SYNTHESIS, SPECTRAL CHARACTERIZATION, HOMO-LUMO AND CYTOTOXIC STUDIES OF *p* – CHLORO DIBENZYLTIN(IV) BROMIDE WITH 4, 7 DIPHENYL – 1, 10 – PHENANTHROLINE

[a,]*S. Chandrasekar, [a]T.Sankar ganesan, [b]V. Balachandran, [c]K. Balasubramani
Head & Associate Professor Research Scholar Assistant Professor Assistant Professor
[a*,a]Department of Chemistry, Arignar Anna Government Arts College, Musiri, Tiruchirappalli 621 211, India.
[b]Department of Physics, Arignar Anna Government Arts College, Musiri, Tiruchirappalli 621 211,India.
[c]Department of Chemistry, Government Arts College (Autonomous), Karur 639 005, India.

Abstract: The p-substituted diorganotin(IV) complex (p - ClBz)$_2$ SnBr$_2$ 4, 7 – diphenyl 1,10 – phenanthroline **(b)** is synthesized and characterized by using FT – IR, ^{1}H, ^{13}C and ^{119}Sn NMR analyses. All spectral studies revealed that the complex formation of bathophenanthroline with *p*-substituted diorganotin dihalides at normal reaction conditions. Single crystallography of the complex **b** had confirmed that the tin atom is in octahedral geometry with the benzyl group in the axial positions. The HOMO –LUMO structure and energy gap reveals the intramolecular charge transfer (ICT) are calculated. *In vitro* assay were prepared for the study of cytotoxicity and anticancer activities using *Vero* and *HeLa* cell lines.

***Keywords: p*- Chlorodibenzyltindibromide, 4, 7-diphenyl – 1, 10 – Phenanthrolines, Synthesis, Crystal Structures, HOMO, LUMO and Anticancer activity.**

I. Introduction

The evolution of new therapeutic agents is a major task in today's society. The role metal-based drugs in this respect have been grasped with questions being asked regarding the toxicity issues of such compounds. Only few metal based drugs are available such as platinum based compounds for cancer treatment till now [1]. The platinum based drugs are not capable of resist in the growth of all forms of malignant cells. To find an alternative new metal based drugs therapies are to be developed in order to resist the broad range of disease.

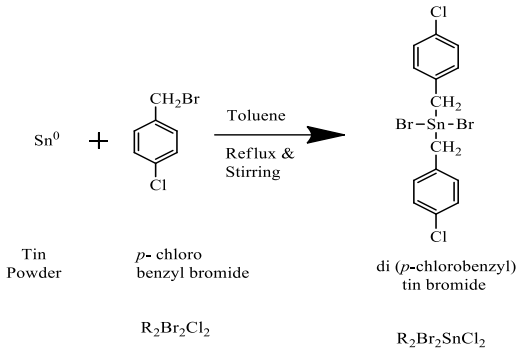
In order to suppress the antitumour / cytotoxicity effects in human body, many researches are carried out for the development of organotin(IV) compounds[2–4]. The number of the organo group attached to the tin atom helps to determine the antitumor activity. The numerous applications of the organotin(IV) compounds linked with nitrogen donor ligands have gained great importances in the recent years [5]. Diorganotin dihalides and ligands showing N-C-C-N skeleton structure such as 2-aminomethyl pyridine and 1, 10- phenanthroline the ratio 1:1 found exhibit the antitumor properties and it has been reported in the previous literature [6]. Herein, we report the design and synthesis of new organotin(IV) complex with phenanthroline derivative. Characterized by the elemental analyses for FT-IR, ^{1}H NMR, ^{13}C NMR, ^{119}Sn NMR. In addition, HOMO-LUMO and structural analyses for X-ray crystallography analysis have been discussed for the investigated molecular system and Anti-therapeutic studies.

II. Experimental Procedure

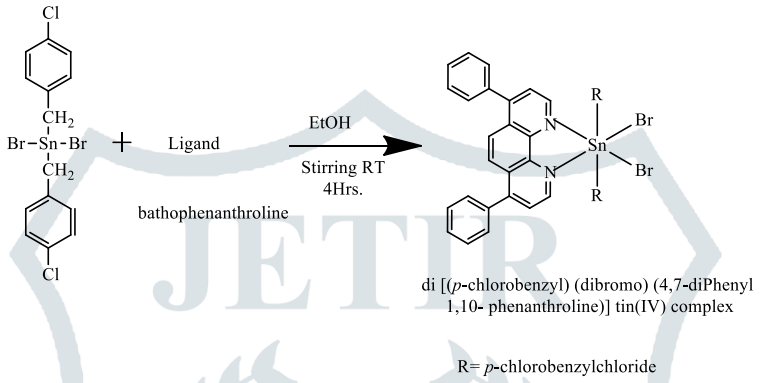
2.1. Materials

p-chlorobenzyl bromide was commercially purchased from Aldrich company and was used as such without further purification. 4, 7 – diphenyl-1, 10-phenanthroline were purchased from Aldrich and was used without further purification. All solvents were dried according to a standard procedure. Melting points were obtained with Sigma instruments apparatus.

2.2 [di (*p*-chlorobenzyl) (dibromo) (4,7-diphenyl 1,10- phenanthroline)] tin(IV), complex



Scheme.1.Synthesis of di (*p*-chlorobenzyl) tin bromide, (a)



Scheme.2. Synthesis of [di (*p*-chlorobenzyl) (dibromo) (4, 7-diphenyl 1, 10- phenanthroline)] tin(IV), complex (b)

2.2.1 Synthesis of di (*p*-chlorobenzyl) tin bromide, (a)

To 4.0 g (0.034 mol) of tin powder, three drops (or 1-2% of the weight of tin) of water was added and kneaded together. The tin powder was suspended in 75 ml of toluene under efficient stirring and heated to the boiling point of the dispersing agent. To this suspension, 6.90 g (0.034 mol) of *p*-chlorobenzyl bromide was added dropwise and refluxed for three hours. Yellow solid (15 g or 84%) and recrystallized from ethyl acetate to give 13.5 g (75%) of white crystals with a silky appearance. Extraction of the recovered tin powder (2 g or 0.016 moles) with water gave no inorganic salt. Yield: 13.5 g (75%) m.p.180° C. This procedure is followed from the reported work in the literature [7,8].

Spectral Results:

^{1}H NMR ($CDCl_3$) ppm: δ 3.211 (s, 4H, $2CH_2$, groups, $^{2}J^{117/119}_{Sn-}{}^{1}_{H}$ = 72 Hz); m 7.207-7.228 (8H, Ar-H),

^{13}C NMR ($CDCl_3$) ppm: δ 32.18 (Sn-CH_2 groups); 128.84-129.60, 132.22 (Ar-C)

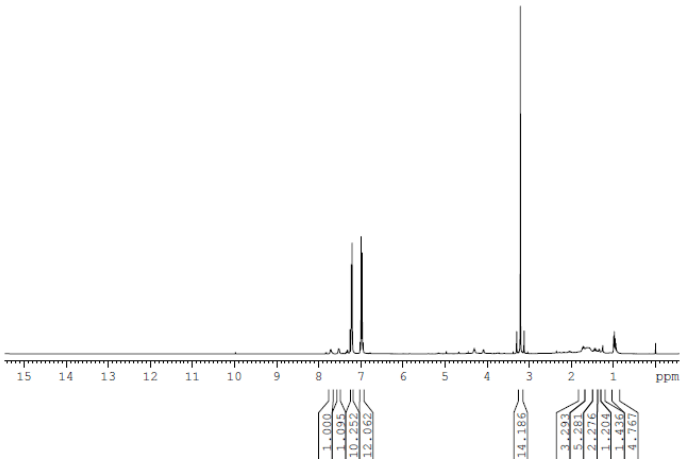


Fig.1

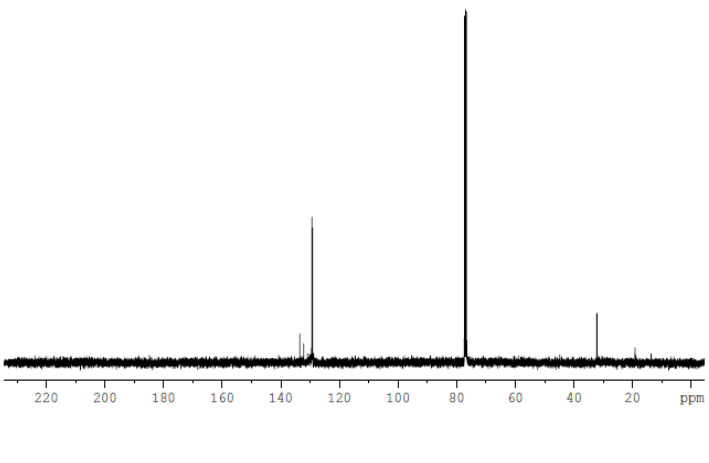


Fig.2

Fig.1 & 2 ^{1}H &^{13}C NMR spectra of di (*p*- chloro benzyl)tin(IV) bromide

2.2.2 Synthesis of bis(p-chlorobenzyl) (dibromo) (4,7 diphenyl - 1, 10-phenanthroline) tin (IV) complex (b).

To the solution of di (p-chlorobenzyl) tin bromide (0.3g, 0.00057 mol) in methanol, 4, 7 - diphenyl - 1, 10-phenanthroline (0.183 g, 0.00057 mol) in methanol was added drop wise using a pressure equalizing funnel. During the addition, the colour of the reaction mixture slowly turned yellow and the mixture was allowed to stir for one hour. After the completion of the reaction, the solvent was removed completely *in vacuum*. A pale yellow solid was obtained. The obtained product was crystallized by vapour diffusion method as follows. The solid was dissolved in chloroform in a vial and was placed in a beaker containing petroleum ether. Crystals separated after two days. Yield = 0.2 g. 85% m.p: 240º C decomposed.

^{1}H NMR ($CDCl_3$) ppm: δ: 3.520 (s, 4H, $2CH_2$ groups, $^{2}J^{117/119}_{Sn\text{-}^{1}H}$ =140.4 Hz); 6.183, 6.213, 6.276, 6.333 (m, 8H, phenyl groups); 7.527, 7.547, 7.559, 7.617, 7.633, 7.643,(m, 10H, phen-Ar-H) 7.706, 7.723, 7.912, 9.543, 9.560 (6H, phen-H)

^{13}C NMR ($CDCl_3$) ppm: δ 55.92 (Sn – CH_2 groups) 124.75, 125.19, 126.40, 126.60 128.80, 129.20, 129.55, 129.67, 130.00, 135.41, 138.55, 140.66, 148.47, 153.10 (Ar-C).

^{119}Sn NMR ($CDCl_3$) ppm: δ −343.532, 1Sn.

III. Results and discussion

The complex **b** were characterized by FT-IR, multinuclear (^{1}H, ^{13}C, ^{119}Sn) NMR spectroscopic techniques X-ray and Cytotoxicity and anticancer activities in addition to physical parameters such as melting points. The X-ray data have been compared with the theoretical values obtained by B3LYP/LanL2DZ calculation method in this section.

Spectroscopic data

3.1.1 FT-IR

Infrared spectrum (cm^{-1}) was recorded using KBr discs using a Perkin Elmer System 2000 FT-IR spectrometer. IR spectroscopy is useful tool in structural determination of coordination compounds [9, 10]. The υ(C=N) band at 1623 cm^{-1} found in the spectrum of free ligand complex, showing that the phenanthroline nitrogen coordinates with the central tin atom [9-11]. The υ (Sn-N) bands was observed at 475cm^{-1}. This bands indicates coordination between the organotin compounds and the ligand moiety. The presence of single Sn- C stretching vibration at 551cm^{-1}.Further the appearance of the other frequencies in the region at C-N, C-C, C-H, and Sn-Br respectively 1521 cm^{-1}, 3067 cm^{-1}, 3387 cm^{-1} and 430 cm^{-1} [12]. The FT-IR spectrum of complex **b** is shown in the **Fig.3**. Ligand show a moderately strong sharp peak due to C=N stretching vibration in the peak

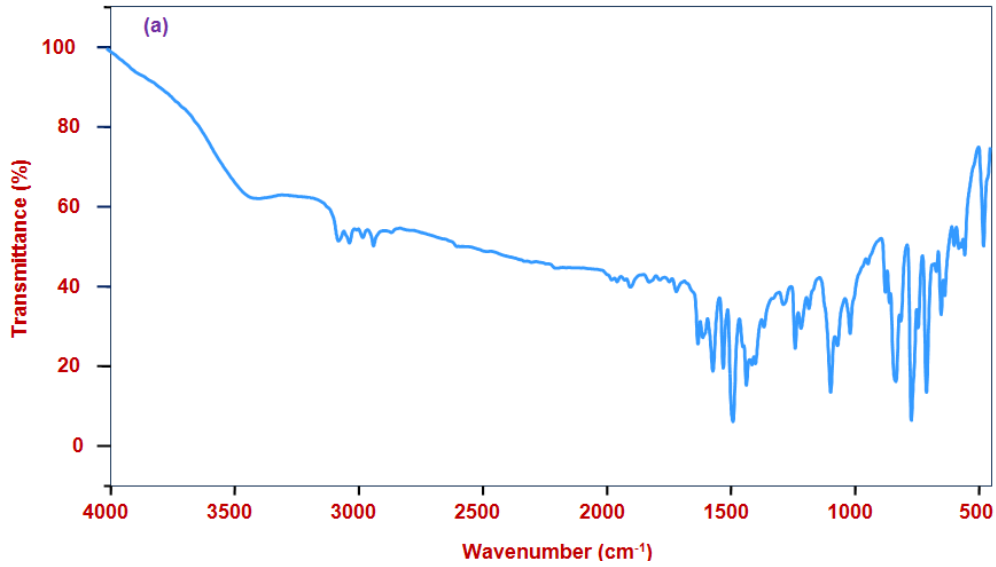


Fig. 3 FT-IR spectrum of [di(o-chlorobenzyl)(dichloro) (4,7-diphenyl-1,10-phenanthroline)]tin(IV) complex (b)

3.1.2 ^{1}H NMR

On a Bruker Avance 500 MHz ^{1}H, ^{13}C and ^{119}Sn NMR spectra were recorded in $CDCl_3$ at room temperature. Me_4Si and Me_4Sn were used as standard sample for recording ^{1}H NMR, ^{13}C NMR and ^{119}Sn NMR. The ^{1}H NMR spectrum of compound **(a)** is shown in **Fig. 1.** The presence of methylene group attached to tin atom has been confirmed from the satellite peak observed at 3.211 ppm. In the down field region the multiplet peaks observed at range of 7.207 – 7.228 ppm has been confirmed the presence of aromatic peaks. The coupling constant shows that the tin is in tetra coordination in the compound.

The ^{13}C NMR spectrum is shown in the **Fig. 2**. The presence of methylene carbon bonded to the tin atom by the peak observed at 32.18 ppm. Both ^{1}H and ^{13}C NMR spectra have confirmed the tetra coordination of the tin atom in the molecule have been above spectral studies.

In **Fig.4** the ^{1}H NMR spectrum, of this complex **(b)** is shown and recorded in $CDCl_3$. The multiplicity pattern along with their intensity was used to identify the chemical shift for the group. The integration values are in good agreement with the number of protons in complex.

The tin and methylene proton atom attached in this complex indicate the proton spectrum to the signal at 3.520. For the spectrum chemical shift values 6.183 – 9.560 ppm are indicate the singlet, doublet, and multiple observed for the protons of the ligand and benzyl tin moieties[13]. The multiplicity pattern is useful for assignment of the substituted dibenzyl tin chlorides moiety for ^{1}H NMR chemical shift. Confirms the coupling constant values for Sn – C atom coordination of ligand with organotin compounds comparable with literature studies. The coupling constant J [^{119} Sn –^{1}H] observed for this complex is140.HZ [14]. The coupling constant value higher than the range of 58.02-58.8HZ confirms the geometry of the complex is six coordinated [15].

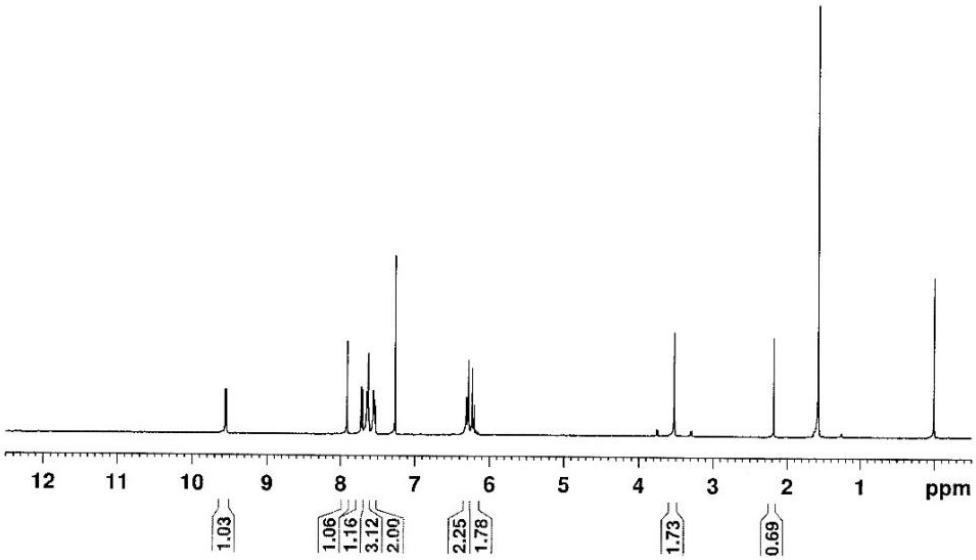


Fig.4 ^{1} H NMR spectrum of [di(*p*-chlorobenzyl)(dibromo) (4,7-diphenyl-1,10-phenanthroline)]tin(IV) compl

Phenanthroline nitrogen loan pair electrons donated by the tin atom which is attributed by the signal at the range of 9.543 ppm to 9.560 ppm in the down field area. This is likely due to the coordination of the nitrogen atoms to tin [16]. The j value is 5.1HZ in the range of 1.2 HZ -8.4 HZ observed for various doublet peaks of 4, 7 disubstituted 1,10-phenanthroline complex formation is confirmed by the difference is observed in the chemical shift values 3.211(a) and 3.520(b) for each CH_2 groups of the starting compound and the corresponding complex . [17]

The ^{13}C NMR spectrum of this complex indicated the likely aliphatic and / or aromatic signals. The signals of ligand are shifted very slightly from their position in the spectrum of free ligand, which can be attributed to the coordination of 1, 10−phenanthroline ligand to the tin and the formation of Sn−N bond [18]. The shift is an importance of an electron density transfer from the ligand to the acceptor [19]. The aromatic carbon atoms of 4, 7−disubbstituted 1, 10−phenanthroline was confirmed by the peaks observed at the range of – 124.75 to 153.10 ppm. [20]. The peak observed to satellites at 55.92 ppm reveals the presence of methylene group carbons attached with Sn atom, [$^{1}J^{119}$ Sn, ^{13}C] = 553.73 Hz **b** [21].

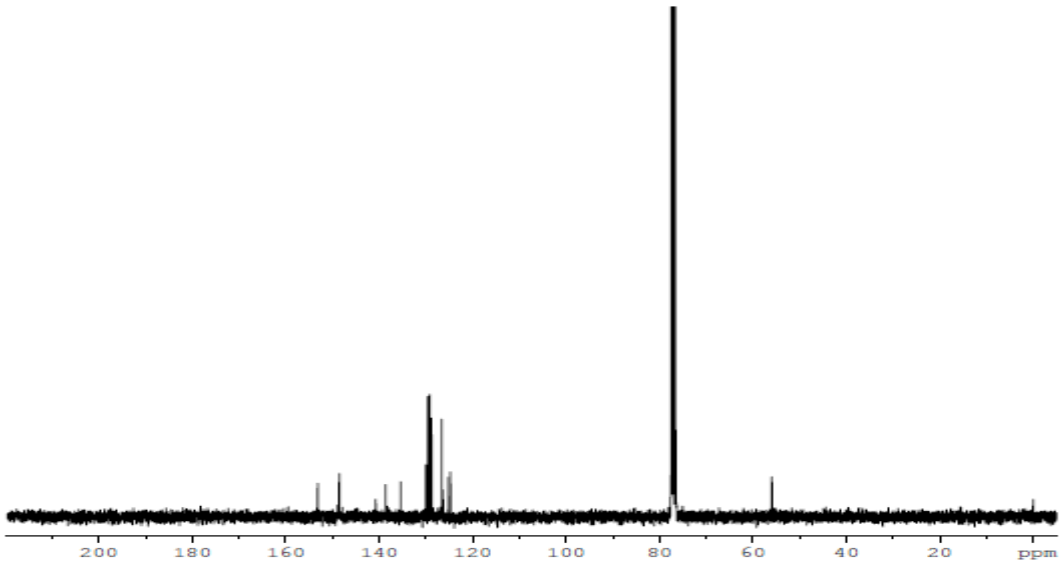


Fig.5. ^{13}C NMR [di(*p*-chlorobenzyl)(dibromo) (4,7-diphenyl-1,10-phenanthroline)]tin(IV) complex

The observation of the $|^{1}J^{119}{}_{Sn}, {}^{13}{}_{C}|$ coupling constant value revealed the coordination of tin atom in the complex and these are comparable with the identical complexes. In order to assess the coordination number around Sn atom in all types of organotin

(IV) compounds [22]. The coupling constant is consider as important parameters. The qualitative investigation of organotin structure has been recognized by the magnitude of the coupling constant, J, value in solution state pertained to the Sn coordination number [23, 24]. The differences in chemical shift values for CH_2 group attached to tin atom in starting compound and complex revealed the complex formation. [25, 26]. The interpretation of chemical shift and coupling constants with bond angles [^{1}J and the Me – Sn – Me, θ; ^{2}J and θ] around tin atom is generally based on the following empirical equations. The calculated bond angles obtained from the equation are comparable with bond angles obtained by experimental crystal data structure solution for this complex [27].

[^{1}J] = 11.4θ– 875. (1)

The observed (X-ray) Me – Sn – Me, angle is 173.9 (**b**), and the calculated angle among three atoms is 173.9

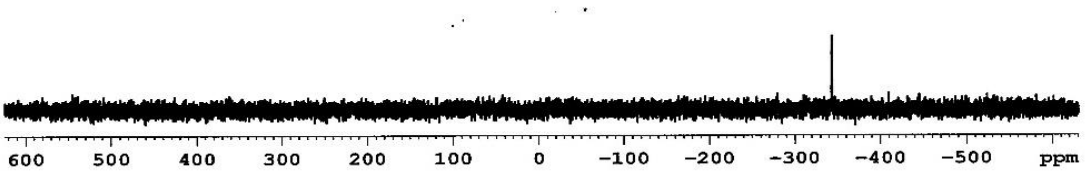


Fig.6

Fig.6 ^{119}SnNMR [di(*p*-chlorobenzyl)(dibromo) (4,7-diphenyl-1,10-phenanthroline)]tin(IV) complex

At -343.532 ppm, a single peak is observed in ^{119}Sn NMR ($CDCl_3$) shown in **Fig.6**. Hexacoordination around tin atom is indicated by the chemical shift value with in the expected range. The chemical shift value is within the expected range as reported earlier and it is the indication of hexacoordination of tin atom in the complex. [28], [29]. In this complex due to the complex formation the up field signals is ascribed to high electron density on tin atom. [30].This is very close to the reported values of similar type complexes [31]. The attachment of more electronegative halide ions with tin atom causes the increase of chemical shift values in ^{119} Sn NMR spectrum. The ^{119}Sn NMR values show the evidences of increasing the chemical shift values because of attachment of most electronegative halide ions with tin atom [32]. The trend of chemical shift can be related to the electron withdrawing inductive effect of the halogens and also to the possibility of additional π-contribution to the Sn-X bonds which would shield the nucleus to a greater extent [33].

3.2 Crystallographic study

Suitable crystal is obtained as pale-yellow plates and pale-yellow rods, by slow evaporation of solutions in chloroform. The intensity data were collected at 293 K on a Stoe Image Plate Diffraction System [13] using MoKα graphite monochromated radiation. Image plate distance 70 mm, / oscillation scans 0–163_ for 2a and 0–186_ for 2b, with step D/ = 1.3_, exposure time 6 min, 2h range 3.27–52.1_. The structure solved by direct methods using the program SHELXS- 97 [34].

Table.1. 1 Crystallographic data and refinement details for complex (b)

Parameters	**b**
Chemical formula	C_{38} H_{28} Br_2 Cl_2 N_2 Sn
M_r	862.03
Cell setting, space group	Monoclinic P21/n
Temperature (K)	293 K
a, *b*, *c* (Å)	10.3007(18) 11.630(2) 29.152(5)
α, β, γ (°)	90 91.967(6) 90
V (Å^3)	3490.3(10)
Z	4
Radiation type	Mo Kα
μ (mm^{-1})	3.204
Diffractometer	Bruker APEX 2 diffractometer
Absorption correction	Semi-empirical from equivalents
T_{min}, T_{max}	1.4 and 29.7
R_{int}	0.053
$R[F^2 > 2\sigma(F^2)]$, $wR(F^2)$, *S*	0.0372, 0.1648, 0.45
No. of reflections	9825
No. of parameters	406
H-atom treatment	H-atom parameters constrained

Table.2 Selected experimental and calculated bond distances (Å) and bond angles (degrees) for compound (b)

Parameters	Bond distances(Å)		Parameters	Bond angles (degrees)	
	Experimental	Calculated		Experimental	Calculated
	b	b		b	b
Sn1-Br2	2.6502	2.5924	C1-Sn-C8	173.79	175.21
Sn1-Br1	2.6871	2.6502	Br1- Sn1- Br2	103.10	103.08
Sn1- N1	2.3487	2.2843	Br2-Sn1-N1	160.82	160.25
Sn1- N2	2.3751	2.1873	Br2-Sn1-N2	90.75	90.47
Sn1- C8	2.1831	2.0814	Br2-Sn1-C8	92.12	92.15
Sn1- C1	2.1801	2.0812	Br2-Sn1-C1	93.03	93.09
C11- C12	1.7501	1.7425	Br2-Sn1-N1	96.08	96.11
C12- C5	1.7527	1.7230	Br2-Sn1-N2	166.10	166.12
N1- C25	1.3618	1.3083	Br2-Sn1-C8	87.62	87.58
N1- C24	1.3222	1.3085	Br1- Sn1-C1	87.84	87.89
N2- C26	1.3571	1.3054	N1-Sn1-N2	70.08	70.13
N2- C15	1.3133	1.3124	N1-Sn1- C8	88.74	88.29
C22- C27	1.4901	1.4920	N1-Sn1- C1	87.54	87.48
C21- C22	1.4161	1.3574	N2-Sn1- C8	90.73	90.75
C27- C28	1.3807	1.3624	N2-Sn1-C1	92.67	92.56

The ORTEP and Gauss view representation of the molecular structures for the complex, **b** is shown in the **Fig.7 and 8**. The crystallographic data, refinement details, the selected bond lengths and angles along with theoretical values for the crystal of this complex are listed in **Table.1** and **Table.2**. In the unit cell four independent molecules are packed in the complex and are discussed here. The prepared complex is confirmed by octahedral environment, two carbon atoms, two chlorines and two nitrogens are surrounded by tin atom. Bidentate nitrogen donor ligand and two chlorines are in equatorial positions and two carbons of benzyl groups are in axial positions in this complex.

All the Sn bond lengths are close or very close to the mean Sn-Br, Sn-C, Sn-N distances [35], [36], [37]. The Sn-Br distances are 2.6871, 2.6502 **b** lies in the range (2.55 Å - 2.75 Å) of Sn-Br distances found in haloorganotin(IV) complex in general [38], [39]. The Sn-N bond lengths are 2.3487 Å and 2.3751 Å in **b** are shorter than the complexes [40]. They are longer than the sum of the covalent radii of tin and nitrogen (2.34Å) and significantly shorter than the sum of their van der Waals radii (3.75 Å) and thus indicating a substantial bonding interaction [41]. The Sn-C distances 2.1801 Å and 2.1831(7) Å in **b** are quite close to those found in this complex. The C-Cl bond distances are 1.7501 Å and 1.7527 Å found to the complex.

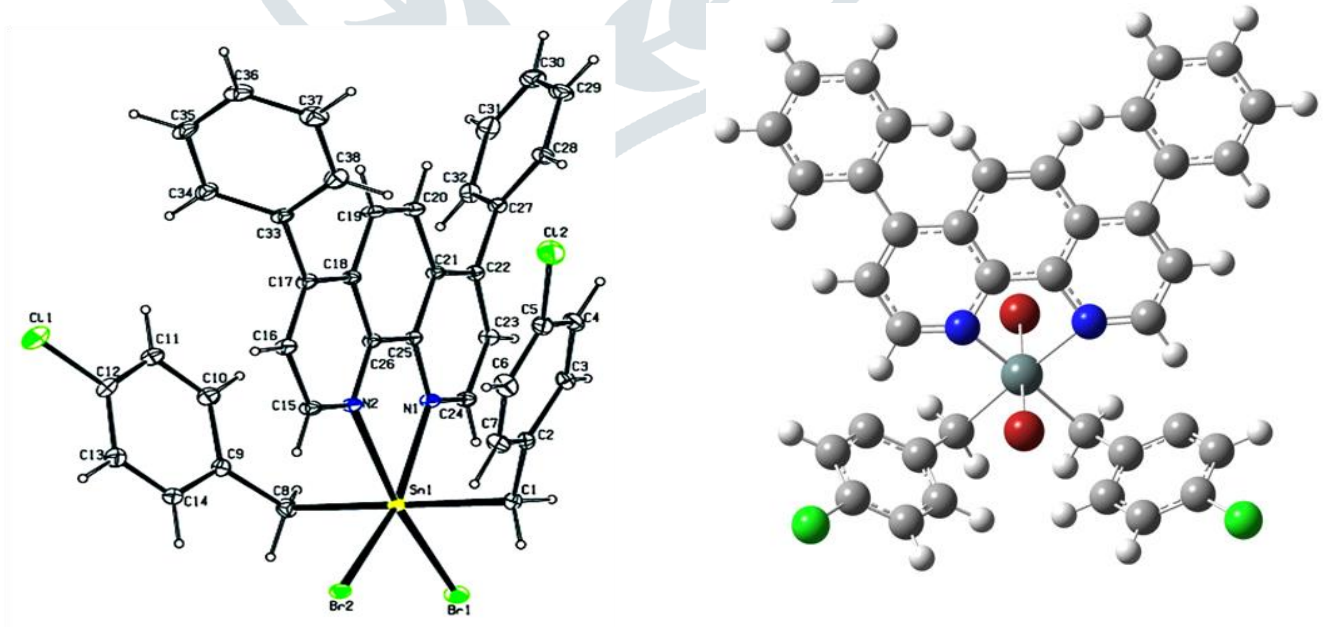


Fig.7 & 8 ORTEP diagam and Optimized molecular structure of [di (*p*-chlorobenzyl)(dibromo) (4,7-diphenyl-1,10-phenanthroline)]tin(IV) complex (b)

No significant distortion has been observed in octahedral geometry due to the presence of the bridged ligand. This is owing to the coordination angles between each respective trans groups are not equal to 180º, the benzyl groups are not precisely perpendicular to the plane Br1-Sn-Br2, 103.10 and N1-Sn-N2, 70.08 the complex. The deviation from the regular octahedral geometry C1-Sn-C8 173.79 in complex (b)**,** may result from the electronegative Cl atoms attached to p-positions of both benzyl groups which are bonded to tin atom in axial Positions [42-46].

HOMO-LUMO Calculations

The highest occupied molecular orbital and lowest unoccupied molecular orbital [HOMO-LUMO] distribution was mainly located over organic backbone and alkyl groups which were adjacent to tin atoms, and were only involved in HOMO distribution with their ipso carbons but not involved in LUMO distribution [47]. Since DFT functionals are known to produce distinct HOMO-LUMO energy values for even simple small molecules [48].

HOMO-LUMO distribution in all complexes was mainly located over organic back bone and alkyl groups which were adjacent to tin atoms. They were only involved in HOMO distribution with their ipso carbons but not involved in LUMO distribution. It was reported that the non-hybrid DFT functional such as HCTH and TPSSTPSS produced the lowest band gap values [49].

HOMO-LUMO analysis

The energies of the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO) are computed at B3LYP/L an L2DZ level. HOMO and LUMO orbitals for the complex (a) are shown in **Fig.** respectively. Generally the energy values of LUMO, HOMO and their energy gap the chemical activity of the molecule. HOMO as an electron donor represents the ability to donate an electron, while LUMO as an electron acceptor represents the ability to receive an an electron [50].

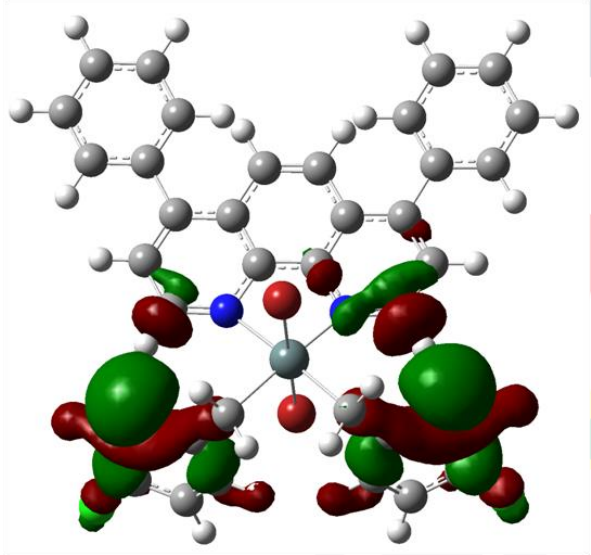


Fig.9
HOMO

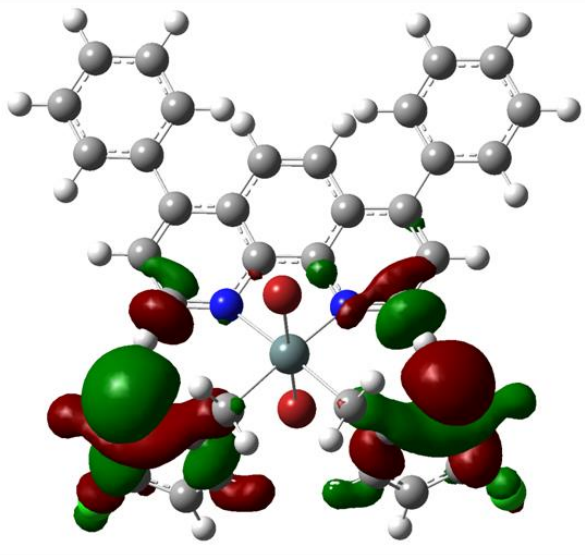


Fig.10
LUMO

Fig 9 & 10 Frontier molecular orbital diagram of [di(*p*-chlorobenzyl)(dibromo) (4,7-diphenyl-1,10-phenanthroline)]tin(IV) complex

The energies of the HOMO [-0.12599 eV,] and LUMO [-0.11131 eV,] and the energy gaps are found to be 0.2990 eV and 0.0053 eV The HOMO–LUMO energy gap reveals the intramolecular charge transfer (ICT) interaction occurs within the molecule.

CYTOTOXIC & ANTICANCER ACTIVITY:

Cell line and culture:

HeLa cell line was obtained from NCCS, Pune. The cells were maintained in Minimal Essential Medium supplemented with 10% FBS, penicillin (100 U/ml), and streptomycin (100 µg/ml) in a humidified atmosphere of 50 µg/ml CO_2 at 37 °C.

***In Vitro* assay for Anticancer activity (MTT assay) (Mosmann, 1983)**

Cells (1×10^5/well) were plated in 24-well plates and incubated in 37^0C with 5% CO_2 condition. After the cell reaches the confluence, the various concentrations of the samples were added and incubated for 24hrs. After incubation, the sample was removed from the well and washed with phosphate-buffered saline (pH 7.4) or DMEM without serum. 100µl/well (5mg/ml) of 0.5% 3-(4, 5-dimethyl-2-thiazolyl)-2, 5-diphenyl--tetrazolium bromide (MTT) was added and incubated for 4 hours. After incubation, 1ml of DMSO was added in all the wells .The absorbance at 570nm was measured with UV- Spectrophotometer using DMSO as the blank. Measurements were performed and the concentration required for a 50% inhibition (IC50) was determined graphically. The % cell viability was calculated using the following formula:

% cell viability = A570 of treated cells / A570 of control cells × 100

Graphs are plotted using the % of Cell Viability at Y-axis and concentration of the sample in X-axis. Cell control and sample control is included in each assay to compare the full cell viability assessments.

Cell line and culture:

VERO cell line was obtained from NCCS, Pune. The cells were maintained in Minimal Essential Medium supplemented with 10% FBS, penicillin (100 U/ml), and streptomycin (100 µg/ml) in a humidified atmosphere of 50 µg/ml CO_2 at 37 °C.

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Table.3 Anticancer and Cytotoxicity effect of cisplatin on *HeLa cell* line and *Vero cell* line.

	CYTOTOXICITY effect of *cis*-Platin				ANTICANCER effect of *cis*-Platin	
S.No	**Concen-tration**	**Dilutions**	**Absorbance**	**Cell viability**	**Absorbance**	**Cell viability**
	(µg/ml)		(O.D)	(%)	(O.D)	(%)
1	1000	Neat	0.374	44.2	0.124	16.66
2	500	01:01	0.419	49.52	0.174	23.38
3	250	01:02	0.459	54.25	0.226	30.37
4	125	01:04	0.502	59.33	0.281	37.74
5	62.5	01:08	0.554	65.48	0.326	43.81
6	31.2	01:16	0.599	70.8	0.372	50
7	15.6	01:32	0.645	76.24	0.431	57.93
8	7.8	0.08611	0.688	81.32	0.481	64.65
9	Cell control	-	0.846	100	0.744	100

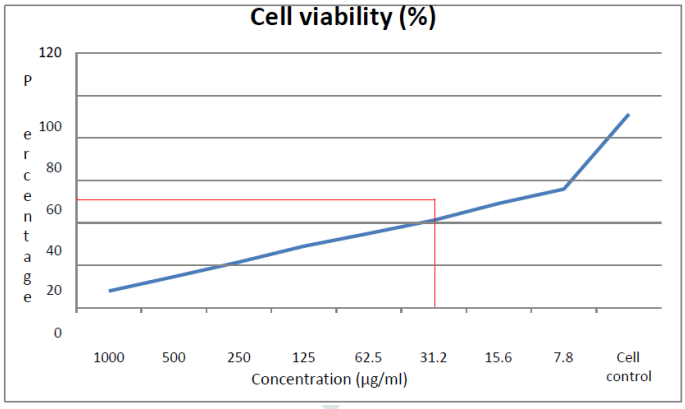


Fig.11 Graphical diagram of Anticancer effect of cisplatin on *HeLa cell* line

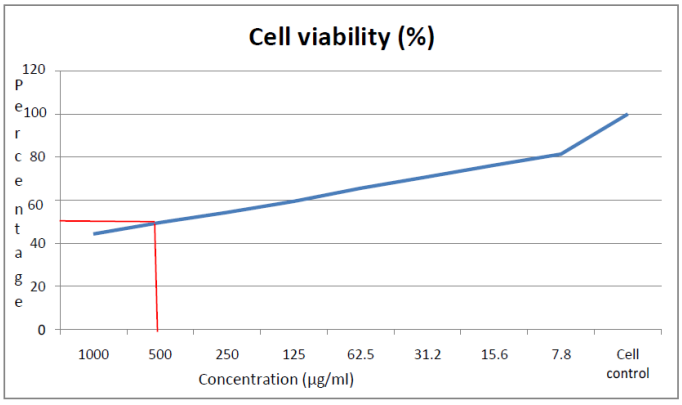


Fig.12 Graphical diagram of Cytotoxicity effect of cisplatin on *Vero cell* line.

Table. 4. Anticancer and Cytotoxic activities of complex "b" on HeLa and VERO cell line

	ANTICANCER effect of *Complex*				CYTOTOXICITY effect of *Complex*	
S.No	**Concentration** (µg/ml)	**Dilutions**	**Absorbance**	**Cell viability**	**Absorbance**	**Cell viability**
1	1000	Neat	0.244	33.28	0.487	51.31
2	500	1:01	0.299	40.79	0.543	57.21
3	250	1:02	0.341	46.52	0.594	62.59
4	125	1:04	0.395	53.88	0.643	67.75
5	62.5	1:08	0.436	59.48	0.697	73.44
6	31.2	1:16	0.486	66.3	0.752	79.24
7	15.6	1:32	0.534	72.85	0.8	84.29
8	7.8	0.086111	0.581	79.26	0.856	90.2
9	Cell control	-	0.733	100	0.949	100

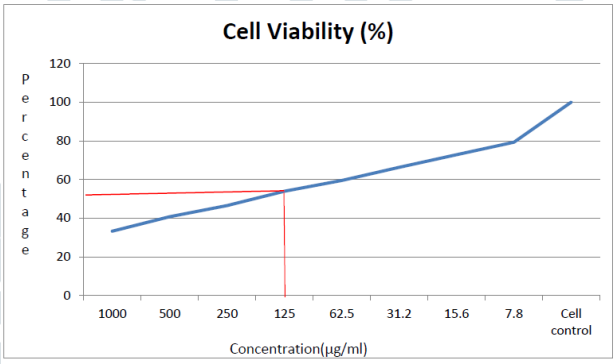


Fig.13 Graphical diagram of Anticancer effect of complex (b) on *HeLa cell* line

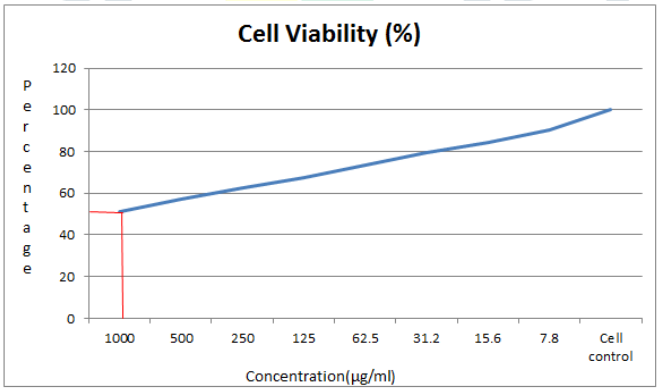
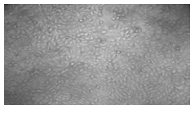
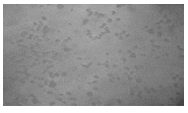
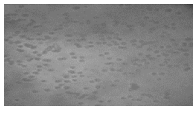
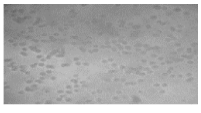


Fig.14 Graphical diagram of Cytotoxicity effect of complex (b) on *Vero cell* line.

Complex	**Normal Vero cell line**	**Toxicity - 1000µg/ml**	**Toxicity - 500µg/ml**	**Toxicity – 7.8µg/ml**
Cytotoxicity of Cisplatin				

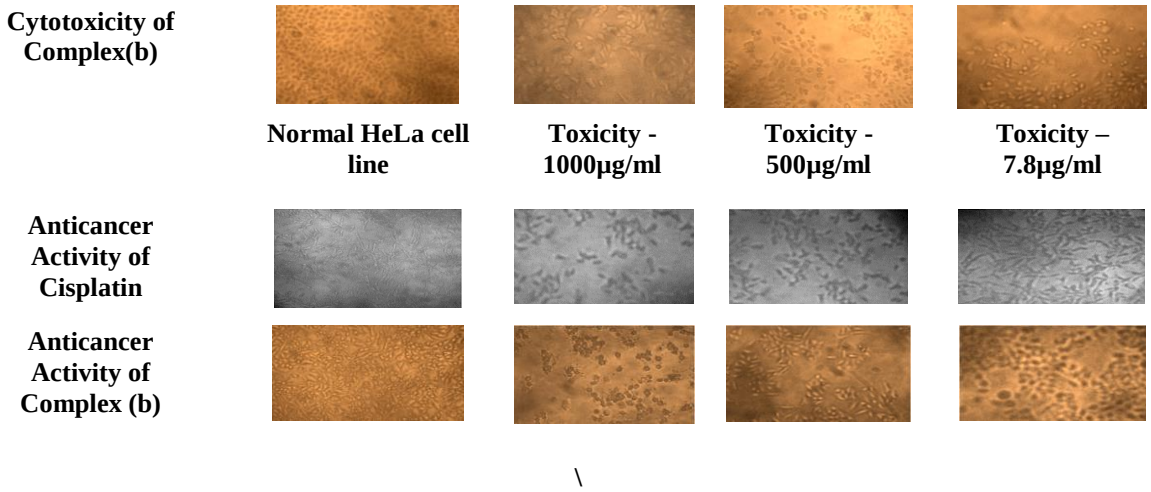


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Fig.15. Comparison of Cytotoxicity and Anticancer activities effect of complex (b) with cisplatin in Vero and HeLa cell lines.

IC_{50} of Anticancer activity

The cell viability of the complex is 53.88 at the concentration 125 µg/ml at the absorbance (OD) of 0.395. The cell viability of the cisplatin is 50 at the concentration is 70.8 µg/ml at the absorbance (OD) of 0.372.

IC_{50} of Cytotoxicity activity

The viability of the complex is 51.31 at the concentration 1000µg/ml at the absorbance (OD) of 0.244.The cell viability of the cisplatin is 49.52 at the concentration is 500µg/ml at the absorbance (OD) of 0.419.

IV. Conclusion

Organotin (IV) complexes with nitrogen donor ligands are having significances in the cytotoxicity and anticancer activities. This is due to the Sn-N bond length in the complexes which will decide the activity of these complexes in the medicinal field. The title complex is also expected to be active in anticancer activities. Similar types of other complexes were prepared in our lab and results are yet to be published.

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