	S%	P%	Cu%	Ni%	Cr%	Fe%
Carbon Steel 45	0.36-0.42	0.15-0.30	1.00-1.40	0.05	0.05	0.50	0.20	0.20	96.88-97.49
	0.03	1.00	2.00	0.030	0.045	1.5	10.0-14.0	2.0-3.0	50%

Compound	E corr.	I corr.	I corr./ r	Resis.	Anodic β	Cathodic β	Corr. rate,	IE%
Blank	-0.678	153.9	1.539E-4	395.4	0.739	0.173	0.755	-
Comp.9k	-0/771	15/13	1/513E-5	1986	0/133	0/145	0/074	**90**

Corrosion parameters for blank and compounds in NaCl solution



Polarization curves for corrosion of blank and compound 9k

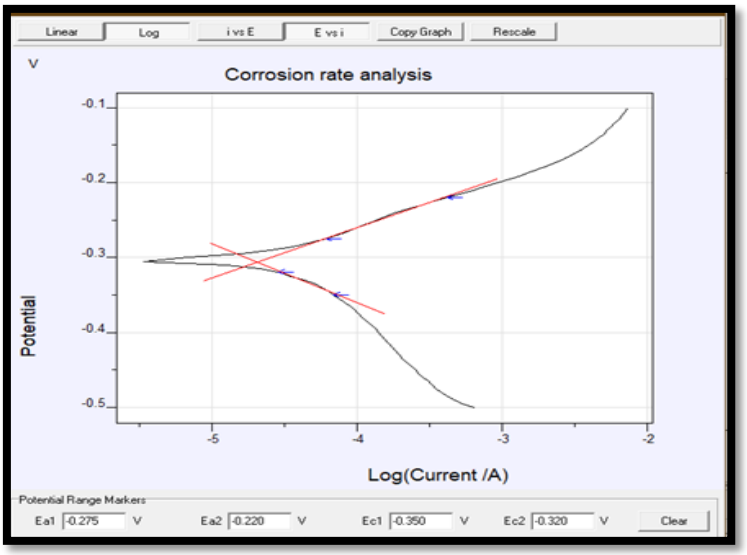
B: Carbon Steal 316 in 0.5 HCl which determines that these atoms bind the carbon surface atoms to protect them from corrosion, as shown in the following tables and figures.

Chemical composition of carbon steel 316L

Metal	C%	Si%	Mn%	S%	P%	Ni%	Cr%
Carbon Steal 316	0.03	1.00	2.00	0.030	0.045	10.0-14.0	2.0-3.0

Compound	T (K)	-Ecorr (mV).	I corr./ r Ma/cm²	*Bc* Mv/dec	βa Mv/dec	C.R Mm/y	Rp Ω/cm²	IE%
Blank	295	303.1	0.1075	110	51	1.249	140.9	-
Comp.9k	295	306.4	0.02026	78	67	0.2354	773.3	81.5

Corrosion parameters for blank and compounds in NaCl solution



Polarization curves for corrosion of blank and compound 9k

Conclusion

In this work, a new heterocyclic compound as (thiazolidinone ,oxazipin 4,7 dione ,4- nitro benzo oxazipin 4,7 dione) was successfully prepared with characterization.

1) From bi-phenyl imidazo–pyridine, the new heterocyclic compounds were synthesised which have a good stability.
2) Fused rings have a wide spectrum of biological activity.
3) FT-IR, ^{1}HNMR, and ^{13}CNMR spectra proved the proposed structures.
4) The new heterocyclic synthesis was carried out with studying its anticorrosion application.

Acknowledgements

I would like to thank everyone who helped me during my career in completing this work and I would also like to thank the staff members of the department of chemistry, Collage of science, University of Baghdad.

Conflict of Interest

The authors declare no conflict of interest to any party.

Orcid:
Doaa Hashim Al-Abboodi:
https://orcid.org/0000-0001-9115-2779
Naeemah Al-lami:
https://orcid.org/0000-0002-8151-4227

References

[1] A.Z. Hattab, N. Al-Lami, J.S. Wadi, *Eurasian Chem. Commun.*, **2022**, *4*, 222-231.[Crossref], [Google Scholar], [Publisher]
[2] J.G. Lombardino, *J. Org. Chem.*, **1965**, *30*, 2403-2407. [Crossref], [Google Scholar], [Publisher]
[3] C. Huo, J. Tang, H. Xie, Y. Wang, J. Dong, *Org. Lett.*, **2016**, *18*, 1016-1019. [Crossref], [Google Scholar], [Publisher]
[4] S.M. Al-Araji, R.A. Ali, *Baghdad Sci. J.*, **2012**, *9*, 168-177. [Crossref], [Google Scholar], [Publisher]
[5] A. Olyaei, M. Sadeghpour, M. Khalaj, *RSC Advances*, **2020**, *10*, 30265-30281. [Crossref], [Google Scholar], [Publisher]
[6] H.M.A. Al-Redha, S.H. Ali, S.S. Mohammed, *Baghdad Sci. J.*, **2022** ,*19*, 0704. [Crossref], [Google Scholar], [Publisher]
[7] R. Abdalrazaq Ibrahem, S.F.N. Al.Zobadyi, *J. Med. Chem. Sci.*, **2023**, *6*, 480-485. [Crossref], [Pdf], [Publisher]
[8] D.B. Narasimhan, S.M. Lim, K. Ramasamy, R.K. Mishra, V. Mani, *RSC Advances*, **2016**, *6*, 109485-109494. [Crossref], [Google Scholar], [Publisher]
[9] S. Kumar, J. Kudva, B. R. Bharath, K. Ananda, R. Sadashiva, S. Madan Kumar, B.C. Revanasiddappa, V. Kumar, P.D. Rekha, D. Naral, *New J. Chem.*, **2019**, *43*, 1597-1610. [Crossref], [Google Scholar], [Publisher]
[10] A. Khudhair, R.J. Nasreen, *Al-Nahrain J. Sci.*, **2020**, *23*, 17-23. [Pdf], [Google Scholar], [Publisher]
[11] H.S. Jasim, A.F. Muslim, W.T. Al-Sa'adi, Ibn AL-Haitham, *Journal For Pure and Applied Sciences*, **2017**, *27*, 333-338. [Google Scholar], [Publisher]
[12] S. Vinoth Kumar, M.R. Subramanian, S.K. Chinnaiyan, *J. Young Pharm.*, **2013**, *5*, 154-159. [Crossref], [Google Scholar], [Publisher]
[13] W. Al Zoubi, A.A.S. Al-Hamdani, S.D. Ahmed, Y.G. Ko, *J. Phys. Org. Chem.*, **2018**, *31*, e3752. [Crossref], [Google Scholar], [Publisher]
[14] O. Abid, A. Ramadan, Al-Mustansiriyah *J. Sci.*, **2018**, *29*, 93. [Crossref], [Google Scholar], [Publisher]
[15] M. Pisoschi, M.C. Cheregi, A.F. Danet, *Molecules*, **2009**, *14*, 480-493. [Crossref], [Google Scholar], [Publisher]
[16] R. Baskar, H. Lgaz, R. Salghi, *Chem. Sci. Eng. Res.*, **2019**, *1*, 32-54. [Crossref], [Google Scholar]

How to cite this article: Doaa Hashim Al-Abboodi*, Naeemah Al-lami. Anti-Corrosion and antioxidant activities of new synthesised oxazepine and thaizolidinone derivatives linking to imidazo/pyridine. *Eurasian Chemical Communications*, 2023, 5(4), 343-357. **Link:** https://www.echemcom.com/article_163825.html