# Solvent Free Synthesis of some Metal Complexes of Novel Ligand Derived from 2-Amino-5, 6-Dimethyl Benzimidazole with 2-Bromo Isophthalaldehyde and Characterization, Biological Activity of Same 

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#### Abstract

A solvent free and environmentally green synthesis using scientific microwave method of novel ligand derived from 2-amino-5,6-dimethyl benzimidazole with 2-bromo Isophthalaldehyde. Metal complexes were derived from nitrate of Mn(II) and chlorides $\operatorname{Ag}(I), \mathrm{Co}(I I), \mathrm{Ni}(I I), \mathrm{Cu}(I I), \mathrm{Zn}(I I), \mathrm{Cd}(I I), \mathrm{Fe}(I I I)$ salts with novel ligand. At the end of the reaction all metal complexes show fine color. By TLC and melting point of each complex was confirming the formation of metal complex. Characterization of novel ligand carried out by elemental analysis, IR spectroscopy, ${ }^{1} H N M R$ spectroscopy, LCMS and characterization of metal complexes carried out by IR spectroscopy, UV spectroscopy and TGA. The novel ligand and its all metal complexes show antibacterial activity against E-Coli, S.Aureus and S.Typhi.


Keywords: Solvent free, Green Synthesis, 2-amino-5,6-dimethyl benzimidazole, 2-bromo Isophthalaldehyde, Antibacterial activity.

## I. INTRODUCTION

Solvent free, green and eco-friendly view of synthesis is increasing in chemistry. Now a day, use of scientific microwave for synthesis is becoming popular. This is the solvent free or less solvent synthesis. It helps to reduce pollution, gives better yield and reduces cost. Simple reaction conditions and important is time saving [1-3]. Synthesis using microwave irradiation technique is environmentally very safe and effective [4-5]. The compound containing Azomethine/Imine ( $\mathrm{C}=\mathrm{N}$ ) group are known as Schiff base ligand [6]. The products of ketone or aldehyde with primary amine are generally known as Schiff base [7]. They are biologically very active compounds, having biological activities like antibacterial [8], antimicrobial [9], anticancer [10], plant growth inhibitors [11] and so on.

## II. EXPERIMENTAL SECTION

All the chemicals used in this work were of analytical grade. 2-amino-5,6-dimethyl benzimidazole and 2-bromo Isophthalaldehyde form Sigma Aldrich and metal nitrates and chlorides from loba chem and MERCK. The novel ligand synthesized in scientific microwave oven. Metal complexes were synthesized by reacting novel ligand with metal salts in scientific microwave oven.

## A. Material and Method

All the starting chemicals are of analytical grade. 2-amino-5,6-dimethyl benzimidazole and 2-bromo Isophthalaldehyde were purchased from Sigma Aldrich and metal salts from Loba chem and MERCK. The novel Schiff base ligand was synthesized by using scientific microwave oven. Syntheses of metal complexes were performed by reacting Schiff base ligand with metal salts in scientific microwave oven.

## B. Techniques

Synthesis was performing in microwave extraction system in scientific microwave oven. Melting points were measured on digital melting point apparatus. The electronic absorption spectra were recorded in the wavelength range 200 to 400 nm using UV spectrophotometer. IR spectra were analyses on Shimadzu Dr 8031. The ${ }^{1}$ HNMR spectra was analyse in DMSO D6 on Brakers 400 MHz instrument. The mass spectrum was recorded by LCMS spectrophotometer. The TGA were carried out in dynamic nitrogen atmosphere ( $30 \mathrm{ml} / \mathrm{min}$ ) with heating rate of $10^{\circ} \mathrm{C} / \mathrm{min}$ using Shimadzu TGA 50 H thermal analyser. TLC analysis performs on pre coated aluminium plates.

## C. Preparation of Novel Ligand

The novel Schiff base ligand was prepared by the reaction between 2-amino-5,6-dimethyl benzimidazole ( 0.63 gm .) and 2-bromo Isophthalaldehyde ( 0.38 gm .) under solvent free condition in scientific microwave oven about 15 min . The irradiated product after cooling at room temperature washed with dry ether. The yield obtained was 0.84 gm . And melting point was $256^{\circ} \mathrm{C}$. The purity of the product confirm by TLC.

## 1) Reaction


( $Z$ )- $N$-((2-bromo-3-((Z)-(5,6-dimethyl-1 H -benzo[d]imidazol-2-ylimino)methyl)phenyl)methylene)-5,6-dimethyl-1 $H$-benzo [d]imidazol-2-amine

## D. Preparation of Metal Complexes

The metal complexes were synthesized under solvent free condition by irradiating metal nitrate or metal chloride with the required amount of the ligand. The reaction mixture was irradiated in microwave oven. The products were washed with dry ether, filter and dried at room temperature. The metal salts used were $\mathrm{MnCl}_{2}$, $\mathrm{Fe}\left(\mathrm{NO}_{3}\right)_{3} \cdot 9 \mathrm{H}_{2} \mathrm{O}, \mathrm{Co}\left(\mathrm{NO}_{3}\right)_{2} \cdot 6 \mathrm{H}_{2} \mathrm{O}, \mathrm{Ni}\left(\mathrm{NO}_{3}\right)_{2} \cdot 6 \mathrm{H}_{2} \mathrm{O}, \mathrm{Cu}\left(\mathrm{NO}_{3}\right)_{2} \cdot 3 \mathrm{H}_{2} \mathrm{O}$, $\mathrm{Zn}\left(\mathrm{NO}_{3}\right)_{2} \cdot 6 \mathrm{H}_{2} \mathrm{O}, \mathrm{Cd}\left(\mathrm{NO}_{3}\right)_{2} .4 \mathrm{H}_{2} \mathrm{O}$ and $\mathrm{AgNO}_{3}$.

## III. RESULT AND DISSCUSION

All metal complexes and novel ligand are colored, solid and stable at room temperature. They possess sharp melting point. The complexes are insoluble in common organic solvents but soluble in DMF and DMSO.

## A. Physical Properties

Physical properties of the novel ligand and metal complexes summarized in Table I
Table I

| Sr. No | Molecular formula | Color | Melting point <br> $\left({ }^{\circ} \mathrm{c}\right)$ | Time | Yield \% |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | $\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}$ | Yellow | 256 | 15 min | 83 |
| 2 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Mn}$ | Dark Yellow | 181 | 240 sec. | 83 |
| 3 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Fe}$ | Brown | 188 | 60 sec. | 85 |
| 4 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Co}$ | Brown | 174 | 120 sec. | 96 |
| 5 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ni}$ | Light Green | 208 | 60 sec. | 100 |
| 6 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cu}$ | Green | 148 | 60 sec. | 100 |
| 7 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Zn}$ | Dark Yellow | 132 | 60 sec. | 100 |
| 8 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cd}$ | Greenish | 280 | 90 sec. | 100 |
| 9 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ag}$ | Yellow | 218 | 60 sec. | 100 |

## B. Mass Spectral Studies

The mass spectrum study of novel ligand showed a peak at $\mathrm{m} / \mathrm{z} .500(\mathrm{M}+1)$ that corresponds to the molecular weight of the Schiff base ligand 499.

## C. ${ }^{I}$ HNMR Spectral Studies

Observed ${ }^{1}$ HNMR peaks ( ppm ) of novel Schiff base ligand summarized in Table II.
Table-II

| Compound | H-from four Methyl <br> Groups in ppm | H-from Aromatic ring <br> In ppm | H-from-NH of <br> Imidazole In ppm |
| :---: | :---: | :---: | :---: |
| $\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}$ | $2.50-2.51$ | $6.87-8.48$ | 5.89 |

The ${ }^{1}$ HNMR spectrum of novel ligand shows different peaks. The characteristic peak observed at 5.89 ppm is due to H -from NH-of Imidazole. The peaks observed at $6.87-8.48 \mathrm{ppm}$ are due to H -from aromatic rings. The peaks observed at $2.50-2.51 \mathrm{ppm}$ is due to H-from four Methyl Groups.

## D. Infrared spectra analysis

Observed IR frequencies of novel ligand and its metal complexes summarized in Table III.
Table-III

| Sr. <br> No | Ligand/complex | $\mathrm{C}=\mathrm{N}\left(\mathrm{cm}^{-1}\right)$ | $\mathrm{C}-\mathrm{H}\left(\mathrm{cm}^{-}\right.$ <br> $\left.{ }^{1}\right)$ | $\mathrm{N}-\mathrm{H}\left(\mathrm{cm}^{-}\right.$ <br> $\left.{ }^{1}\right)$ | $\mathrm{C}=\mathrm{C}$ <br> $\left(\mathrm{cm}^{-1}\right)$ | $\mathrm{M}-\mathrm{N}\left(\mathrm{cm}^{-}\right.$ <br> $\left.{ }^{1}\right)$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | $\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}$ | 1662.64 | 3280.92 | 3452.58 | 1471.69 | --- |
| 2 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ni}$ | 1730.15 | 3200.00 | 3420.00 | 1454.33 | 576.72 |
| 3 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cu}$ | 1680.00 | 3190.00 | 3400.00 | 1575.84 | 513.07 |

The IR spectrum of novel ligand show characteristics band at $1662.64 \mathrm{~cm}^{-1}$ which indicates ( $\mathrm{C}=\mathrm{N}$ ) stretching vibration of azomethine group [12-17]. The vibrational band at $3452.58 \mathrm{~cm}^{-1}$ assigned $\mathrm{N}-\mathrm{H}$ stretching in the ligand. Band observed at 1471.69 $\mathrm{cm}^{-1}$ corresponds to $\mathrm{C}=\mathrm{C}$ stretching. The band observed at $3280.92 \mathrm{~cm}^{-1}$ indicates aromatic $\mathrm{C}-\mathrm{H}$ stretching in the ligand.
IR spectral study of Ni metal complex: The band appeared at $1730.15 \mathrm{~cm}^{-1}$ corresponds to azomethine $(\mathrm{C}=\mathrm{N})$ stretching, whereas same azomethine band is observed at $1662.64 \mathrm{~cm}^{-1}$ in spectrum of ligand. Which indicate coordination of ligand with metal ion [18]. The band appeared at $3200.00 \mathrm{~cm}^{-1}$ indicates the aromatic (C-H) stretching in complex, whereas same aromatic (C-H) stretching is observed at $3280.92 \mathrm{~cm}^{-1}$ in spectrum of ligand. The band observed at $3420.00 \mathrm{~cm}^{-1}$ assign to $(\mathrm{N}-\mathrm{H})$ stretching, whereas in spectrum of ligand it is observed at $3425.58 \mathrm{~cm}^{-1}$. The vibration observed at $1454.33 \mathrm{~cm}^{-1}$ due to aromatic ( $\mathrm{C}=\mathrm{C}$ ) stretching. The characteristics band appeared at $576.72 \mathrm{~cm}^{-1}$ assign to ( $\mathrm{M}-\mathrm{N}$ ) vibration, which confirms coordination of azomethine and metal ion [19-20]. The weak bands observed at $825.53 \mathrm{~cm}^{-1}$ and $1035.77 \mathrm{~cm}^{-1}$ were due to OH wagging mode of vibration, indicating coordination of water molecule in metal complex [21-24]. Above bands which are appeared in spectrum of complex are not appeared in spectrum of ligand that confirm the formation of metal complex with stable metal ligand bonding.
IR spectral study of Cu metal complex: A stretching observed at $1680.00 \mathrm{~cm}^{-1}$, which corresponds to azomethine $(\mathrm{C}=\mathrm{N})$ stretching vibrations, whereas same stretching is observed at $1662.64 \mathrm{~cm}^{-1}$ in spectrum of ligand. The band appeared at $3190.00 \mathrm{~cm}^{-1}$ assign to aromatic (C-H) stretching, whereas same stretching is observed at $3280.92 \mathrm{~cm}^{-1}$ in spectrum of ligand. The vibration observed at $1575.84 \mathrm{~cm}^{-1}$ due to aromatic $(\mathrm{C}=\mathrm{C})$ stretching. The coordination of metal to nitrogen was justified by stretching observed at 490 $\mathrm{cm}^{-1}$ [25]. The weak bands observed at $825.53 \mathrm{~cm}^{-1}$ and $1033.85 \mathrm{~cm}^{-1}$ were due to OH wagging mode of vibration, indicating coordination of water molecule in metal complex [21-24]. Above bands which are appeared in spectrum of complex are not appeared in spectrum of ligand that confirm the formation of metal complex with stable metal ligand bonding.

## E. Electronic spectra

UV-Vis spectral data and probable geometry for the metal complexes summarized in Table IV
Table-IV

| $\begin{aligned} & \text { Sr. } \\ & \text { No. } \end{aligned}$ | Complex | UV-visible major bands. Absorption Maxima cm ${ }^{1}(\mathrm{~nm})$ | Assignment | Proposed geometry |
| :---: | :---: | :---: | :---: | :---: |
| 1 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ni}$ | 43898.15 (227.80) | ${ }^{3} \mathrm{~A}_{2 \mathrm{~g}} \rightarrow{ }^{3} \mathrm{~T}_{2 \mathrm{~g}}(\mathrm{~F})$ | Octahedral |
|  |  | 44563.27 (224.40) | ${ }^{3} \mathrm{~A}_{2 \mathrm{~g}} \rightarrow{ }^{3} \mathrm{~T}_{1 \mathrm{~g}}(\mathrm{~F})$ |  |
|  |  | 47438.33 (210.80) | ${ }^{3} \mathrm{~A}_{2 \mathrm{~g}} \rightarrow{ }^{3} \mathrm{~T}_{1 \mathrm{~g}}(\mathrm{P})$ |  |
| 2 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cu}$ | 40650.40 (216.00) | ${ }^{2} \mathrm{~B}_{1 \mathrm{~g}} \rightarrow{ }^{2} \mathrm{~A}_{1 \mathrm{~g}}$ | Octahedral |
|  |  | 46296.29 (208.60) | ${ }^{2} \mathrm{~B}_{1 \mathrm{~g}} \rightarrow{ }^{2} \mathrm{~B}_{2 \mathrm{~g}}$ |  |
|  |  |  | ${ }^{2} \mathrm{~B}_{1 \mathrm{~g}} \rightarrow{ }^{2} \mathrm{E}_{\mathrm{g}}$ |  |

UV-Vis spectrum of both metal complexes $\mathrm{Ni}(\mathrm{II}), \mathrm{Cu}(\mathrm{II})$ recorded in the wavelength region 200 nm to 400 nm in DMSO solution.
UV-Vis spectral data of Ni: Electronic spectrum of $\mathrm{Ni}(\mathrm{II})$ complex shows absorption maxima at 43898.15 (227.80), 44563.27 (224.40) and 47438.33 (210.80) assign to ${ }^{3} \mathrm{~A}_{2 \mathrm{~g}} \rightarrow{ }^{3} \mathrm{~T}_{2 \mathrm{~g}}(\mathrm{~F}),{ }^{3} \mathrm{~A}_{2 \mathrm{~g}} \rightarrow{ }^{3} \mathrm{~T}_{1 \mathrm{~g}}(\mathrm{~F})$ and ${ }^{3} \mathrm{~A}_{2 \mathrm{~g}} \rightarrow{ }^{3} \mathrm{~T}_{1 g}(\mathrm{P})$ transitions respectively indicating that complex possess octahedral geometry[26-27].
UV-Vis spectral data of Cu : Electronic spectrum of $\mathrm{Cu}(\mathrm{II})$ complex shows absorption maxima at 40650.40 (216.00) and 46296.29 (208.60) assign to ${ }^{2} \mathrm{~B}_{1 \mathrm{~g}} \rightarrow{ }^{2} \mathrm{~A}_{1 \mathrm{~g}}$, ${ }^{2} \mathrm{~B}_{1 \mathrm{~g}} \rightarrow{ }^{2} \mathrm{~B}_{2 \mathrm{~g}}$ and ${ }^{2} \mathrm{~B}_{1 \mathrm{~g}} \rightarrow{ }^{2} \mathrm{E}_{\mathrm{g}}$ transitions indicating that complex possess octahedral geometry[28-29].

## F. Thermo Gravimetric Analysis of Metal Complexes

Thermo gravimetric analytical data of metal complexes were summarized in Table V .

| $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ni}$ |  | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cu}$ |  |
| :---: | :---: | :---: | :---: |
| Weight loss \% | Temperature ${ }^{\circ} \mathrm{C}$ | Weight loss \% | Temperature ${ }^{\circ} \mathrm{C}$ |
| 0 | 29.22 | 0 | 29.74 |
| 10 | 143.30 | 10 | 93.52 |
| 20 | 213.54 | 20 | 145.87 |
| 30 | 292.20 | 30 | 226.75 |
| 40 | 314.92 | 40 | 263.84 |
| 50 | 367.38 | 50 | 348.18 |
| 60 | 422.05 | 60 | 377.77 |
| 70 | 449.05 | 70 | 394.49 |
| 80 | 476.17 | 80 | 452.83 |
| 84.184\% total wt. loss | 500 | 84.832\% total wt. loss | 500 |

The TGA curve of $\mathrm{Ni}(\mathrm{II})$ was carried out in the temperature range from $29.22^{\circ} \mathrm{C}$ to $500^{\circ} \mathrm{C}$. The heating was carried out in the nitrogen atmosphere, with heating rate $10^{\circ} \mathrm{C} \mathrm{min}$.
In the range of $29.94^{\circ} \mathrm{C}$ to $143.30^{\circ} \mathrm{C}$ water of crystallization lost with $10 \%$ weight loss is observed. Then loss up to organic moiety total weight loss of $84.184 \%$ at $500^{\circ} \mathrm{C}$. Stable curve indicates formation of metal oxide of nickel.
The TGA curve of $\mathrm{Cu}(\mathrm{II})$ was carried out in the temperature range from $29.74^{\circ} \mathrm{C}$ to $500^{\circ} \mathrm{C}$. The heating was carried out in the nitrogen atmosphere, with heating rate $10^{\circ} \mathrm{C} \mathrm{min}^{-1}$. The thermogram of $\mathrm{Cu}(\mathrm{II})$ shows total weight loss of $69.51 \%$. Firstly loss water of crystallization in the range of $29.74^{\circ} \mathrm{C}$ to $93.52^{\circ} \mathrm{C}$. Lastly loss of organic moiety with total weight loss at $500^{\circ} \mathrm{C}$ was $84.832 \%$. A stable curve shows the formation of metal oxide of copper.


Proposed structure of metal complex (M)=Mn(II), $\mathrm{Fe}(\mathrm{III}), \mathrm{Co}(\mathrm{II}), \mathrm{Ni}(\mathrm{II}), \mathrm{Cu}(\mathrm{II}), \mathrm{Zn}(\mathrm{II}), \mathrm{Cd}(\mathrm{II}), \mathrm{Ag}(\mathrm{I})$.

## G. Bioactivity Study

Antibacterial activity of novel Schiff base ligand and its metal complexes were summarized in Table VI.
Table-VI

| Sr. No. | Compound | Minimum inhabitation concentration (ug/ml) |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | E. Coli | S. Aureus | S. Typhi |
| 1 | $\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}$ | 250 | 125 | 250 |
| 2 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Mn}$ | 62.5 | 500 | 250 |
| 3 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Fe}$ | 500 | 500 | 100 |
| 4 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Co}$ | 100 | 250 | 100 |
| 5 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ni}$ | 125 | 250 | 50 |
| 6 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cu}$ | 100 | 250 | 125 |
| 7 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Zn}$ | 200 | 50 | 25 |
| 8 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Cd}$ | 100 | 125 | 125 |
| 9 | $\left[\left(\mathrm{C}_{26} \mathrm{H}_{23} \mathrm{~N}_{6} \mathrm{Br}\right)_{2}\left(\mathrm{H}_{2} \mathrm{O}\right)_{4}\right] \mathrm{Ag}$ | 250 | 250 | 200 |

Antibacterial activity of synthesized novel ligand and its metal complexes were performing against Escherichia Coli, Staphylococcus Aureus and Salmonella Typhi. Which were grown overnight at $37^{\circ} \mathrm{C}$ temperature. The minimum inhibitory concentration (MIC) was evaluated against test bacteria. Concentration ranging is in between $0.4 \mathrm{ug} / \mathrm{ml}$ to $10 \mathrm{ug} / \mathrm{ml}$. Mn (II) shows better and $\mathrm{Co}(\mathrm{II}), \mathrm{Cu}(\mathrm{II}), \mathrm{Cd}(\mathrm{II})$ good antibacterial activity on E.coli as compared to rest of metal complexes and parent ligand. Zn (II) complex shows excellent antibacterial activity on S.Aureus as compared to rest of metal complexes and parent ligand. $\mathrm{Zn}(\mathrm{II})$ and $\mathrm{Ni}($ II $)$ shows excellent antibacterial activity on S.Typhi as compared to rest of metal complexes and parent ligand.

## IV. CONCLUSION

The microwave method assures the principle of green chemistry. The novel ligand was synthesized from 2-amino-5,6-dimethyl benzimidazole and 2-bromo Isophthalaldehyde. It forms stable binuclear complexes with transition metal ions such as Mn (II), $\mathrm{Fe}(\mathrm{III}), \mathrm{Ni}(\mathrm{II}), \mathrm{Cu}(\mathrm{II}), \mathrm{Co}(\mathrm{II}), \mathrm{Zn}(\mathrm{II}), \mathrm{Cd}(\mathrm{II})$ and $\mathrm{Ag}(\mathrm{I})$. The novel ligand and its eight metal complexes show good antibacterial activity.

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