Academic Journal of Research and Scientific Publishing

International peer-reviewed scientific journal

The Forty-Sixth Issue

Publication date: 05-02-2023

ISSN: 2706-6495

doi.org/10.52132/Ajrsp.en.2023.46

Email: editor@ajrsp.com

Publication Date: 05-02-202 ISSN: 2706-6495

Dedication

It is our pleasure and great privilege to present the forty- Sixth issue of the Academic Journal of Research and Scientific Publishing to all researchers and doctors who published their research in the issue, and we thanks and appreciate to all contributors and supporters of the academic journal and those involved in the production of this scientific knowledge edifice.

Academic Journal of Research and Scientific Publishing

Publication Date: 05-02-202 ISSN: 2706-6495

Table of Content:

Synthesis, Characterization, Thermal Behavior and Biological Properties of Zn (II) Schiff Base Complexes

Ziaulhaq Naimzai*
Assistant Professor in chemistry department of paktia university, Afghanistan.
n.ziaullhaq@gmail.com
Abdul Zahir Muhsin,
Assistant Professor in biology department of paktia university, Afghanistan.
zahir.ahmadzay47@gmail.com
Abdul fatah Pathman,
Assistant Professor in Physic department of paktia university, Afghanistan.

Abstract

In this research, *N*, *N*`-bis ((E)-3-(4-dimethylamine) phenyl allylidene)-phenylen-1,2-diamine as a bidentate Schiff base ligand, was synthesized in ethanol and purified and then was identified by physical and spectral methods. Using this ligand, compounds with the general formula of $ZnLX_2$ in which X is Cl^-, Br^-, I^-, N_3^-, SCN^- and/or NO_3^-. Different techniques such as FT-IR, UV-Vis, ^{1}H-NMR, thermal analysis (TG, DTA, DTG), melting point and molar conductivity were used for characterization of the coordination compounds. The IR spectrum of the ligand shows the group (C=N) vibration frequency at 1604 cm^{-1} as main peak. However, the relevant frequency changed after complex formation which indicates coordination of the Schiff base ligand to the Zn metal ion. The data obtained from the UV-Vis spectra and the ^{1}H-NMR of the ligand and its coordination compounds confirm their synthesis. Ultimately thermal behavior of the ligand and its metal compounds in the temperature range of 20-900˚C was studied and their decomposition steps were evaluated along with some thermo-kinetic parameters of thermal decomposition of the complexes in each decomposition step.

Keyword: Complex, Zinc, Thermal behavior.

1. Introduction

These compounds are synthesized as organic polychelate ligands, the Schiff bases (C=N-) are unsaturated compounds [1-3]. Used in the field of coordination chemistry. Recently, several types of Schiff bases ligands with N, O, S and P atoms have been made available for structural analysis and biological applications [4-6]. In addition, Schiff bases have wide applications in several fields of life sciences as catalysts [6-8] and photochromic sensors [9,10]. these compounds also have fluorescence [11, 16,17,18], nonlinear optical, magnetic properties [19]. Schiff bases are considered significant ligands for meatal ion coordination complexes due to their ease of Synthesis, variability in structural design and range of applications [11, 20-22]. These ligands have been widely used as polychelator ligands and have shown high performance in terms of steric properties and therm – electronic regulation of their metal complexes [23-25]. Chemists design Schiff bases as polyunsaturated ligands their complexes and these have provided different fields of chemistry [7-23,24]. In this way we have focused on the synthesis, characterization, thermal behavior of Zn(II) Schiff base complexes using IR, NMR, UV-Vis, TG, DTA, TGA and molar conductivity of melting point methods.

2. Experimental

2. 1. Material and methods

All material for the synthesis of these compounds were purchased from Merck, Aldrich and/or BDH companies in high purity and used as received. the spectrum of IR ligand and synthesized complexes was taken by FT-IR type spectrometer (JASCO-680) in KBr disks and the spectrum of NMR these compounds taken by DPX FT-NMR-400 type spectrometer in DMSO solvent in range of 4000-400 cm^{-1}. The UV-visible spectra of all compounds were taken by a 730-JASCO-V type spectrometer in range of 800-200 nm in DMF solvent. Melting point temperature (℃) of all compounds were recorded by the Kruse instrument. Molar conductance's all compounds of (1.0×10^{-4} M in DMF solution) were determined using a Met Rohm 712 conduct meter at 298 K) the behavior of all compounds in thermal analysis was investigated by Perkin-Ilmir type Piers Diamond type in the presence of N_2 gas at a temperature range of 30-900 (℃) with a heating rate of 10 (℃)/men were used.

2. 2. Synthesis of compounds

2. 2. 1. Synthesis of Schiff bases ligand

0.25mmol of 2,1-phenylenediamine dissolved in 3 mL ethanol was slowly added in room temperature with string, to a solution of 2mmol 4-dimethyl amin Cinnam aldehyde, which was dissolved in 10 mL of ethanol by ultrasonic for 30mn, and after four hours form a brownish orange precipitate. Then it was smoothed and washed with a little ethanol.

2. 2. 2. Synthesis of ZnL (Cl_2, Br_2, I_2) complexes

0,5mmol of Zinc salts dissolved in 3mL of ethanol and then the synthesized ligand was gradually added dropwise with it and stirring vigorously at 25^0C temperature for four hours. finally, complexes in solution of reactions was precipitated a different colors and was washed smoothly with a little ethanol.

2. 2. 3. Synthesis of ZnL($(SCN)_2$, $(N_3)_2$ and $(NO_3)_2$) complexes

The synthesized ligand was gradually added dropwise over 30 minutes to 0,25mmol of Zinc salts, newly prepared in 3mL ethanol and after four hours of stirring at 25^0C temperature complex in solution of reactions was precipitated a different colors and was washed smoothly with a little ethanol.

TABLE (1) Vibrational spectral (cm^{-1}) and electronic (nm) data of the Schiff base ligand and tis Zn (II) complexes

Compounds	Color	M.P (˚C)	Yield (%)	Λ_M ($cm^2\ \Omega^{-1} M^{-1}$)
Ligand	Orange	164 – 167	25	0.60
$ZnLCl_2$	crimson	260 – 263	70	0.53
$ZnLBr_2$	brown- crimson	169 – 171	68	0.82
$ZnLI_2$	brown- crimson	234 – 236	63	1.17
$ZnL(SCN_3)_2$	brownish-black	206 – 208	66	0.54
$ZnL(N_3)_2$	black-blood	193 – 196	32	0.50
$ZnL(NO_3)$	black-blood	164 – 167	48	0.55

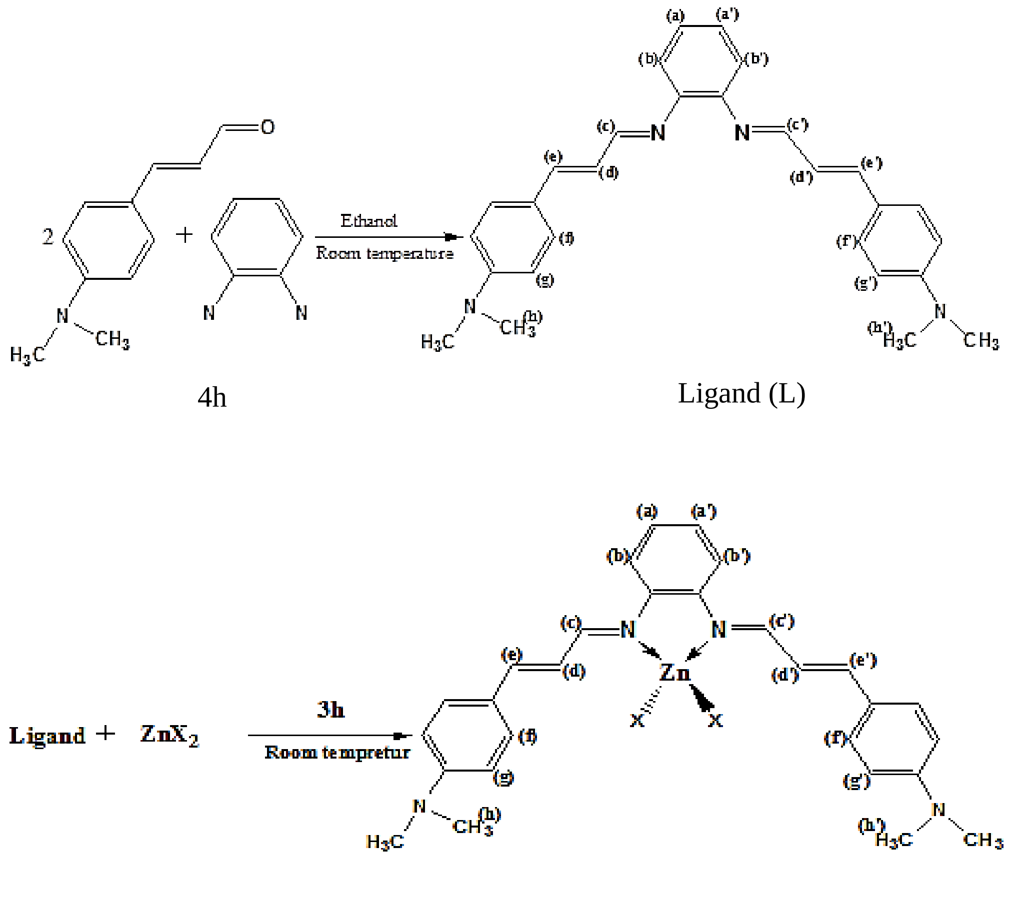
TABLE (2) Analytical and Physical data of the Schiff base ligand and tis Zn (II) complexes

Compounds	vCH arom	vCH alkene	vCH aliph	vCH imine	C=N	$-N_3$, -SCN $-O_3N$	C=C	Zn-N	λmax (nm)
Ligand	3464	3367	2958	2850	1604	-	1490,1439	—	399
$ZnLCl_2$	3446	3219	2992	2856	1592	-	1490,1438	499	386
$ZnLBr_2$..	3441	3158	2930	2853	1598	-	1442	527	313, 386
$ZnLI_2$	3447	3256	2986	2886	1592	-	1488, 1438	517	354, 385
$ZnL(SCN_3)_2$	3445	3150	2906	2856	1593	2067	1480,1438	506	388
$ZnL(N_3)_2$.	3446	3085	2912	2853	1593	2066	1480,1437	499	387
$ZnL(NO_3)_2$	3447	3081	2916	2856	1548	1195,1228	1480,1439	501	388

TABLE (3) ^{1}HNMR Spectral data of the ligand and its Zn (II) Schiff base complexes in DMSO

Compounds	^{1}HNMR data (б, ppm)
Ligand	7.71 (bs,2$H_{cc'}$), 7.43 (d, 4$H_{ff'}$, J=8.70Hz) 7.23 (d, 2$H_{bb'}$, J=8.9 Hz), 7.21 (d, 2$H_{aa'}$, J=8.9 Hz),6.71 (d, 4$H_{gg'}$, J=8.7 Hz), 6.62 (dd, 2$H_{dd'}$, J_1=15.7 Hz, J_2=8.0 Hz), 6.51 (d, 2$H_{ee'}$, J=15.5 Hz), 3. 00 (s, 12$H_{hh'}$).
$ZnLCl_2$	7.80 (bs,2$H_{cc'}$), 7.47 (d, 4$H_{ff'}$, J=8.9Hz) 7.3 (d, 2$H_{bb'}$, J=7.6 Hz), 7.30 (d, 2$H_{aa'}$, J=6.1 Hz), 6.78 (d, 4$H_{gg'}$, J=8.9 Hz), 6. 69 (dd, 2$H_{dd'}$, J_1=15.7 Hz, J_2=8.0 Hz), 6.57 (d, 2$H_{ee'}$, J=15.3 Hz), 3. 00 (s, 12$H_{hh'}$).
$ZnLBr_2$..	8. 26 (bs,2$H_{cc'}$), 7.45 (d, 4$H_{ff'}$, J=7.46Hz) 6.76 (d, 2$H_{bb'}$, J=8.8 Hz), 6.67 (t, 2$H_{aa'}$, J=6.68 Hz), 7.23 (d, 4$H_{gg'}$, J=7.23 Hz), 6. 18 (dd, 2$H_{dd'}$, J_1=15.80 Hz, J_2=6.9 Hz), 6.32 (d, 2$H_{ee'}$, J=15.9 Hz),2. 99 (s, 2$H_{hh'}$).
$ZnLI_2$	8. 01 (d,2$H_{cc'}$, J=9.0 Hz),7.48 (d, 4$H_{ff'}$, J=8.70Hz) 7.26 (d, 2$H_{bb'}$, J=7.3 Hz), 7.23 (t, 2$H_{aa'}$, J=7.23 Hz),6.77 (d, 4$H_{gg'}$, J=8.9 Hz), 6. 60 (dd, 2$H_{dd'}$, J_1=18.7 Hz, J_2=8.30 Hz), 7.12 (d, 2$H_{ee'}$, J=16.1 Hz),2. 99 (s, 12$H_{hh'}$).

$ZnL(SCN_3)_2$	7.90 (d,2H$_{cc'}$, J=8.9 Hz), 7.43 (d, 4H$_{ff'}$, J=8.80H) 7.23 (d, 2H$_{bb'}$, J=6.1 Hz), 7.24 (t, 2H$_{aa'}$, J=6.8 Hz), 6.66 (d, 4H$_{gg'}$, J=8.9H), 6. 09 (dd, 2H$_{dd'}$, J$_1$=17.2 Hz, J$_2$=7.3 Hz), 6.22 (d, 2H$_{ee'}$, J=15.5 Hz), 2. 91 (s, 12H$_{hh'}$).
$ZnL(N_3)_2$.	8.55 (bs, 2H$_{cc'}$), 7.59 (d, 4H$_{ff'}$) 7.34-7.28 (4H$_{bb'}$, aa') 6.78-6.58 (m, 8H$_{gg'}$, $_{dd'}$, ee'), 3.03 (s,12H$_{hh'}$).
$ZnL(NO_3)_2$	8. 52 (d, 2H$_{cc'}$, J=8.1 Hz), 7.48 (d, 4H$_{ff'}$, J=9. 0 Hz) 7. 12 (d, 2H$_{bb'}$, J=6.1 Hz), 7.13 (d, 2H$_{aa'}$, J=6.2 Hz), 6.45 (d, 4H$_{gg'}$, J=9.0 Hz), 6.51 (dd, 2H$_{dd'}$, J$_1$=15.6 Hz, J$_2$=7.9 Hz), 6.58 (d, 2H$_{ee'}$, J=15.9 Hz), 2. 99 (s, 2H$_{hh'}$).



$ZnLX_2$ Where in X=Cl^-, Br^-, I^-, SCN^-, N_3^- and NO_3^-

Scheme (1) Synthetic route from ligand to zinc(II) complexes

3. Results and Discussion

3.1 Physical and analytical data

The physical and analytical data of bidentate Schiff base ligand and its Zn(II) complexes are given in Table 1. The proposed structures of the compounds, as seen in (scheme. 1), have been validated by spectroscopic, physical and other methods. Examination of the analysis data of these compounds with the general formula $ZnLX_2$ (L=ligand) and (X= Cl^-, Br^-, I^-, N_3^-, SCN^-, NO_3^-) for the complexes shows seen in (Scheme. 1) the ligand melts in the range 164-167℃, while the melting temperature of the complexes is in the range of 260-263℃. these coordination compounds do not dissolve in water and common organic solvents such as alcohol, but are soluble in DMSO and DMF solvents. The Yield of ligand are 25% and the Yields of metal complexes are 32-70% respectively. As shown in the Table 1, all synthesized compounds are solid and colored, insensitive to moisture, stable at 25 ° C, and degraded in further heating. The molar conductivity of these compounds in DMF solvent (10^{-4}mol) was in the range of 0.50-1.17cm^2 Ω^{-1} mol^{-1}, which is confirmed their non- electrolytic nature at 25℃ [27]. The Low molar conductivities indicate that the halide/ pseudo halide ions and Schiff base ligand have been bonded to the zinc ion in an inner-sphere coordination mode.

3. 2. FT/IR spectra

The IR spectrum of free ligand and its synthesized Zn(II) complexes were recorded in range of 4000 to 400 cm^{-1}. As shown in (Figure. 1). Table. 2 summarizes the important vibrational frequencies of these complexes compared to the free Schiff base ligand. in the IR ligand spectrum one absorption band at 1604cm^{-1} belongs to the cinnamaldehyde carbonyl group and two absorption bands in the range of 3464cm^{-1} and 3434cm^{-1} belong to the amine group of the 1,2-phenyl diamine, which confirms the synthesis of purity and the formation of an imine functional group (C=N) of the desirable ligand. The IR spectra of the synthesized compounds shown ligand-related vibration, but with the difference that the ligand absorption bands change with alignment with the metal. Modifications include displacement of vibration absorption bands, the ligand compound, which is used as a by-dentate ligand in the synthesis of desirable complexes, has several specific bands.

1- A strong absorption band in the range of 1604cm-1 corresponding to (C=N), which is the displacement of this absorption band towards lower energies, indicating the coordination of ligand from towards the N imine to the zinc metal ion coordination complexes.

2- vibrational bands in the range of 1336cm^{-1} and 1323 cm^{-1} depend on the group C=C, which is placed at different frequencies when ligand coordinated with zinc metal.

3- vibrations belonging to the C-H amine that are seen in the range of 2958cm^{-1} and 2850cm^{-1}, which are displaced after coordinated.

The vibrational bond of imine in this synthesized compounds shows the desired displacement relative to the ligand free, this type of displacement is due to the π-back bone of the zinc metal, which reduces the length of iminic bond and as a result, cause it strengthens the iminic bond which has shifted to larger frequencies and this displacement indicates coordinated of ligand to the zinc metal. In the new zinc (II) synthesized complexes, the absorptions bands in the range of 1592cm^{-1} to 1598 cm^{-1} depend on the imine group (C=N), these absorptions bands placed at lower frequencies then the ligand (Table. 2). For the thiocyanate zinc complex, an absorption band in range of 2067cm^{-1} belong to SCN^- and for the azide zinc complex an absorption band in range of 2066cm^{-1} belong to N_3^-, both which are coordinated form nitrogen head, and an absorption band in range of 2066cm^{-1} belong to and an absorption band corresponding to the zinc nitrate complex appeared in the range of 211cm^{-1} the displacement of these absorption bands corresponds to a slight change from the free state to them. The nitrate group is attached to the zinc metal atom via oxygen. The ligand and several samples zinc synthesized complexes spectra are shown in (Figure. 2)

3. 3. Electron spectra description

The electronic spectra of the ligand and its zinc(II) complexes are shown in (Figure. 3) MDF (10^{-4}mol) solvent at room temperature was used to record these spectra, ligand field transitions are not seen in the constructed complexes, for these synthesized complexes, charge transfer and intra-ligand transfer are also not seen in the UV range (Table. 1). In the ligand electron spectrum of the ligand, a transfer in the range of 399nm, which belongs to the azometin $\pi \rightarrow \pi^*$ group, appears as a peak. For zinc bromide and zinc iodide complexes, another peak appeared in the range of 313nm and 354nm which is related to the transfer of electrons d to the complexes π^*.

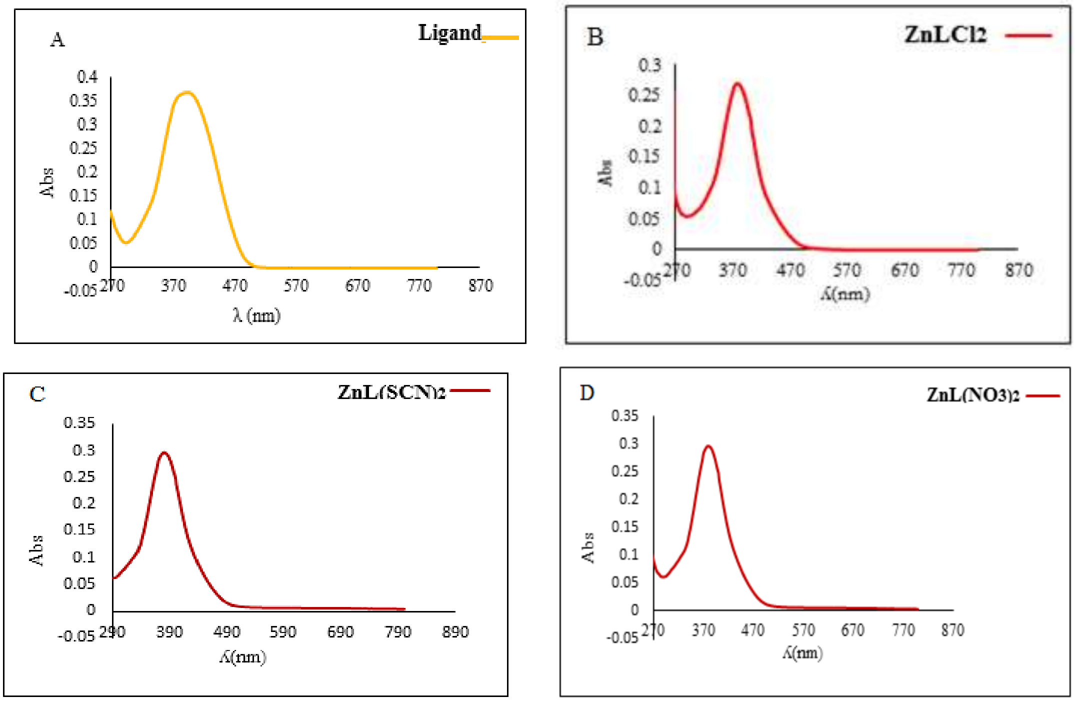


Figure (1) Electronic spectra of (A) ligand, (B) $ZnLCl_2$, (C) $ZnL(SCN)_2$ and (D) $ZnL(NO_3)_2$ complexes

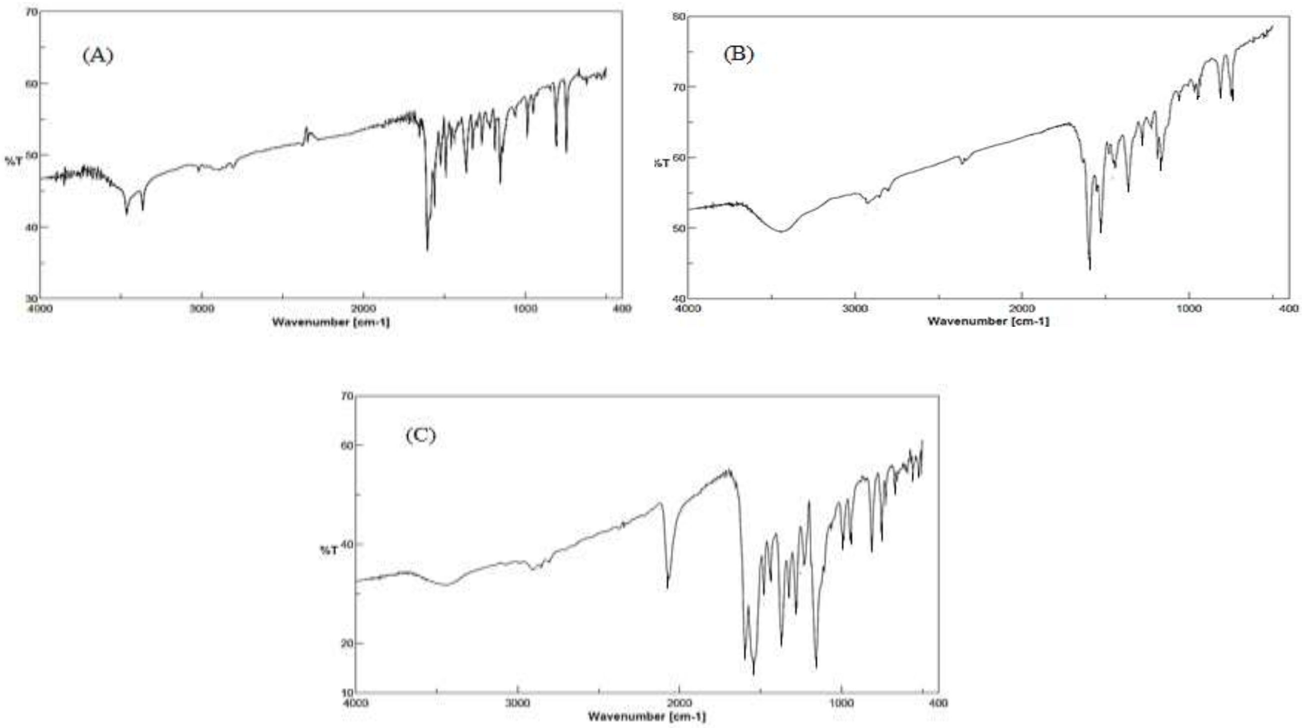


Figure (2) infrared spectra of (A) ligand, (B) $ZnLCl_2$ and (C) $ZnL(SCN)_2$ complexes

3. 4. NMR spectra

In continuation of FT/IR and UV-visible spectral analyses, the ligand and its Zn (II) complexes were subjected to ^{1}HNMR spectroscopy. The ^{1}HNMR spectral data have been tabulated as Table 3. The ^{1}HNMR spectra of the ligand and the zinc iodide complex are giving Figure 3 as examples. A comparison of the ^{1}HNMR signals of the complexes with respect to free ligand according to Scheme 1 can well confirm their formation. A specific signal form the Schiff base ligand related to the hydrogen azometin cc'appeared as a broad signal in the range of 7.71 ppm. In the range of complexes, the signals in the range of 7.80- 8.55 ppm can be compared with the hydrogens of the azometin group. This is a strong evidence for the coordination of Schiff base ligand with zinc metal. The aromatic signal of the free ligand hydrogens ff', gg' and bb' appear as doublet and aa' as multiplet appear in the range of 7.43, 6.71, 7.23 and 7.21 ppm, respectively. These peaks come up or down to the metal center after the ligand is coordinated and are seen in the range of 7.43-7.59, 6.65-7.34, 6.26-7.34 and 6.34-7.31ppm, respectively. The alkene hydrogens signal ee' appear in the ligand structure as double peaks of 6.51 ppm and peak hydrogens dd' appear as double and double in the peaks of 6. 62 ppm regions. But in their complexes, the signals of these hydrogens after ligand coordination are seen in the range of 6.22-7.12 ppm as double and 6.09-6.78 ppm as double and double respectively. The aliphatic hydrogen peaks of the ligand, hh' in the range of 3.00 ppm appear as single and these signals appear in the peaks of zinc complexes in the range of 2.99-3.03 ppm seen.

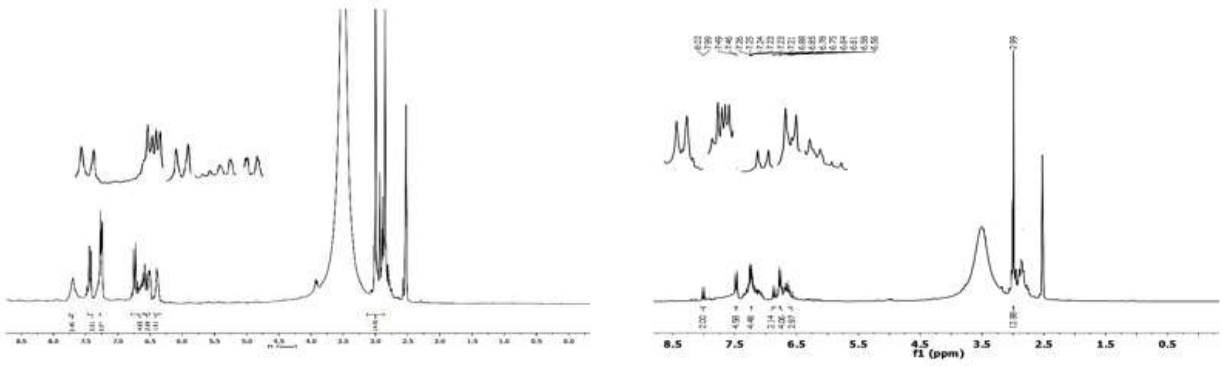


Figure (3) ^{1}HNMR spectra of ligand and $ZnLI_2$ complex

3. 5. Thermal investigation (TG/DTA)

In addition to determining the stability of the related compounds, the presence or absence of coordinated or free water molecules in the structure of these complexes can be determined by the thermal study data of the ligand and the compound synthesized on zin. The water molecule normally separates from the composition structure at temperature below 200℃, which ultimately reveals a mass deficiency in the TG/DTG diagram as a definite peak. Also, the study of the temperature decomposition behavior of the above compounds can be studied at different temperatures and at different stages. The Schiff base ligand decomposes in two temperature steps on the study of the thermal composition diagram. In the first stage, thermal composition of $C_9H_{15}N_2$ components in the range of 148-400℃ is removed from this compound. The reduced mass in the second stage is related to the $C_{18}H_{14}N_2$ fragments which are removed from the composition in the range of 400-700℃. Finally, the final residue of this compound is the amount of carbon. Table 4 shows the data depending on the proposed steps and components. The heat degradation stages of the ligand are shown in Scheme 2.

$$\underset{\text{Mol. Wt: 422.56}}{C_2H_{30}N_4} \xrightarrow[\text{step}^1\ 35.89\ (35.79)]{-C_9H_{15}N_2\ \text{Mol. Wt: 151.23}} \underset{\text{Mol. Wt: 271.34}}{C_{19}H_{15}N_2} \xrightarrow[\text{step}^2\ 96.21\ (96.92)]{-C_{18}H_{14}N_2\ \text{Mol. Wt: 258.23}} \text{Trance Carbon}$$

Scheme (2) thermal decomposition steps of ligand

The study of thermal composition of these compounds concludes that not all synthesized complexes decompose completely. Thermal composition of synthesized compounds is lost in three to four stages without the composition of water at temperatures below 200℃. In the following, the thermal behavior of $ZnLI_2$ is studied as an example. The compound does not lose almost all of the relevant ligand during the four steps undergoing thermal composition. In the first stage, the thermal composition of component with molecular formula $C_4H_{12}N_2$ loses in the temperatures range of 200-320℃. the reduced mass in the second stage corresponds to apiece of molecule with the molecule formula C_5H_3 removed from the composition in the temperature range of 320-428℃. In the third stage, the lowest mass reduce is related to the removal of Sam particle with the molecular formula C_2H_2 which takes place in the temperature range of 428-519℃.

Academic Journal of Research and Scientific Publishing | Vol 4 | Issue 46
Publication Date: 05-02-2023 ISSN: 2706-6495

During the fourth stage of the thermal analysis in the thermal range of 519-762℃ pieces with molecular formula $C_{17}H_{13}I_2$ are separated from this complex, which are the most molecular mass related to this piece. Table 3 shows the data related to the proposed phases and components of the decomposed complex and other complexes. The thermal decomposition phases related to this complex can be seen in Scheme 3.

Composition of the data depending on the thermal analysis of the synthesized zinc compounds show that the zinc chloride complex starts to decompose at higher temperatures, is more stable and zinc nitrate complex starts at lower temperatures than other compound. It decomposes and has less stability Table 4.

$$C_{28}H_{30}I_2N_4Zn \xrightarrow[Sep^{1}]{-C_4H_{12}N_2} C_{24}H_{18}I_2N_2Zn \xrightarrow[Sep^{2}]{-C_5H_3} C_{19}H_{15}I_2N_2Zn \xrightarrow[Sep^{3}]{-C_2H_2}$$

$$C_{17}H_{13}I_2N_2Zn \xrightarrow[Sep^{4}]{-C_{17}H_{13}I_2} \text{Zinc Salt}$$

Scheme (3) thermal decomposition steps of $ZnLI_2$ complex

Kinetic parameters obtained from TG, DTG and DTA diagrams include activation energy (E^*), enthalpy changes (ΔH^*), entropy changes (ΔS^*), Gibbs free energy changes (ΔG^*). It is listed in Table 4. These kinetic parameters are obtained at each step by Cartes Redfurn diagrams. According to the results, the activation energy (E^*) is more indicative of thermal stability, most of the composition in each stage of thermal decomposition and covers the range of 29.52-128.28 ℃, which the highest value is related to the first stage of the thermal decomposition of $ZnLCl_2$ and the lowest value is related to the second stage of the thermal decomposition of $ZnL(N_3)_2$. positive enthalpy changes (ΔH^*) for all compounds indicate the calorific value of the decomposition phases and are in the range of 12.15-123.90 ° C, most of which are related to the first phase. Thermal decomposition of $ZnLCl_2$ complex and the lowest value is related to the second stage of thermal decomposition of $ZnLCl_2$. Negative entropy changes (ΔS^*) indicate compound accumulation and reduction of irregularity at each stage and range from -8.98×10^{-2} - -1.14×10^{-2} ℃, the highest value is related to the first stage of thermal decomposition of $ZnLI_2$ and the lowest value is related to the first stage of thermal decomposition of $ZnLCl_2$. Gibbs free energy (ΔG^*) positive energy changes indicate the non-spontaneity of these decomposition phases and range from 1.68×10^{2}- $3.64\times10^{-}$

^{2} ℃, the highest value is related to the fourth stage of thermal decomposition of $ZnL(SCN)_2$ and the lowest value is related to the first stage of thermal decomposition of $ZnLCl_2$ compound.

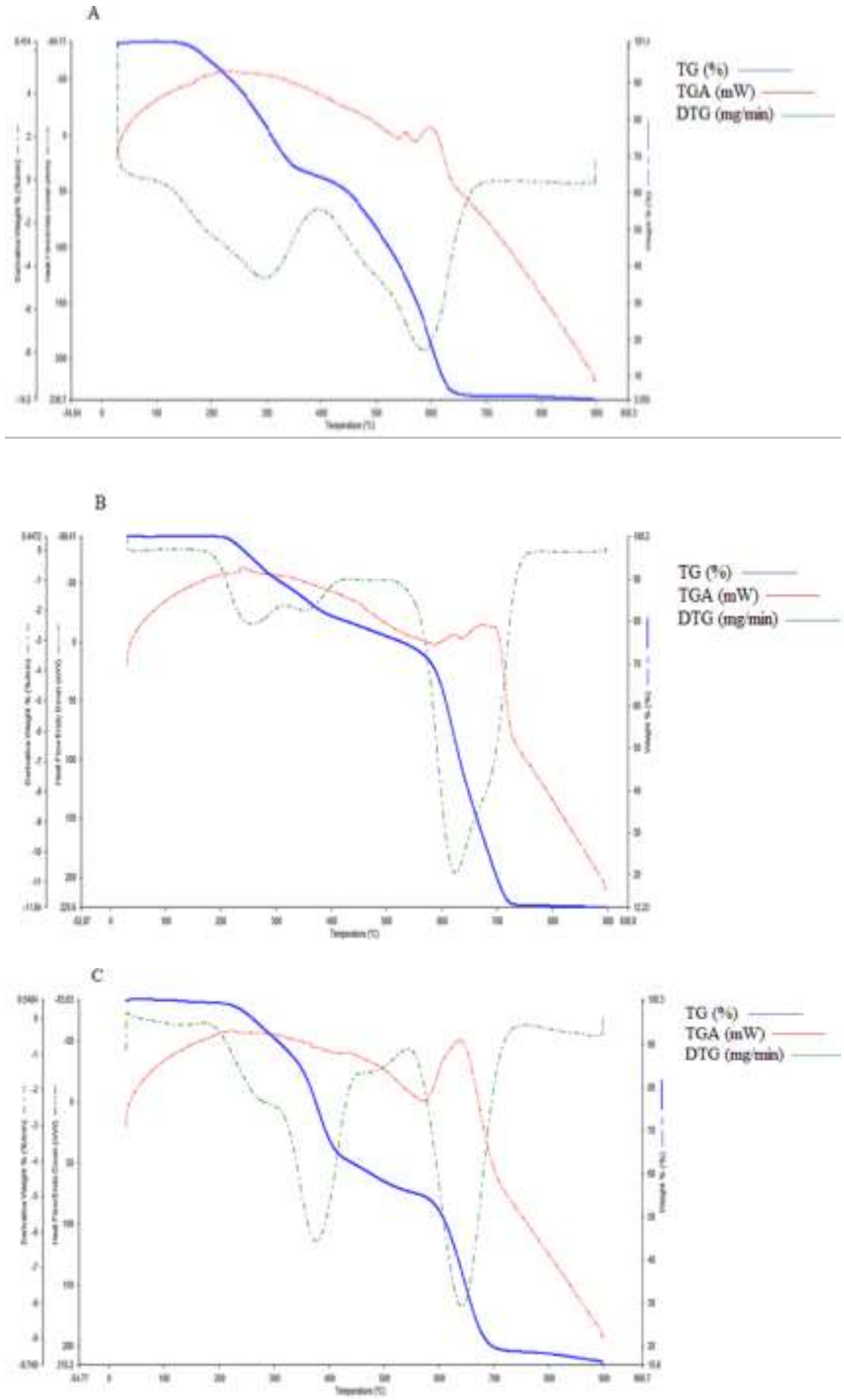


Figure (3) Termo-gravimetric/differential thermal gravimetric (TG, DTG and TGA) plots of (A) ligand, (B) $ZnLI_2$ and (C) $ZnL(N_3)_2$ complexes

TABLE (4) decomposition processes of ligand and its complexes

Compound	Temperature range/_℃	Mass loss, found (calculated)/%	DTG peak/_℃	Proposed segment	Final Residue
Ligand	148-400	35.89 (35.79)	299.05	$C_9H_{15}N_2$	
	400-700	60.32 (61.13)	597.23	$C_{18}H_{14}N_2$	Carbon
$ZnLCl_2$	215-320	17.35 (17.92)	253.22	$C_5H_{12}N_2$	
	320-528	15. 45(13.82)	378.48	C_6H_5	
	528-660	28. 02 (29.56)	633.13	$C_{13}H_9$	
	660-820	33.0 (27.0)	704.22	$C_4H_4Cl_2$ N_2	Zinc Salt
$ZnLBr_2$. 0.39H_2O	100-235	1.11 (1.11)	-	0.39H_2O	
	235-390	19.10 (19.11)	348.57	$C_7H_{13}N_2$	
	390-530	12.59 (11.93)	423.98	C_6H_6	
	530-805	64.82(64.96)	670.45	$C_{15}H_{11}Br_2N_2$	Zn0.016
$ZnLI_2$	200-320	11.64 (11.88)	256.82	$C_4H_{12}N_2$	
	320-428	8.12 (8.5)	356.3	C_5H_3	
	428-519	4.48 (3.52)	466.38	C_2H_2	
	519-762	62.48 (63.5)	625.21	$C_{17}H_{13}I_2$	Zinc Salt
$ZnL(SCN_3)_2$ 0.096H_2O.	70-223	5.18 (5.18)	-	0.096H_2O	
	223-294	7.32 (7.34)	271.22	$C_4H_{12}N$	
	294-441	29.81 (29.29)	353.33	$C_{15}H_9N$	
	441-750	35.64 (35.52)	644.82	$C_{10}H_9N_2S_2$	Zinc Salt
$ZnL(N_3)_2$. 0.16H_2O	180-200	0.5 (0.5)	-	0.16H_2O	
	200-313	7.32 (7.34)	285.4	C_3H_9N	
	313-450	29.81 (29.29)	376	$C_{11}H_{11}N$	
	450-555	35.64 (35.52)	489	C_3H	
	555-730	5.18 (5.18)	643.55	$C_{11}H_9N_5$	Zinc Salt
$ZnL(NO_3)_2$. 0.91H_2O	50-202	2.72 (2.72)	-	0.91H_2O	
	202-375	19.04 (19.82)	309.69	$C_8H_{14}N_2$	
	375-525	14.74 (14.7)	440.92	C_7H_6	
	525-728	53.87 (52.57)	631.5	$C_{13}H_{10}N_4O_6$	Zn

Publication Date: 05-02-2023 ISSN: 2706-6495

TABLE (5) thermodynamic parameters (ΔE^*, (ΔH^*, ΔS^* and ΔG^*) of decomposition processes of ligand and its complexes

Compound	Decomposition step (°C)	E^* (KJ/mol)	A^* (S^{-1})	ΔS^* (KJ/mol.K)	ΔH^* (Kj/mol)	ΔH^* (Kj/mol)
Ligand	148-400	40.36	1.34×10	-3.11×10^{-2}	35.80	$2.06\times10^{+2}$
	400-700	93.17	$6.66\times10^{+2}$	-2.62×10^{-2}	87.27	$2.37\times10^{+2}$
$ZnLCl_2$	215-320	128.28	9.46× 11	-8.38×10^{-1}	123.90	$1.68\times10^{+2}$
	320-528	17.57	1.32×10^{-3}	-3.70×10^{-2}	12.15	$2.53\times10^{+2}$
	528-660	114.88	$1.77\times10^{+4}$	-2.36×10^{-2}	107.38	$3.21\times10^{+2}$
	660-820	85.39	$1.03\times10^{+1}$	-2.93×10^{-2}	77.27	$3.64\times10^{+2}$
$ZnLBr_2.0.39H_2O$	235-390	69.82	$1.53\times10^{+3}$	-2.53×10^{-2}	64.66	$2.22\times10^{+2}$
	390-530	43.55	4.51×10^{-1}	-3.22×10^{-2}	37.76	$2.62\times10^{+2}$
	530-805	89.51	$4.13\times10^{+1}$	-2.87×10^{-2}	81.66	$3.52\times10^{+2}$
$ZnLI_2$	200-320	102.16	$1.07\times10^{+9}$	-1.41×10^{-2}	97.60	$1.75\times10^{+2}$
	320-428	71.01	$2.11\times10^{+4}$	-2.33×10^{-2}	65.11	$2.30\times10^{+2}$
	428-519	83.54	$1.73\times10^{+4}$	-2.36×10^{-2}	76.38	$2.80\times10^{+2}$
	519-762	29.52	1.95×10^{-2}	-3.50×10^{-2}	21.86	$3.45\times10^{+2}$
$ZnL(NCS)_2.0.096H_2O$	223-294	51.72	$1.40\times10^{+2}$	-2.74×10^{-2}	45.82	$2.41\times10^{+2}$
	294-441	78.87	$4.99\times10^{+3}$	-2.46×10^{-2}	71.72	$2.84\times10^{+2}$
	441-750	79.94	$2.19\times10^{+1}$	-2.92×10^{-2}	72.29	$3.41\times10^{+2}$
$ZnL(N_3)_2.0.16H_2O$	200-313	71.01	$2.11\times10^{+4}$	-2.33×10^{-2}	65.11	$2.30\times10^{+2}$
	313-450	83.54	$1.73\times10^{+4}$	-2.36×10^{-2}	76.38	$2.80\times10^{+2}$
	450-555	29.52	$1.95\times10^{+2}$	-3.50×10^{-2}	21.86	$3.45\times10^{+2}$
	555-730	100.67	$7.80\times10^{+2}$	-2.62×10^{-2}	93.02	$3.35\times10^{+2}$
$ZnL(NO_3)_2.0.91H_2O$	202-375	66.03	$1.50\times10^{+3}$	-2.53×10^{-2}	61.47	$2.00\times10^{+2}$
	375-525	38.55	1.27×10^{-1}	-3.33×10^{-2}	32.64	$2.69\times10^{+2}$
	525-728	78.87	$4.99\times10^{+3}$	-2.46×10^{-2}	71.72	$2.84\times10^{+2}$

4. Conclusion

In this study, a new bidentate Schiff base ligand of *N*, *N*`-bis [(E)-3-(4-dimethyl amine) phenylallylidene]-phenylen-1,2-diamine, in ethanol solvent was synthesized and then complexes Zn(II) was also made by the above ligand.

All of these compounds were identified by various physical and chemical methods including molar conductivity, melting point, FT-IR, UV-Vis, ^{1}H-NMR and TG. Based on the results, the general formula of MLX_2 in which X ions of chloride, bromide, iodide, azide, thiocyanate and nitrate were proposed for the complexes. In the IR spectrum, fast absorption at 1604cm^{-1}, which belongs to the azometin group (C=N) and this absorption band is transferred to lover energies in the complexes, which coordinated the ligand from the nitrogen said of the azometin group to Zn(II) ion confirms. In the UV-Vis spectrum of the ligand, a transition appears at 402nm depending on the $\pi\rightarrow\pi^*$ azometin group (C=N). The results of ^{1}HNMR nucleus magnetic resonance spectra show that hydrogen, depending on the C=N bond, olefin group hydrogen and aromatic rings in the synthesized compounds shifts to a lower level (weaker field) than the ligand. This also confirms the coordinated of the azometin group (C=N) with Zn(II). The thermal behavior of the synthesized compounds was studied using TG/DTG/TGA diagrams and based on the results, the ligand was completely decomposed and the zinc-related complexes were completely decomposed. In addition, a number of thermosynthic parameters of ligand and complexes were calculated using TG/DTG diagrams.

5. References:

1. M. Petrus, R. Bouwer, U. Lafont, S. Athanasopoulos, N. Greenham, T. Dingemans, (2014). *Mater Chem*. 2, 9474-9477.
2. S. Ilhan, H.Baykara, M. Seyitoglu, A. Levent, S. Ozdemir, A.Dündar, A. Oztomsuk, M. Cornejo. (2014). *Molec Struc*, 1075, 32-42.
3. M. Gaber, N. A. El-Wakiel, H.El-Ghamry, S.K. Fathalla. (2014). *Molecu Struc*, 1076, 251-216.
4. S. Banerjee, C.Adhikary, C. Rizzoli, R. Pal. (2014). *Inor. Chimica Acta*, 209,202-207.
5. W. Qin, S. Long, M. Panunzio, S. Biondi. (2013). *Molecules*, 18, 12264-12289.
6. G. Grivani, G. Bruno, H.A. Rudbari, A. D. Khalaji, P. Pourteimouri. (2012). *Inor. Chem. Commun*. 18, 15-20.
7. G. Grivani, A. Ghavami, M. Kucerakova, M. Dusek, A.D. Khalaji. (2014). *Mole. Struct*, 1076, 326-332.
8. T. B. Wei, G.-Y. Gao, W.-J. Qu, B.-B. Q. Shi,Lin, H. Yao, Y-M. Zhang. (2014). *Sensor. Actuato. Chemical*, 199, 142-147.

9. P. Fita, E. Luzina, T. Dziembowska, C. Radzewicz, A. Grabowska. (2006). *Chem. Phys*, 125, 184-508.

10. M. Nath, P.K. Saini. (2011). *Dalton. Transa*, 40 ,7077-7121.

11. S. M. Bensaber, H. Allafe, N.B. Ermeli, S.B. Mohamed, A.A. Zetrini, S.G.Alsabri. M. Erhuma, A. Hermann, M.I. Jaeda, A.M. Gbaj, (2014). Chemical synthesis, molecular modelling, and evaluation of anticancer activity of some pyrazol-3-one Schiff base derivatives. *J. Medic. Chem. Resear*. 23**,** 5120-5134.

12. M. M. Abd-Elzaher, A. A. Labib, H. A. Mousa, S. A. Moustafa, M. M. A. A. Ali,El-Rashedy. (2016). Synthesis, anticancer activity and molecular docking study of Schiff base complexes containing thiazole moiety. *J. Basic Appl. Sci* 5, 85-96.

13. K.V. Shuvaev, L.N. Dawe, L.K. Thompson. (2010). A MnII12 Supramolecular Array with Four Independent Spin-Coupled Subunits, *J. Inorg. Chem.* 4583-4586.

14. M. Sunita, M. Padmaja, B. Anupama,C.G.Kumari. (2012). Synthesis, characterization, DNA binding and cleavage studies of mixed-ligand Cu (II) complexes of 2, 6-bis (benzimidazol- 2-yl) pyridine, *J. Fluorescence.* 22,103-112.

15. A. Pandey, R. Rajavel, S. D. Dash, Chandraker, (2012). Synthesis of Schiff bases of 2-amino-5- aryl-1, 3, 4-thiadiazole and its analgesic, anti-inflammatory and anti-bacterial activity. *J. Chem.* 9, 2524-2531.

16. K.M. Abuamer, A. A. Maihub, M. M. El-Ajaily, A. M. Etorki.M. M. Abou-Krisha, M. A. Almagani. (2014). the role of aromatic Schiff bases in the dyes techniques. *J. Org. Chem*. 7.

17. D. Z.Beata, B. Magdalena, C. Christophe, B. Georges. (2020). Nonlinear optical study of Schiff bases using Z-scan technique, *J. Optics. Laser Techno*. 124, 105968.

18. D. Rosita, P. Barbara. (2020). the Role of Zinc (II) Ion in Fluorescence Tuning of Tridentate Pincers: A Review. J. Molecules. 25, 4984.

19. P. M. Jadhav. (2020). A review on biological activities of Schiff base ligand and their metal complexes. *J.Chem.Tech.* 13, 217-221.

20. R.Udupi. (2012). Synthesis and biological screening of certain new triazole Schiff bases and their derivatives bearing substituted benzothiazole moiety. *J. Chem. Pharm. Research* 4, 1151-1159.

21. L. Jia, J. Xu, X. Zhao, S. Shen T. Zhou, Z. Xu, T. Zhu, R. Chen, T. Ma, J. Xie. (2016). Synthesis, characterization, and antitumor activity of three ternary dinuclear copper (II) complexes with a reduced Schiff base ligand and diimine coligands in vitro and in vivo. *J. Inorg. Biochem.* 159, 107-119.
22. K.S. Kumar, S. Ganguly, R. Veerasamy, E. De Clercq. (2010). Synthesis, antiviral activity and cytotoxicity evaluation of Schiff bases of some 2-phenyl quinazoline-4 (3) H-ones. European Journal of Medicinal Chemistry, J. Med. Chem. 45, 5474-5479.
23. Z. Shokohi-Pour, H. Chiniforoshan, A.A. Momtazi-Borojeni, B. A Notash. (2016). novel Schiff base derived from the gabapentin drug and copper (II) complex: Synthesis, characterization, interaction with DNA/protein and cytotoxic activity. *J. Photochem. Photobiol. Boil*.162, 34-44.
24. P.A. Vigato, S. Tamburini, The challenge of cyclic and acyclic Schiff bases and related derivatives. Coordination Chemistry Reviews, *J. Chem. Rev.* 248 (2004) 117-2128.
25. P. R. Inamdar, R. Chauhan, J. Abraham, A. Sheela. (2016). DNA interaction and cytotoxic activity of copper complex based on tridentate hydrazone derived ligand and nitrogen donor heterocycle. *Inorg. Chem.Commun*. 67, 67-71.

Doi: doi.org/10.52132/Ajrsp.en.2023.46.1

The Role of Artificial Intelligence in Tackling Covid-19 (A Review)

By: Smrutirekha Panda

Department of Electrical Engineering, Government Engineering College, Keonjhar, Odisha, India

Email: smrutirekhap.panda@gmail.com

Abstract

This paper investigates how Artificial Intelligence (AI) can be used to combat the Covid 19 epidemic. The article first introduces the benefits of AI and how it has been used to aid people during the pandemic. The history of the Covid-19 pandemic is laid out, and AI technology is introduced. It then examines the responses to the pandemic and its effects on the economy and society. The research uses a qualitative methodology, which entailed looking at original documents and supplementary materials like scholarly articles and books about the subject. The paper used this method to determine how various forms of artificial intelligence could combat Covid 19. Among these were improvements to vaccines and medications and the ability to detect and identify infections, manage their remediation, keep track of individuals' contacts, predict mortality rates, and calculate them. Additionally, the paper explored how AI technology has affected disease prevention efforts and how further study of AI could benefit healthcare. After observing the effectiveness of AI technologies in halting the spread of the Covid 19 pandemic, the authors concluded that more study was required to fully grasp the long-term effects of AI technology in healthcare and its ethical implications.

Keywords: Artificial Intelligence (AI), Covid-19, Machine Learning, Neural Networks, Deep Learning, and pandemic.

1. INTRODUCTION

AI has become one of the fastest-growing technologies worldwide. Technology has been greatly appreciated because of its different advantages. The different impacts obtained from AI have been seen to be good for humankind. The recent developments of the covid 19 pandemic have resulted in different impacts on the world. Most people have gone through different types of suffering because of the pandemic. AI technology showcased many applications in helping people through the pandemic. AI technology was used by organizations such as the World Health Organization (WHO) to analyze the number of people affected by the virus (Geyser, 2021). Henceforth, AI has been a new revolution in information technology. AI has enabled most organizations to have a solution through such a tough time. This research discusses the overall role of AI technology on covid 19 and some of the implications of this technology.

2. BACKGROUND ON ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a cutting-edge innovation. In most fields, technological advancements are seen as essential. AI is how machines attempt to mimic human intelligence and behavior (Pampliega, 2019). Computer systems have become one of the leading machines to be influenced by AI technology heavily. One of the reasons that have caused this technology to grow and develop greatly is its potential impact on different industries (Tsenkova & Toyoda, 2001). AI is still being researched and learned. Researchers and organizations are learning more about technology to learn more aspects (Wirawan, 2021). This factor has brought the terminology that AI learns more over time (Haddock & O'Keefe, 1990). The idea that AI has the potential to succeed is also one factor that has made the technology greatly endorsed.

AI technology has different applications in different firms. The application of AI technology across different industries has made it very popular. This factor has also made many people learn and research the concepts (ECS, 2018). This aspect makes the concept of AI greatly grow and develop. Technology's main driving force is trying to ensure machines can reason like humans' brains. Over the years, this concept has been closely achieved. This factor can be viewed from the recent advancements and accomplishments in AI.

3. How Artificial Intelligence Works

Aichner, a communications official in Microsoft Teams, tried to relate machine-learning approaches for noise cancellation with machine-learning methods for speech recognition. Aichner found that a massive corpus of consumers talking into the microphone for voice recognition should be recorded (Ernes et al., 2021). After recording, human beings should be requested to mark the voice information by recording what has been stated. Rather than mapping the microphone input into written words, individuals will attempt to change from noise to clear speech in noise cancellation. With such strategies, Microsoft Teams will train the model to comprehend the variation between speech and noise, and the model will learn to maintain the speech. In developing the training datasets, Microsoft Teams took thousands of dissimilar speakers with more than 100 forms of noise (Kadykalo, 2019). The team then integrated the noiseless clear speech with noise to feign a microphone signal. The training model is then fed with clear speech as the foundation of truth. The team enquires from the training model to abstract a pure signal and its features from noisy data. Therefore, the neural network is trained in supervised learning to identify the basic truth.

According to Hinton et al. (2012), the primary truth is the speech in the microphone when recognizing speech (Pesec, 2020). In real-time cancellation, the primary truth speech should be free from noise. The Microsoft Team can effectively train its model by providing massive data sets for hundreds of hours of data. The model will learn to generalize and minimize noise using a clear speech even if the speech was not part of the training data.

To properly understand the role of AI in the pandemic, one should first understand how AI works. The entire ideology of AI technology is that it tries to make machines reason like human brains. This factor has ensured that most electronic products are included with the technology to receive a large market. AI, in general, is a huge concept mixed with different concepts (Vadinský, 2018). Special products and hardware are always required to ensure that AI successfully runs in a product. AI systems have thus been included in different machines or products to achieve efficiency.

The technology of Artificial intelligence involves very many different factors. The main use of AI technology was invented in analyzing pieces of information (Boden, 1984). As showcased above, AI technology involves the development of systems that can analyze and interpret information similarly to humans. AI technology has been developing in recent years. Many people must understand what it entails and how it affects different industries. This factor was showcased in a study conducted in 2017, where 17% of 1500 business leaders understood this concept (Ernes et al., 2021). This aspect was showcased as an underlying factor that impacts the development of AI technology.

AI technology combines large amounts of data, fast processing, and intelligent algorithms. This feature allows AI technology to detect patterns in the available data and learn from this data. Therefore, AI technology involves various technologies and methods (Boden, 1984). These methods and theories are included as a subfield of AI technology. Different languages can be used to develop the machine language of machine learning. The theories and methods listed below are some of the subfields of AI technology.

A. *Machine Learning*

Machine learning is a large part of AI technology - it is considered a branch of AI technology and computer science. It involves the automation of analytical model building. Different methods are included in the hidden data insights in neural networks, statistics, and operations research. By interpreting large amounts of data is possible to determine these concepts. Improving the learning concepts like humans ensures more accuracy (Pesec, 2020). Machine learning was first developed in 1962 when a machine learning algorithm was included in the game of checkers. Robert Nealey, a master in this game, was fond of losing to this computer. This aspect was a major milestone in machine learning (Trappl, 2019). One of the fields that have been greatly appreciated is machine learning technology in the field of data science.

The field of data science has appreciated machine learning concepts because it can analyze vast information and detect the patterns available. The accuracy and speed included in the machine learning algorithms are one of the factors that have made this technology to be appreciated greatly (Ryman-Tubb et al., 2019). Data mining projects have also been included in the applications of machine learning algorithms. The demand for machine learning will continue to increase as data increases.

B. *Neural Networks*

Neural Networks are technology-focused on mimicking the way the human brain functions. The technology is concerned with the operations included in the human brain and how it interprets a vast amount of data. The technology is used in different industries for various applications, such as financial interpretation (Sharma & Dash, 2023). Neural networks in financial industries enable financial forecasting, trading algorithms, and securities classification. The field of finance has developed greatly from neural network technology (Sriram, 1987). A neuron in the neural network is the mathematical function that can classify the available information in a specific architecture. The network relies greatly on statistical methods that are used in the interpretation of the available data.

Similarly to the brain, a neural network involves nodes connected in different layers. Each node in the network is a perception of eh available multiple linear regression. This perception is essential in feeding the signal produced by the multiple linear regression nodes into an activation function. This ideology ensures that the concepts work together to serve the different applications of neural networks. A neural network in the trading algorithms will evaluate the available price data and make trading decisions. Other application areas include market research solutions, risk assessment, and fraud detection.

C. *Deep Learning*

Deep learning is also a key part of artificial intelligence. It is included as a subset of machine learning, helping computers perform human-like tasks. These tasks include speech recognition, image identification, and making a prediction (Chrisley, 2016). This technology has increased the capabilities of machines to classify data. Recognition, detection, and describing are key concepts that have grown with advances in deep learning in machine learning and Artificial intelligence in general.

Deep learning is considered a great part of Artificial intelligence. The key application can be seen in our daily products, such as Siri and Cortana. With deep learning, computers are trained to understand large amounts of data patterns, ensuring we learn from these patterns (Dash et al., 2022). The technology of deep learning has evolved over the years. This technology has included various concepts, all concerned with the evolution of machine understanding (Bohre et al., 2015). Besides its applications, it is one of the most sought deep learning principles in computer vision. The evolution of AI and robots is concerned with computer vision. Through these concepts, deep learning plays a huge part in the overall evolution of AI technology (see Fig 1).

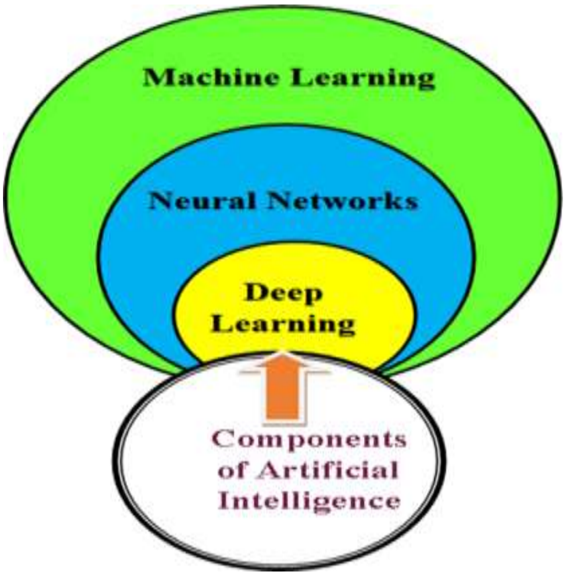


Fig 1. Components of AI

4. Background of Covid 19

Covid 19 affected different operations worldwide, creating a pandemic. The disease is caused by an infectious virus called SARS-CoV-2 (Norlen, 2020). The symptoms of the virus are similar to those of the common cold virus. One of the aspects that made the disease a pandemic was how easily it could be transmitted from one individual to the next [VD, 2020]. The disease impacted most of the normal operations in the world through different mitigation measures, impacting people's lives. Lockdowns and a ban on globalization were painful measures that interfered with the social construct and day-to-day operations.

The virus was first detected in December 2019 in Wuhan, China. The World Health Organization (WHO) concluded that it was a new type of coronavirus. The virus spread very first across the globe, facilitated by globalization. The health impacts of the disease included an infection in the respiratory tract of the affected individuals. This aspect affected most people's lives and sometimes led to death. The spreading of the disease was mainly through contact. Every person may experience unique symptoms relating to respiratory tract infection (Jayasinghe, 2021). The impact of the virus was felt worldwide when governments started including measures to fight the spread of the disease. Overall impacts of the virus were aspects such as how people's lives were changed by the measures placed to fight the spread of the disease. Many countries received many cases and had to impose measures to avoid more spread.

One of the key measures imposed was the ban on international travel (Hassan, 2021). This measure aimed to decrease the rate at which the virus spread across different individuals.

Early research on the spread of the virus showcased that a single individual could affect two to three others (Roloff, 2020). This aspect led to an increase in new cases reported every week. Data collected by WHO found that the spread of the virus was associated with the interactions of different individuals (Bansa, 2020). Reported from the CDC also included a report showing that a person could be infected if they stay within 6 feet of an infected person for a minimum of 15 minutes (Oliveira, 2020). This aspect led to increased measures being implemented to fight the spread of the diseases.

5. Measures to Fight Against the Spread of Covid 19

Different measures were included to fight against the spread of the virus. These measures were placed in most countries to ensure that minimal impact was felt. All the measures placed were made to ensure the virus was tackled. Technological innovations were also included in assisting these measures. One of these key measures was the wearing of face masks. By wearing face masks, it was possible to ensure that people remained safe. Wearing face masks was made mandatory to protect people from contracting the virus. People are still required to continue wearing face masks to remain safe. Facemasks were considered the first key measure to ensure the spread of the virus had been minimized.

The next key measure was the aspect of online schools and working from home. Online learning greatly ensured that the spread of the virus did not impact students. Through online learning, students continued with their studies after the closure of schools. Working from home was also introduced, where people who could work from home were given permission [26]. This attribute included the technology innovations of technologies such as Zoom and Meet. The two technological developments allowed people to communicate through the internet (Chiu, 2020). The two measures above ensured that contact at the workplace and school was minimized.

Another key aspect that was included was the attribute of online shopping. Companies like Amazon, which supported online shopping, greatly developed based on this factor. The technology enabled people to shop online and deliver their products to their doorstep (Opast, 2021). This factor ensured that the transmission of the virus through market products was reduced (Benefit, 2021).

The attribute also ensured that people remained safe. Another measure that was also introduced included the aspect of sanitization throughput. Organizations and companies were required to erect sanitization sections to achieve this factor.

Table 1. Methods used to fight Covid 19 and their impacts

Measures to fight Covid 19	**Positive Impacts**	**Negative Impacts**
Washing hands regularly	➢ Reduced transmission and spread of disease	✚ N/A
Social distancing	➢ Reduced transmission of the virus ➢ Reduced risk of infection	✚ Lack of social interaction ✚ Economic impact
Mask wearing	➢ Reduced transmission of the virus ➢ Reduced risk of infection	✚ Inconvenience ✚ Difficulty breathing
Quarantine	➢ Reduced transmission of the virus ➢ Reduced risk of infection	✚ Loss of freedom ✚ Financial hardship
Vaccinations	➢ Reduced transmission of the virus ➢ Reduced risk of infection ➢ Reduced risk of severe illness	✚ Potential side effects ✚ Cost of vaccinations
Sanitizing	➢ Reduced transmission of the virus ➢ Reduced risk of infection ➢ Reduced risk of severe illness	✚ Cost of supplies
Contact tracing	➢ Reduced transmission of the virus ➢ Reduced risk of infection	✚ Privacy concerns
School/Business Closures	➢ Reduced transmission of the virus ➢ Reduced risk of infection	✚ Economic impact ✚ Lack of social interaction

6. METHODOLOGY

Researcher relied on a qualitative methodology to learn how AI can help with Covid 19. The qualitative method was utilized to comprehend the overarching ideas and the influence of AI on the epidemic. Primary and secondary sources were utilized in the research process. Articles and publications relevant to the topic were analyzed as part of the primary research. This research strategy facilitated deeper comprehension of the report's many abstract ideas. Different reports and publications were analyzed to determine their relevance to the topic, which constituted the secondary sources used. This aspect was essential to making sense of the study as a whole.

Additionally, the research focused on studies examining the overall applications of AI technologies in fighting the virus. The applications were included in the health organizations, businesses, research organizations, and organizations impacted by the pandemic (Elhami et al., 2019). The impacts of AI technology on Covid 19 could be divided into different aspects such as diagnosis, treatment, transmission evaluation, etc. Every application of AI was attributed to the fight against the pandemic.

7. AI TECHNOLOGY AND COVID 19

Based on the impacts of the Covid 19 pandemic, various aspects must be included to tackle the above impacts. Tackling Covid 19 and its impacts was essential across different industries (Lapostolle et al., 2021). The innovations in different sectors aimed to reduce the impacts and the total number of cases globally. AI was regarded as one of the aspects that could tackle the virus and its impacts (Chiu, 2020). Below are some of the ways through which AI technology could tackle Covid 19.

D. *Diagnosis and Recognition for the Patient's Infection*

The first major use of AI technology for Covid 19 has been recognizing patient infection. The attribute of visual learning has been key in different health organizations. It is always hard for humans to detect simple and smaller changes. AI technology, on the other hand, can easily recognize such changes. This factor makes AI technology able to recognize symptoms and infections in individuals (Dawson, 2021). Machines used in hospitals have been included with AI algorithms to help with this factor. Visual learning in deep learning and neural networks lay a huge part in the overall impact of AI technologies in the health industry.

AI is said to resolve infrequent symptoms available and other red alarms available. The healthcare management can be notified of an available diagnosis that the AI has made. The attribute is considered because it offers a faster response than human analysis. The response helps in saving costs since it can observe different patients in a short time. This factor ensures that more people are diagnosed, and healthcare management saves money and time. For the Covid 19 virus, the technologies ensure they have learned from previous patients' data (Kommu, 2021). This factor ensures that the symptoms can be analyzed quickly and that a diagnosis is provided through the available algorithms.

AI has also been used to recognize the available infection through MRI, Magnetic Resonance Imaging technology (Park et al., 2020). The technology involves scanning the human body and providing health management with changes resulting from the virus. Understanding these changes will help analyze the other patients to be treated (Voleti, 2020). Diagnosis and Recognition of the Patient's Infection is thus a major impact of AI technology in tackling the Covid 19 virus.

E. Controlling the Remediation

Technology also played a huge part in the remediation of the virus. Understanding the virus behavior is a key part of controlling the pandemic. This attribute involves AI technology being able to read huge amounts of data. Technology plays a huge role in predicting the propagation of this pandemic (Voleti, 2020). This factor is obtained from AI technology's ability to build an intelligent framework for auto-controlling and predicting the behavior of the pandemic.

The development of a neural network that could be extracted as seen from the behavior of the virus is one of the underlying factors that ensure the disease can be controlled. This attribute will ensure proper remediation and monitoring of the influenced patients. Patient updates can be given continuously, and the provision of available solutions for these updates. The overall impact of this benefit will ensure that the virus has been mitigated. The attribute of AI technology controlling the remediation of Covid 19 will ensure that patients can maintain themselves without help from others (Wee & Findlay, 2020). This aspect ensures that cost has been saved exponentially through this technology.

F. *Tracing of Contact for The Users*

One of the main factors that are making the virus to be deadly is the rate of spread. Reducing the number of cases being detected daily has been researched to be a key way of mitigating the virus spread. This attribute could be showcased through the prevention of more cases happening. Contact tracing was one of the key ways of preventing the virus from spreading (Leslie, 2020). The aspect of contact tracing involves tracing every individual that had contact with a person. To stop the number of available cases, contact tracing is used to trace every individual that had contact with a certain infected individual. In this way, the individual may be told to isolate themselves from others.

Contact tracing can be easily achieved through AI technologies. Using AI algorithms in contact tracing makes ntire process faster. AI can detect the clusters and contagion of the patients. This data will help the authorities reach these people and ask them to self-isolate. The technology is also ensured by interpreting each patient's vast data (Geyser, 2021). The technology can also trace all the available patients and research the person who contaminated them. This attribute is considered one of the key ways AI technologies could mitigate the increase in new cases. AI technology can also estimate the near course of Covid 19 and the available pre-existence estimation.

G. *Estimation of the Number of Cases and Death-Rate*

Understanding the number of cases was a key requirement in the pandemic. Every country is required to provide the WHO with the number of recorded cases (Naudé, 2020). This factor will ensure that the organization understands which countries require the most help. The attribute also ensures that the vaccines produced can be provided to the hugely affected countries (Dash & Sharma, 2022a). The death rate was also essential in keeping track of the overall impact of the virus. Understanding the number of death rates ensured that the virus's mortality rate could be tracked.

AI played a huge part in showcasing the spread of the disease - AI is essential in tackling the number of cases of infections across different countries. The spread and potential distribution are also aspects calculated with the help of technology (Wright, 2020).

AI is essential in predicting the most affected regions in the coming years and the available nations that require more measures than others (Manzo & Pellino, 2021). The number of cases and death rates were obtained through publicly available data, media networks, and social networking.

H. Improvement of Vaccines and Drugs

Drug research is a key essential part of the tackling of Covid 19. Finding the vaccine or cure for the symptoms of the virus was an important part of undertaking the disease. The disease generally affects many lives (Dash & Sharma, 2022b). The more people affected by the virus, the more vaccine research was prioritized. AI technologies have recently been integrated into drug and vaccine research (Bansa, 2020). The technology is used to research more vaccine information, which is then provided to the researchers. By providing more details concerning the virus, it becomes necessary to make drugs and vaccines that work.

The technology has also been found to support the making of the Covid 19 vaccine. The available side effects are analyzed with the help of AI technology. The technology was also greatly utilized in creating and expanding available drug distribution methods. Drug distribution is an important part of the tackling process (Haque & Abdelgawad, 2020). People who greatly need the vaccines must receive them first. Medical tests and vaccines were included throughout Covid 19 mitigation. The technology helped ensure that the improvement of vaccines and drugs was made possible. The technology of machines using AI also ensured that drug manufacturing processes were automated. This aspect ensured that more doses were being produced at a time. This factor showcases that AI technology plays a huge part in tackling Covid 19.

I. The Disease Prevention

AI technology played a huge part in trying to save more people from the disease. This aspect was evident from analyzing the vast amount of publicly available data. The governments and organizations analyzed different information and found ways to avoid further disease transmission. The first key disease prevention method was ensured by predicting possible areas of infection-understanding the areas of infection provided necessary data on the influx of the virus (Dash, 2021; Lovetrue, 2020). This data ensured that organizations and governments could understand beds and healthcare staff requirements at given periods (Lovetrue, 2020). AI will analyze the data and prevent such an outbreak based on the information collected during this pandemic.

The different factors will ensure that preventative measures have been placed for future virus outbreaks. Analyzing the data using AI technologies showcases that it is essential to disease prevention. This factor showcases that disease prevention through AI technology is an essential part through which AI technology can tackle Covid 19.

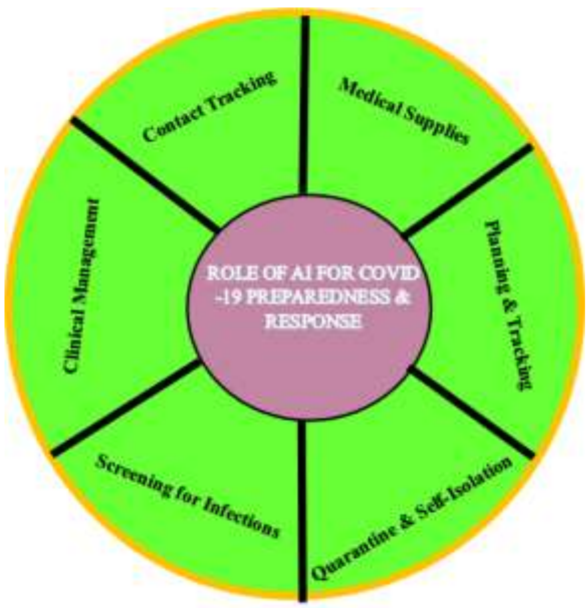


Fig 2. Role of AI for Covid I9 preparedness and response

The image above summarizes some key aspects through which AI tackles Covid 19. It shows the overall process through which AI technology could be used in Covid 19 pandemic, specifically for preparedness and response.

8. RESULTS

According to the findings, AI technologies successfully combat the Covid 19 epidemic. Diagnosis, recognition of infection, remediation management, user contact tracking, case, mortality rate estimation, and enhancement of vaccines and drugs are some areas where artificial intelligence technologies have been used. AI technologies in the fight against disease have also been demonstrated to be crucial. Decision-makers at various institutions have benefited greatly from the information made available by AI technologies deployed to combat Covid 19. As a bonus, technological advancements have reduced expenses and accelerated processes.

The capacity of AI technologies to process large amounts of data has been instrumental in enhancing the efficiency of the healthcare system as a whole. According to the findings, AI tools are crucial in the battle against the Covid 19 pandemic.

9. Future Research and Recommendation

This study gives a full picture of how AI can help us deal with Covid 19. Studies have shown that AI technologies are crucial for accurate diagnosis, contact tracing, and disease prevention. Yet more study is needed in a few key areas. Understanding the long-term effects of AI technology in healthcare is an important area for future research. This research has only focused on the immediate effects of AI on Covid 19 so far. Examining how AI will change the medical field is a crucial future study area. To do so entails researching how AI may affect the healthcare sector, among other things, by examining its impact on other diseases and conditions. The ethical ramifications of using artificial intelligence in medicine is another promising area for future study. The ethical implications of using AI technologies are still being explored, despite the technology's potential to alter the healthcare system radically. The risk of biased judgments, privacy issues, data security, and other related topics will all be investigated. Finally, research into the economic effects of AI on the healthcare sector is essential. Artificial intelligence technologies may help the healthcare sector save money and work more efficiently. The cost-benefit analysis of artificial intelligence (AI) technologies and their potential effects on the healthcare industry should be thoroughly researched.

10. Conclusion

The number of applications of AI technology is increasing. The increase in this number of applications showcases that the future will have more influence on AI technologies. Companies should ensure that more research is designated for future AI technologies. AI is regarded as a fourth-revolution technology. This factor means that technology is considered a huge part of the evolution of the globe. The growth of AI technology impacts various industries. This factor means that there is a high possibility that AI will entail 80% of all innovations in the next 30 years. A key recommendation for healthcare organizations is that they should adopt technologies greatly. The report showcases that technologies have a higher chance of tackling pandemics. More research into these perspectives will ensure that virus outbreaks such as Covid 19 can be prevented. Covid 19 pandemic was one of the greatest impacts on the globe.

The pandemic affected a lot of lives and resources. The impacts resulting from the pandemic were devastating across different countries. Different measures were placed to try and tackle the virus.

One of these technologies included AI technology. AI proved to be a huge part through which Covid 19 infection rates could be prevented. The research has identified some of the ways through which AI technology tackled the pandemic. Covid 19 was greatly impacted by the rise of AI. Some of these ways included contact tracing and drug and vaccine production. All of the ways through which AI affected Covid 19 showcase that it could be used to prevent future virus outbreaks. The report also examines the background of AI technology and some of its applications today. The fight against the Corona Virus pandemic is continuing, and more health organizations should include AI technology in this fight. This factor will ensure that more lives are saved through technology.

11. Acknowledgment

While working on this article, Dr. Swati Swayamsiddha, a professor of Electronics Engineering at KIIT University, and the other faculty members were a great help and source of advice for the author. Dr. Swati's time and effort in reading this work and offering enlightening commentary are greatly appreciated by the author.

12. References

Bansal, P. (2020). Impact of COVID-19 on Healthcare Workers. International Journal Of Clinical Case Reports And Reviews, 3(3), 01-03. https://doi.org/10.31579/2690-4861/047

Benefit, M. (2021). The synergistic impact of climate change and COVID-19 on gut health in Africa. Medical & Clinical Research, 6. https://doi.org/10.33140/mcr.06.027

Boden, M. (1984). Impacts of artificial intelligence. Futures, 16(1), 60-70. https://doi.org/10.1016/0016-3287(84)90007-7

Bohre, A., Agnihotri, G., Dubey, M., & Kalambe, S. (2015). Impacts of the Load Models on Optimal Planning of Distributed Generation in Distribution System. Advances In Artificial Intelligence, 2015, 1-10. https://doi.org/10.1155/2015/297436

Chiu, C. (2020). How COVID-19 and Policies to Combat the Spread of COVID-19 Impact the World Stock Markets. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3644471

Chrisley, R. (2016). Embodied artificial intelligence. Artificial Intelligence, 149(1), 131-150. https://doi.org/10.1016/s0004-3702(03)00055-9

Dash, B. (2021). A hybrid solution for extracting information from unstructured data using optical character recognition (OCR) with natural language processing (NLP).

Dash, B., & Sharma, P. (2022a). Role of Artificial Intelligence in Smart Cities for Information Gathering and Dissemination (A Review). Academic Journal of Research and Scientific Publishing, 4(39).

Dash, B., & Sharma, P. (2022b, December). Impact of Digitalization on Shaping Consumer-Centered Smart Healthcare System-A Comprehensive Study. In 2nd International Conference on Advances in Computing & Information Technologies (CACIT 2022).

Dash, B., Sharma, P., & Ali, A. (2022). Federated Learning for Privacy-Preserving: A Review of PII Data Analysis in Fintech. International Journal of Software Engineering & Applications, 13(4), 1-13.

Dawson, M. (2021). Cybersecurity Impacts for Artificial Intelligence use within Industry 4.0. Scientific Bulletin, 26(1), 24-31. https://doi.org/10.2478/bsaft-2021-0003

ECS. (2018). Corrosion Measurement on Reinforced STEEL Concrete after Exposure to Marine Environment By Electrochemical Noise Technique with Artificial Intelligence. ECS Meeting Abstracts. https://doi.org/10.1149/ma2018-02/14/677

Elhami, B., Farahani, S., & Marzban, A. (2019). Improvement of energy efficiency and environmental impacts of rainbow trout in Iran. Artificial Intelligence In Agriculture, 2, 13-27. https://doi.org/10.1016/j.aiia.2019.06.002

Ernes, R., Wirawan, N., & Defnizal. (2021). Pengimplementasian Artificial Inteligence pada Sistem Keamanan Locker Otomatis berbasis SMS Gateway dan Radio Frequency Identification. JurnalKomtekinfo, 8(1),7-65. https://doi.org/10.35134/komtekinfo.v8i1.98

Geyser, L. (2021). The Impact of Covid-19 on Food Security. A qualitative analysis of the rise in London's existing food insecurity due to the financial impact of Covid-19. World Nutrition, 12(1), 40-50. https://doi.org/10.26596/wn.202112140-50

Geyser, L. (2021). The Impact of Covid-19 on Food Security. A qualitative analysis of the rise in London's existing food insecurity due to the financial impact of Covid-19. World Nutrition, 12(1), 40-50. https://doi.org/10.26596/wn.202112140-50

Haddock, J., & O'Keefe, R. (1990). Using artificial intelligence to facilitate manufacturing systems simulation. Computers & Industrial Engineering, 18(3), 275-283. https://doi.org/10.1016/0360-8352(90)90049-r

Haque, K., & Abdelgawad, A. (2020). A Deep Learning Approach to Detect COVID-19 Patients from Chest X-ray Images. AI, 1(3), 418-435. https://doi.org/10.3390/ai1030027

Hassan, D. (2021). Impact of Covid-19 on people and Work from Home. Pakistan Biomedical Journal, 3(2). https://doi.org/10.52229/pbmj.v3i2.10

Jayasinghe, N. (2021). The COVID-19 Pandemic and the Impact of COVID-19 on Sri Lanka Economy. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3911088

Kadykalo, A. (2019). The vision of technology's effect upon a human being in the context of the development of artificial intelligence (Review of Max Tegmark's Book "Life 3.0: Being Human in the Age of Artificial Intelligence" [Ukrainian language edition], 432 p. Kyiv, 2019). Humanitarian Vision, 5(2), 45-47. https://doi.org/10.23939/shv2019.02.045

Kommu, G. (2021). An AI (Artificial Intelligence) based Device for Covid-19 Fever Detection. International Journal For Research In Applied Science And Engineering Technology, 9(VI), 2745-2748. https://doi.org/10.22214/ijraset.2021.35548

Lapostolle, F., Petrovic, T., Goix, L., & Adnet, F. (2021). Impact of COVID-19 pandemic on non-COVID-19 publications. Resuscitation, 162, 102-103. https://doi.org/10.1016/j.resuscitation.2021.02.020

Leslie, D. (2020). Tackling COVID-19 through Responsible AI Innovation: Five Steps in the Right Direction. Harvard Data Science Review. https://doi.org/10.1162/99608f92.4bb9d7a7

Lovetrue, B. (2020). The AI-discovered aetiology of COVID-19 and rationale of the irinotecan+ etoposide combination therapy for critically ill COVID-19 patients. Medical Hypotheses, 144, 110180. https://doi.org/10.1016/j.mehy.2020.110180

Manzo, M., & Pellino, S. (2021). Fighting Together against the Pandemic: Learning Multiple Models on Tomography Images for COVID-19 Diagnosis. AI, 2(2), 261-273. https://doi.org/10.3390/ai2020016

Naudé, W. (2020). Artificial intelligence vs. COVID-19: limitations, constraints, and pitfalls. AI & SOCIETY, 35(3), 761-765. https://doi.org/10.1007/s00146-020-00978-0

Norlen, T. (2020). The Impact of COVID-19 on Salafi-Jihadi. Connections: The Quarterly Journal, 19(2), 11-23. https://doi.org/10.11610/connections.19.2.01

Oliveira, M. (2020). Pandemia COVID-19: Impacto (Também) na Cardiologia. Gazeta Médica. https://doi.org/10.29315/gm.v7i2.349

Opast. (2021). Plausible Transition of Covid-19 from Pandemic to an Endemic State: Impact of Variant UK Strain, b 7.1.1, on the Spread of Covid-19 in the Population. Advances In Bioengineering And Biomedical Science Research, 4(2). https://doi.org/10.33140/abbsr.04.001

Pampliega, C. (2019). Inteligencia artificial en el sector de la construcción = Artificial inteligence in construction sector. Building & Management, 3(2), 1. https://doi.org/10.20868/bma.2019.2.3917

Park, G., Kim, H., & Li, Y. (2020). Virtue for Post COVID-19 and A.I. Technology. J-Institute, 5(2), 8-18. https://doi.org/10.22471/ai.2020.5.2.08

Pesec, M. (2020). IMPACT OF ARTIFICIAL INTELLIGENCE DEVELOPMENT ON NATIONAL SECURITY. CONTEMPORARY MILITARY CHALLENGES, (Volume 2020, issue 22/1), 109-128. https://doi.org/10.33179/bsv.99.svi.11.cmc.22.1.7

Roloff, R. (2020). COVID 19 and No One's World: What Impact for the European Union? Connections: The Quarterly Journal, 19(2), 25-36. https://doi.org/10.11610/connections.19.2.02

Ryman-Tubb, N., Krause, P., & Garn, W. (2018). How Artificial Intelligence and machine learning research impacts payment card fraud detection: A survey and industry benchmark. Engineering Applications Of Artificial Intelligence, 76, 130-157. https://doi.org/10.1016/j.engappai.2018.07.008

Sengar, V., & Das, S. (2020). APPLYING AI IN TIMES OF COVID-19. International Journal Of Engineering Applied Sciences And Technology, 5(1), 314-318. https://doi.org/10.33564/ijeast.2020.v05i01.049

Sharma, P., & Dash, B. (2023). Smart SCM using AI and Microsoft 365. IJARCCE, 12(1). https://doi.org/10.17148/ijarcce.2023.12106

Sriram, D. (1987). Impacts of artificial intelligence. Artificial Intelligence In Engineering, 2(1), 49. https://doi.org/10.1016/0954-1810(87)90073-2

Trappl, R. (2019). SPECIAL ISSUE ARTIFICIAL INTELLIGENCE: FUTURE, IMPACTS, CHALLENGES PART 3. Applied Artificial Intelligence, 7(1), iii-iii. https://doi.org/10.1080/08839519308949971

Tsenkova, R., & Toyoda, K. (2001). Artificial Intelligence in Dairy Farming: Near-Infrared Approach. IFAC Proceedings Volumes, 34(28), 167-172. https://doi.org/10.1016/s1474-6670(17)32843-4

Vadinský, O. (2018). An Overview of Approaches Evaluating Intelligence of Artificial Systems. Acta Informatica Pragensia, 7(1), 74-103. https://doi.org/10.18267/j.aip.115

VD, K. (2020). COVID-19: Impact on Indian Agriculture. International Journal Of Psychosocial Rehabilitation, 24(5), 3465-3472. https://doi.org/10.37200/ijpr/v24i5/pr202057

Voleti, R. (2020). AI-A Shield against COVID-19. International Journal For Research In Applied Science And Engineering Technology, 8(7), 14-17. https://doi.org/10.22214/ijraset.2020.7004

Wee, A., & Findlay, M. (2020). AI and Data Use: Surveillance Technology and Community Disquiet in the Age of COVID-19. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3715993

Wirawan, N. (2021). P Pengimplementasian Artificial Inteligence Pada Sistem Keamanan Locker Otomatis Berbasis SMS Gateway dan Radio Frequency Identification. KOMTEKINFO, 8(1), 57-65. https://doi.org/10.35134/komtekinfo.v8i1.1573

Wright, K. (2020). An AI Assist for Spotting COVID-19 in X-Rays. Physics, 13. https://doi.org/10.1103/physics.13.73

Doi: doi.org/10.52132/Ajrsp.en.2023.46.2