

Antioxidant and Anticancer Potential of the New Cu(II) Complexes Bearing Imine-Phenolate Ligands with Pendant Amine N-Donor Groups

Adriana Castro Pinheiro ^{1,2}, Ianka Jacondino Nunes ², Wesley Vieira Ferreira ², Paula Pellenz Tomasini ¹, Cristiano Trindade ^{1,3}, Carolina Cristóvão Martins ⁴, Ethel Antunes Wilhelm ⁴, Robson da Silva Oliboni ², Paulo Augusto Netz ⁵, Rafael Stieler ⁶, Osvaldo de Lazaro Casagrande, Jr. ⁶ and Jenifer Saffi ^{1,*}

¹ Laboratory of Genetic Toxicology, Department of Basic Health Sciences, Federal University of Health Sciences of Porto Alegre (UFCSPA), Porto Alegre 90050-170, RS, Brazil

² Group of Catalysis of Theoretical Studies, Center of Chemical, Pharmaceutical and Food Science Center, Federal University of Pelotas (UFPel), Pelotas 96160-000, RS, Brazil

³ Centro de Investigaciones en Ciencias de la Vida, Universidad Simón Bolívar, Barranquilla 080002, Colombia

⁴ Laboratory in Biochemical Pharmacology, Center of Chemical, Pharmaceutical and Food Sciences, Federal University of Pelotas (UFPel), Pelotas 96160-000, RS, Brazil

⁵ Grupo de Química Teórica, Instituto de Química, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre 91501-970, RS, Brazil

⁶ Laboratory of Molecular Catalysis, Instituto de Química, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre 91501-970, RS, Brazil

* Correspondence: jenifers@ufcspa.edu.br

Table of Contents

Figure S1. ^1H NMR spectrum (400 MHz, CDCl_3 , 298 K) of **1a**

Figure S2. ^{13}C NMR spectrum (100 MHz, CDCl_3 , 298 K) of **1a**

Figure S3. ^1H NMR spectrum (400 MHz, CDCl_3 , 298 K) of **1b**

Figure S4. ^{13}C NMR spectrum (100 MHz, CDCl_3 , 298 K) of **1b**

Figure S5. ESI-HRMS spectrum for complex **2a**.

Figure S6. ESI-HRMS spectrum for complex **2b**.

Figure S7. ESI-HRMS spectrum for complex **2b** (isotopic profile).

Figure S8. UV-Vis spectra of **1a** and its complex **2a** (1×10^{-4} M) in dichloromethane.

Figure S9. UV-Vis spectra of **1b** and its complex **2b** (1×10^{-4} M) in dichloromethane.

Figure S10. Intermolecular hydrogen bonds between two mononuclear species of complex **2a** (thermal ellipsoids drawn at 60% probability level). For clarity the hydrogen atoms not-involved in the hydrogen bonds have been omitted. (N(3)-H(3A)···Cl(2)#2, $d(\text{H}\cdots\text{A}) = 2.24 \text{ \AA}$, $d(\text{D}\cdots\text{A}) = 3.2036(17) \text{ \AA}$, $\angle(\text{D-H}\cdots\text{A}) = 160.2^\circ$) (#1 = 2-x, 1-y, 1-z; #2 = 1-x, -y, 1-z).

Figure S11. UV-Vis spectra of **1a** (1×10^{-7} M) in DMSO (250 – 800 nm).

Figure S12. UV-Vis spectra of **1b** (1×10^{-7} M) in DMSO (250 – 800 nm).

Figure S13. UV-Vis spectra of **2a** (1×10^{-7} M) in DMSO (250 – 1000 nm).

Figure S14. UV-Vis spectra of **2b** (1×10^{-7} M) in DMSO (250 – 1000 nm).

Figure S15. UV-Vis spectra of **2a** (1×10^{-7} M) in H_2O (250 – 1000 nm).

Figure S16. UV-Vis spectra of **2b** (1×10^{-7} M) in H₂O (250 – 1000 nm).

Figure S17. Cyclic voltammograms of ligands **1a-b** and Cu(II) complexes **2a-b**, in DMF solution at 100 mV/s scan rate, corresponding to the **1a** (a), **2a** (b), **1b** (c) and **2b** (d).

Figure S18. Effect of ligands and Cu(II) complexes represented by the **1a** (a), **2a** (b), **1b** (c), **2b** in different concentrations on DPPH radical-scavenger activity. Data are expressed as the mean \pm SEM for three independent experiments, carried out on different days. The results are calculated as % of control of the absorbance at 517 nm. Asterisk denotes significance levels when compared to control group: (*) $P < 0.05$, (***) $P < 0.001$ and (****) $P < 0.0001$ (One-way ANOVA followed by the Newman-Keul's test).

Figure S19. Effect of ligands and Cu(II) complexes represented by the **1a** (a), **2a** (b), **1b** (c), **2b** in different concentrations on ABTS⁺ radical-scavenger activity. Data are expressed as the mean \pm SEM for three independent experiments, carried out on different days. The results are calculated as % of control of the absorbance at 730 nm. Asterisk denotes significance levels when compared to control group: (*) $P < 0.05$, (***) $P < 0.001$ and (****) $P < 0.0001$ (One-way ANOVA followed by the Newman-Keul's test).

Figure S20. Comparison of the dose-response survival diagrams of MRC-5, MCF-7 and

SW620 cell lines exposed to **1a** and **1b** free ligand (0 – 100 μ M) for 24 h or 72 h. The obtained values represent an average of at least three independent experiments. NC represents the negative control. Graphs represent the average \pm SD. Statistical analysis were performed using One-way ANOVA followed by Dunnett's multiple comparison test and $p < 0.05$ was considered as significant. * $p = 0.0189$ (d), 0.0145 (e), 0.0224 (f); ** $p = 0.0027$ (a), 0.0015 (d); *** $p = 0.0010$ (c) and (f), 0.0003 (d); **** $p = <0.0001$.

Figure S21. Comparison of the dose-response survival diagrams of MRC-5, MCF-7 and SW620 cell lines exposed to complex **2a** (0 – 100 μ M) for 24 h and 72 h. The obtained values represent an average of at least three independent experiments. NC represents the negative control. Graphs represent the average \pm SD. Statistical analysis were performed using One-way ANOVA followed by Dunnett's multiple comparison test and $p < 0.05$ was considered as significant. * $p = 0.0141$ (a); 0.0185 (24 h - b), 0.0445 (72 h -b), ** $p = 0.0026$ (b), 0.0036 (24 h - c), 0.0017 (72 h - c) *** $p = 0.0002$ (a); 0.0009 (24 h-b), 0.0004 (72 h -b), **** $p = <0.0001$.

Figure S22. Colony Survival for **1a**, **1b**, **2a** and **2b** on MRC-5, MCF-7 and SW620. Data represent mean and SD of 3 independent experiments. One-way ANOVA and Dunnett's posttest. (*) $p < 0.05$; (**) $p < 0.01$; (***) $p < 0.001$.

Figure S23. Two-dimensional interaction diagram of complexes (a) **2a** and (b) **2b** with DNA (PDB: 1BDNA).

Figure S24. (a) An alternative docking pose for **2b** with an affinity value of -7.4 kcal mol $^{-1}$. (b) Two-dimensional interaction diagram of this mode with DNA.

Table S1. Crystallographic data and structure refinement parameters for **2a**.

Table S2. Selected geometrical properties of compounds **2a**, **2a'** and **2b** at the B3LYP/def2-TZVPP/def2-SVP level of theory. Distances are in angstroms and angles in degrees.

Coordinates xyz : Coordinates from ORCA-job **2a**.

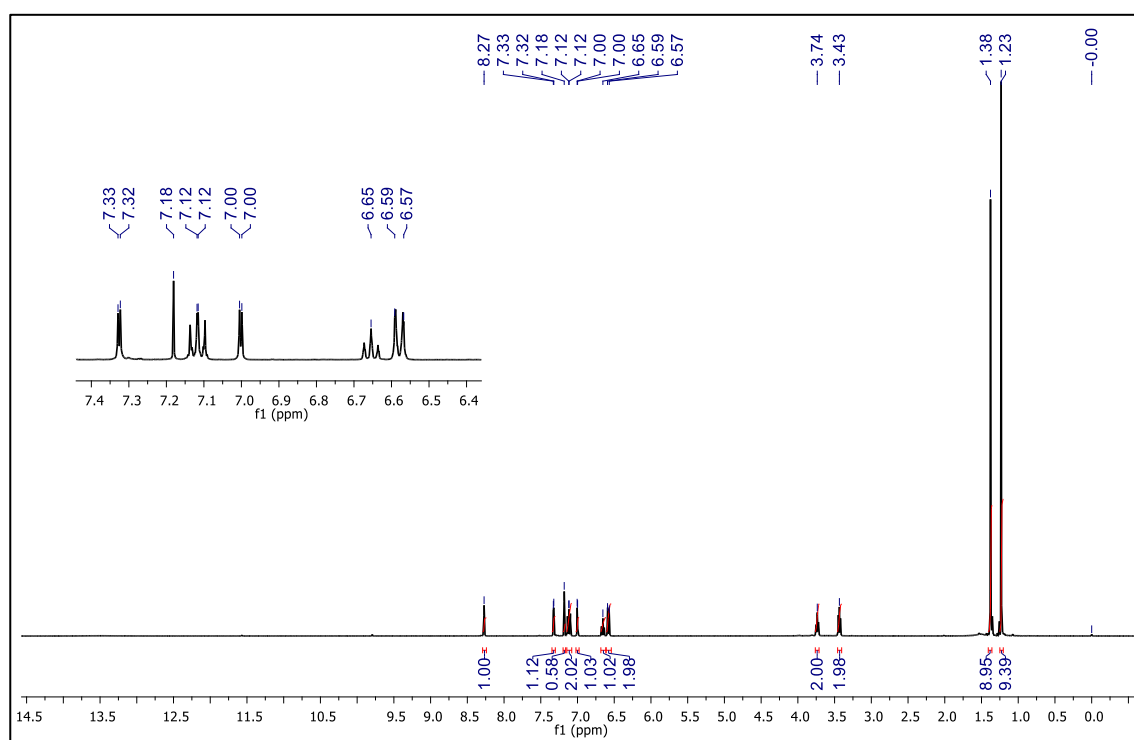


Figure S1. ^1H NMR (400 MHz, CDCl_3 , rt) spectrum of ligand **1a**.

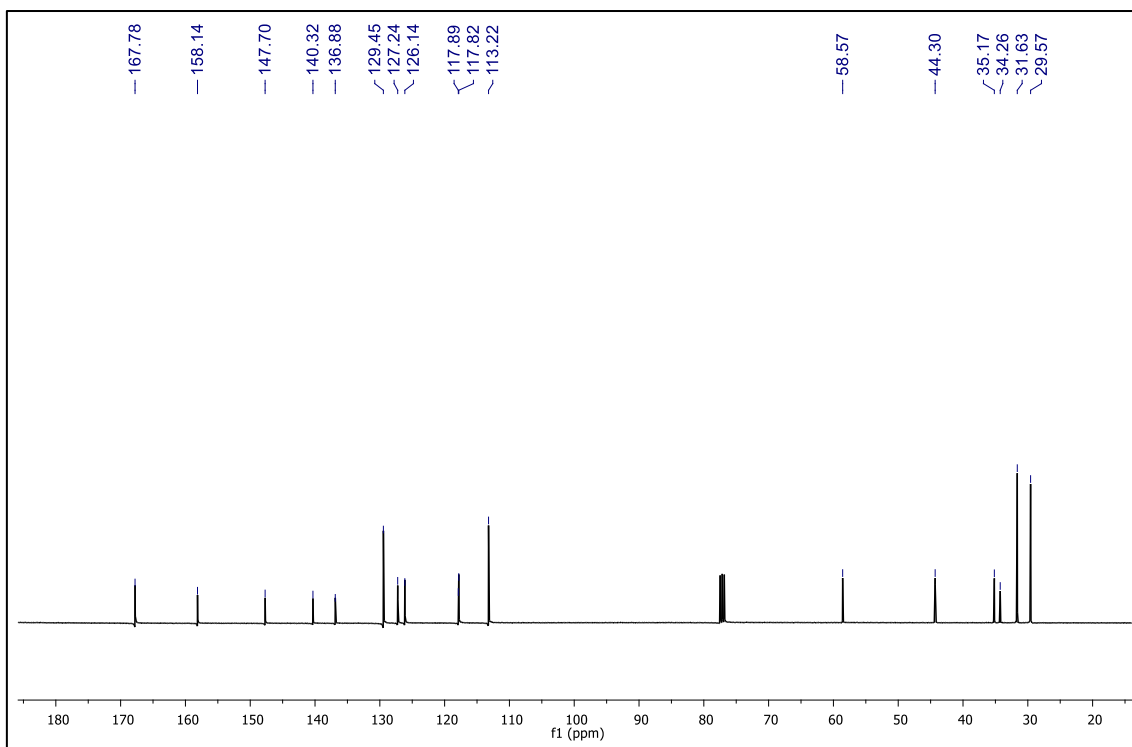


Figure S2. $^{13}\text{C}\{^1\text{H}\}$ NMR (101 MHz, CDCl_3 , rt) spectra of ligand **1a**.

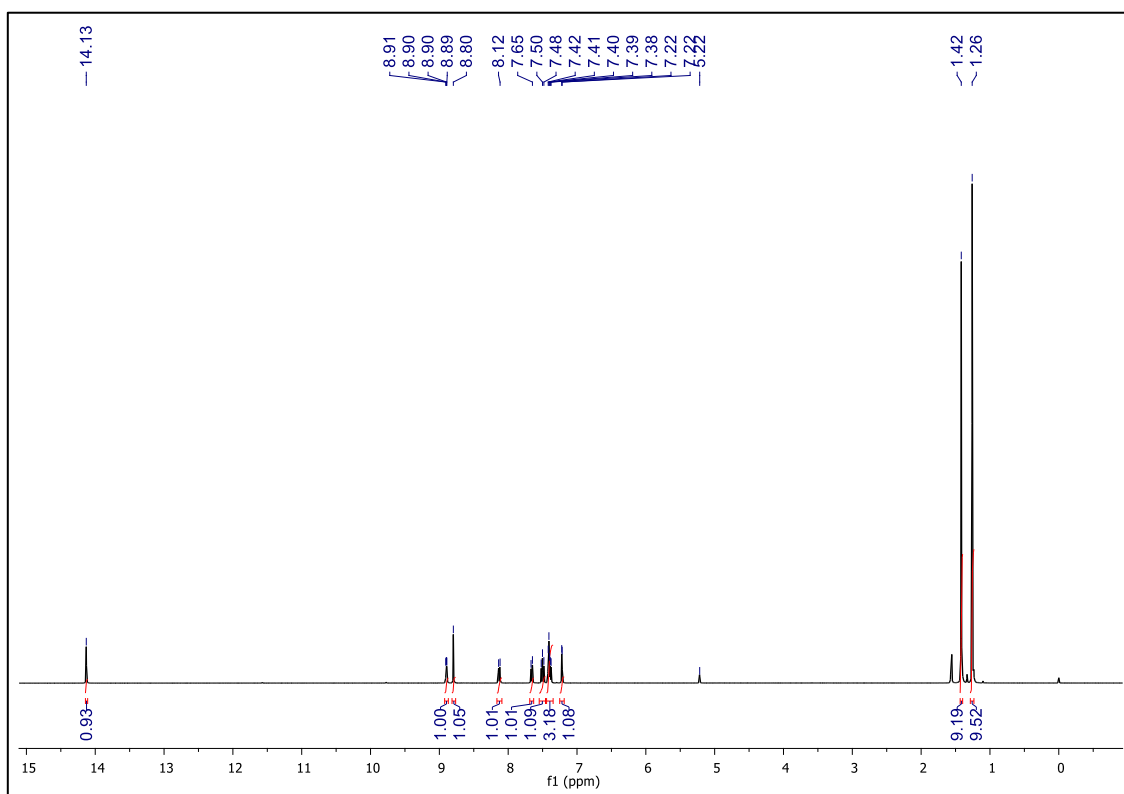


Figure S3. ^1H NMR (400 MHz, CDCl_3 , rt) spectrum of ligand **1b**.

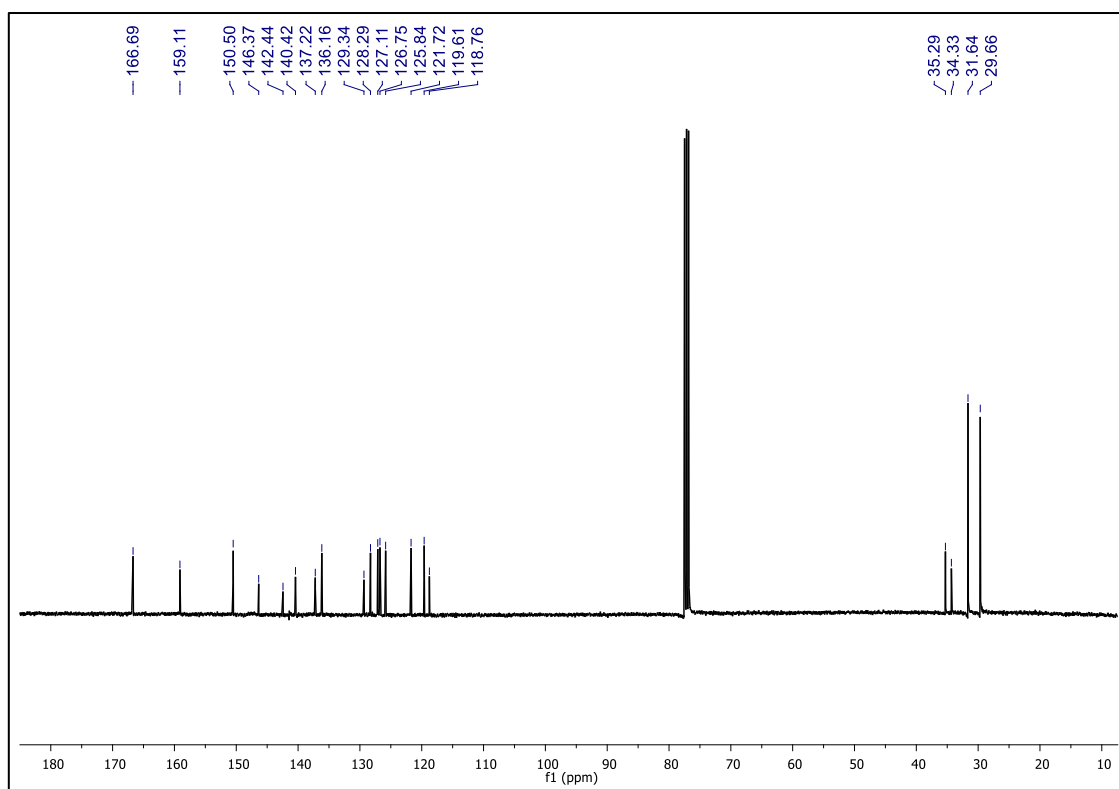


Figure S4. $^{13}\text{C}\{^1\text{H}\}$ NMR (101 MHz, CDCl_3 , rt) spectra of ligand **1b**.

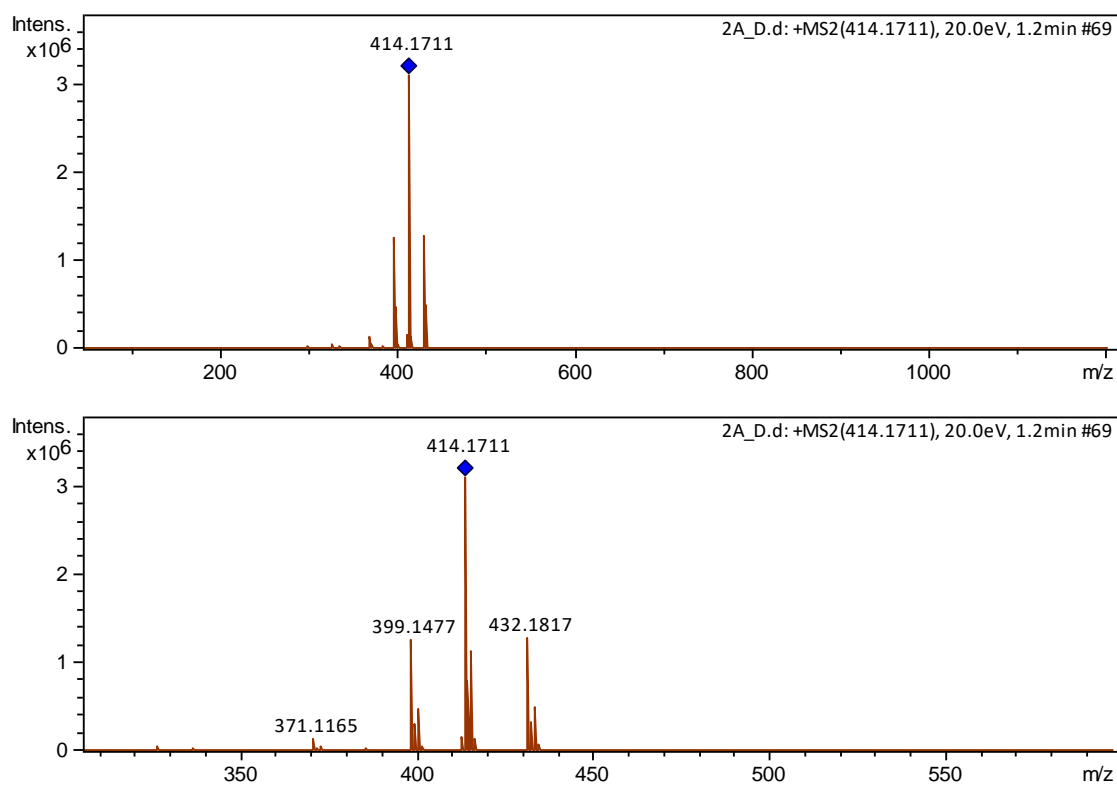


Figure S5. ESI-HRMS spectrum for complex **2a**.

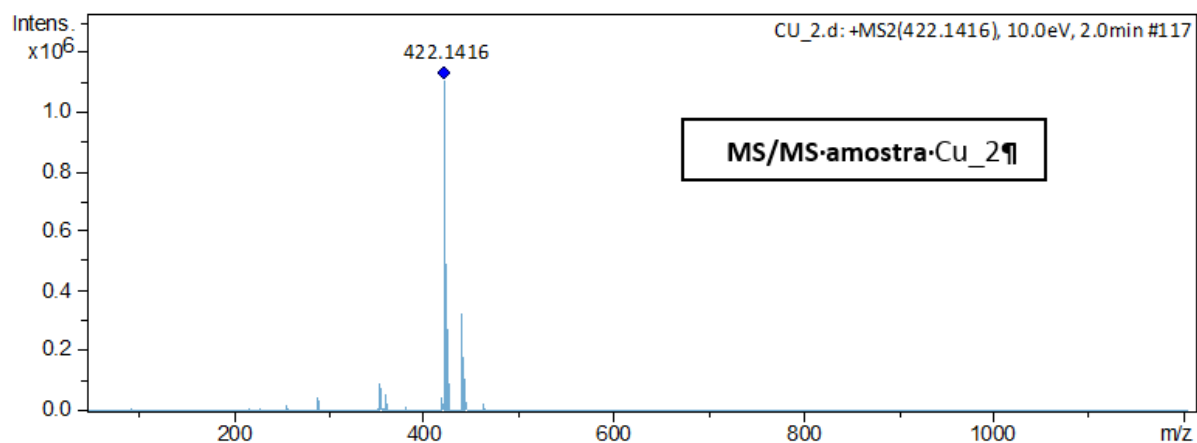


Figure S6. ESI-HRMS spectrum for complex **2b**.

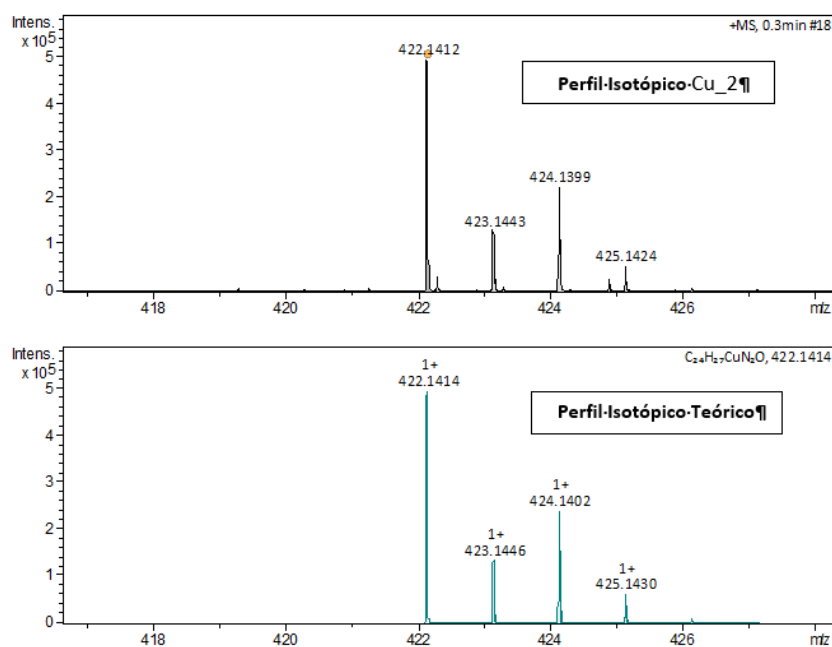


Figure S7. ESI-HRMS spectrum for complex **2b** (isotopic profile).

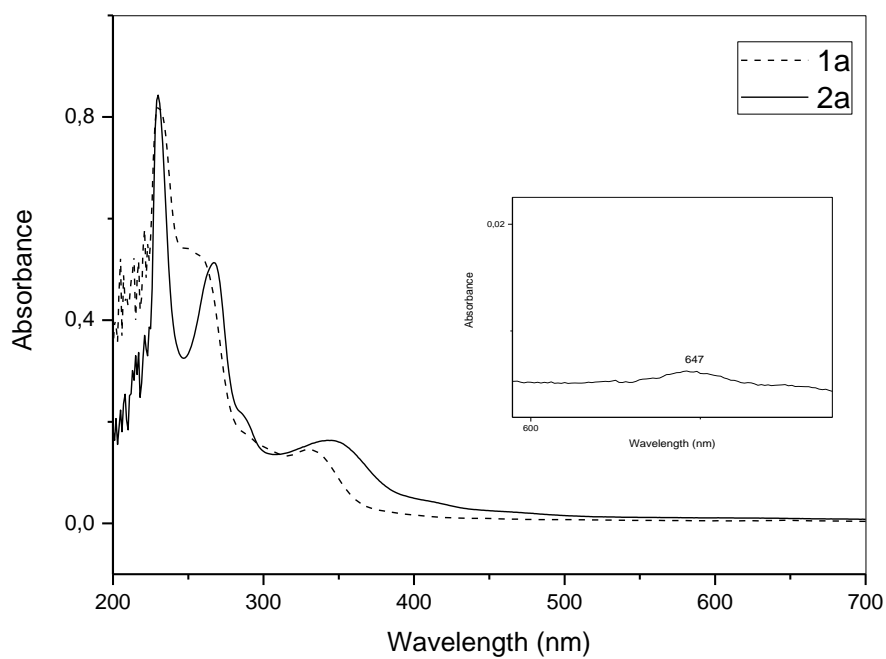


Figure S8. UV-Vis spectra of **1a** and its complex **2a** (1×10^{-4} M) in dichloromethane.

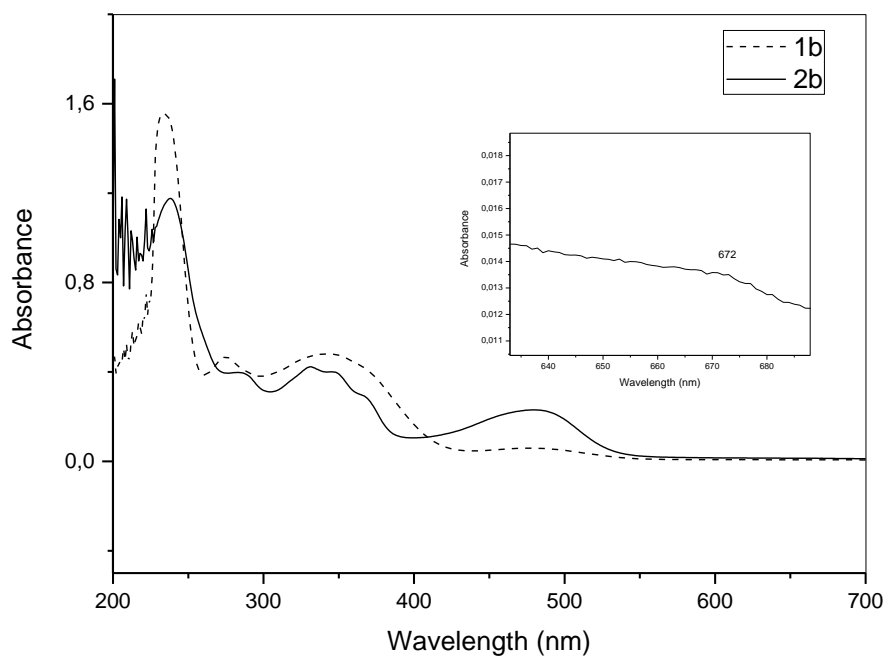


Figure S9. UV-Vis spectra of **1b** and its complex **2b** (1×10^{-4} M) in dichloromethane.

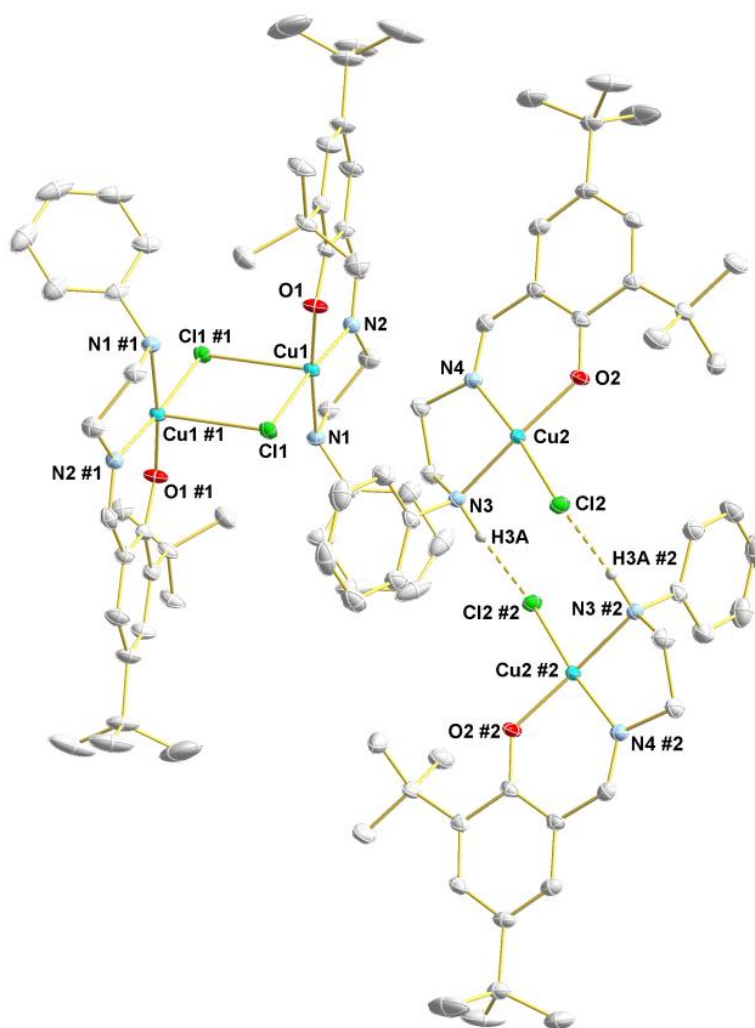


Figure S10. Intermolecular hydrogen bonds between two mononuclear species of complex 2a (thermal ellipsoids drawn at 60% probability level). For clarity the hydrogen atoms not-involved in the hydrogen bonds have been omitted. (N(3)-H(3A)⋯Cl(2)#2, $d(\text{H}\cdots\text{A}) = 2.24 \text{ \AA}$, $d(\text{D}\cdots\text{A}) = 3.2036(17) \text{ \AA}$, $\angle(\text{D-H}\cdots\text{A}) = 160.2^\circ$ (#1 = 2- x , 1- y , 1- z ; #2 = 1- x , - y , 1- z).

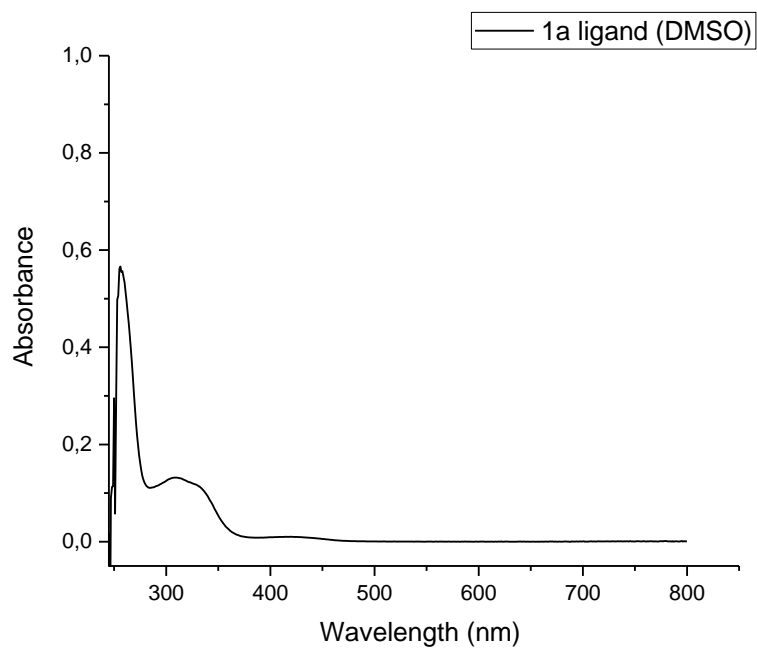


Figure S11. UV-Vis spectra of **1a** (1×10^{-7} M) in DMSO (250 – 800 nm).

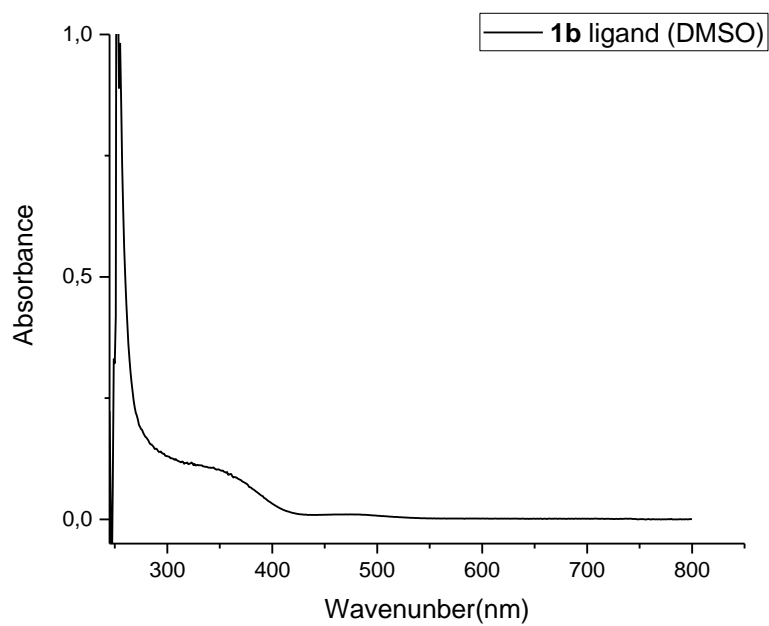


Figure S12. UV-Vis spectra of **1b** (1×10^{-7} M) in DMSO (250 – 800 nm).

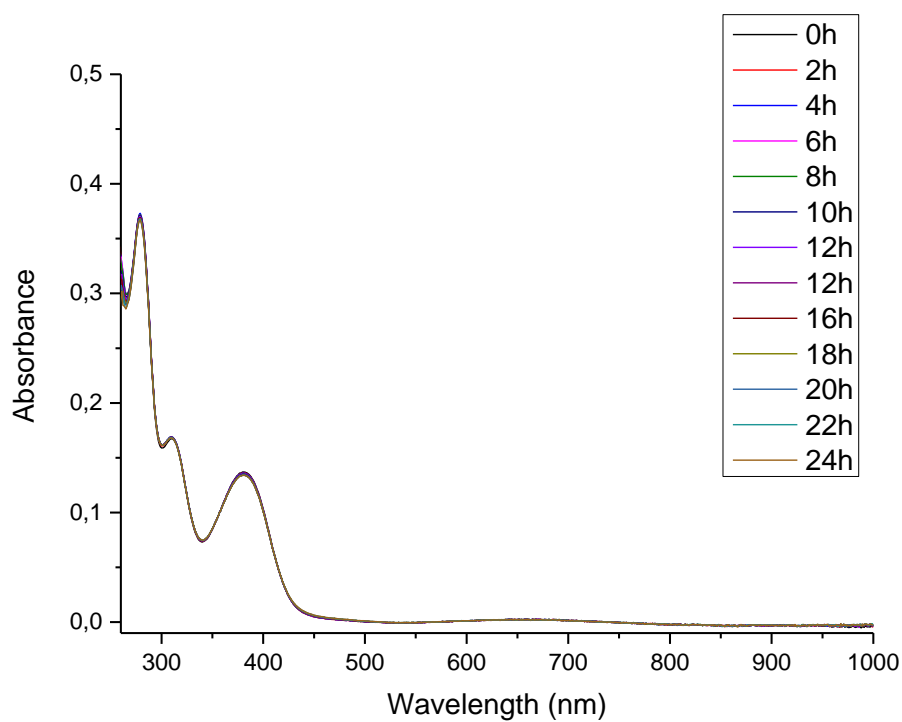


Figure S13. UV-Vis spectra of **2a** (1×10^{-7} M) in DMSO (250 – 1000 nm).

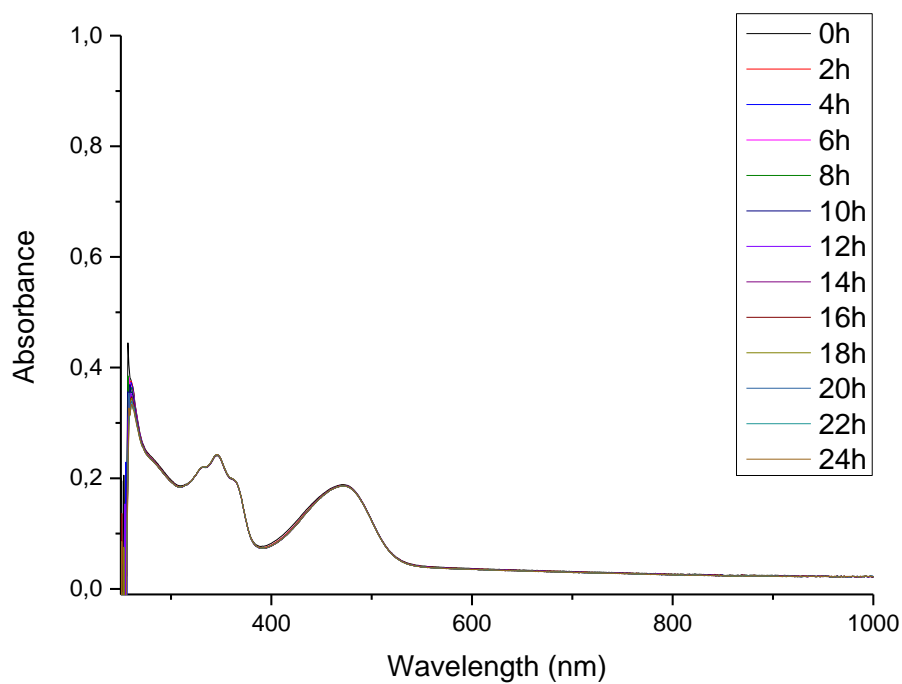


Figure S14. UV-Vis spectra of **2b** (1×10^{-7} M) in DMSO (250 – 1000 nm).

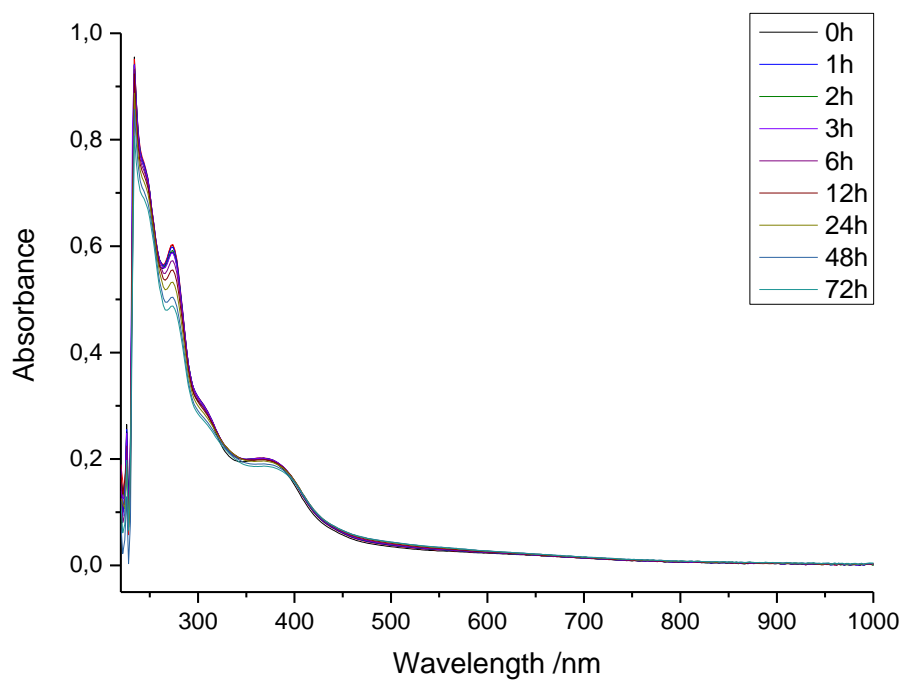


Figure S15. UV-Vis spectra of **2a** (1×10^{-7} M) in H₂O (250 – 1000 nm).

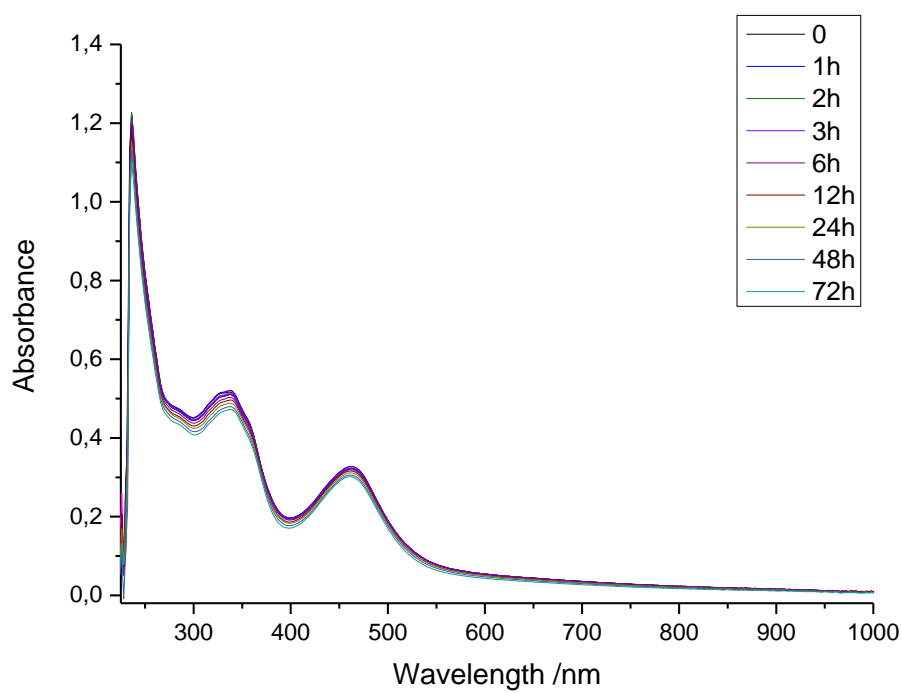


Figure S16. UV-Vis spectra of **2b** (1×10^{-7} M) in H_2O (250 – 1000 nm).

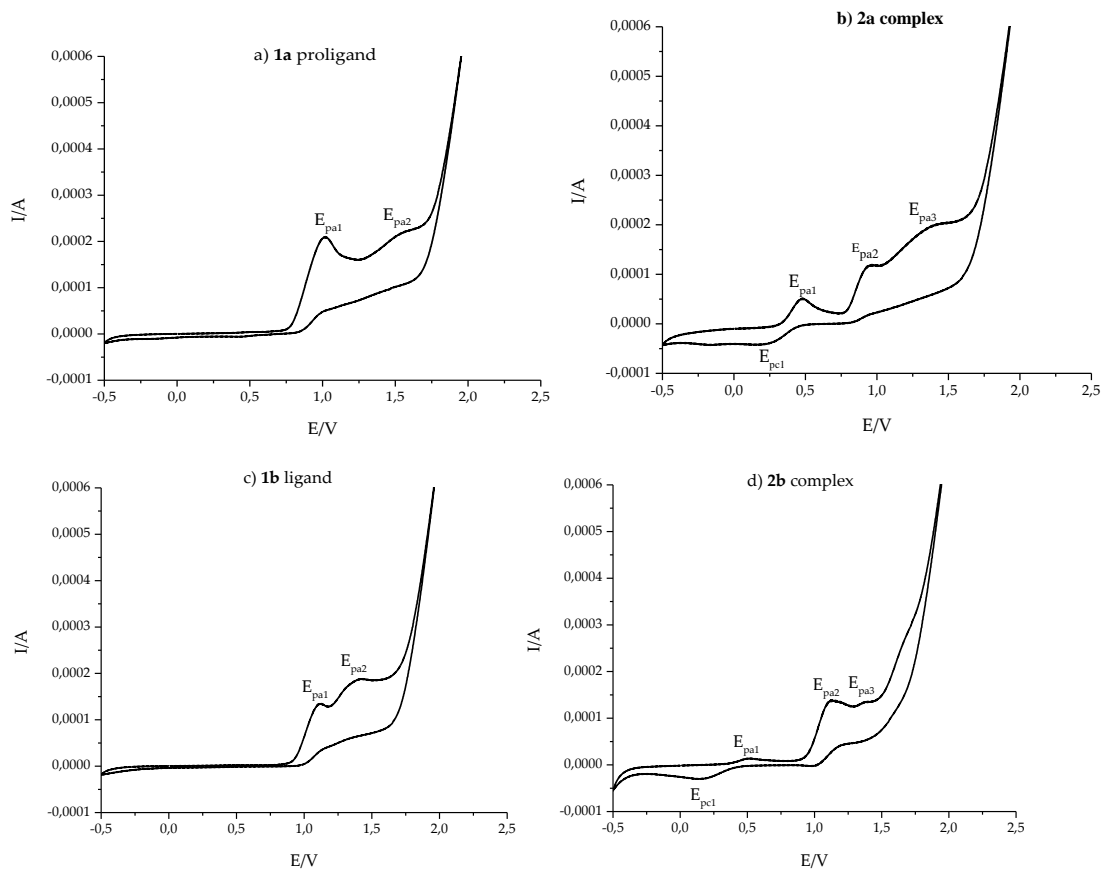


Figure S17. Cyclic voltammograms of ligands **1a-b** and Cu(II) complexes **2a-b**, in DMF solution at 100 mV/s scan rate, corresponding to the **1a** (a), **2a** (b), **1b** (c) and **2b** (d).

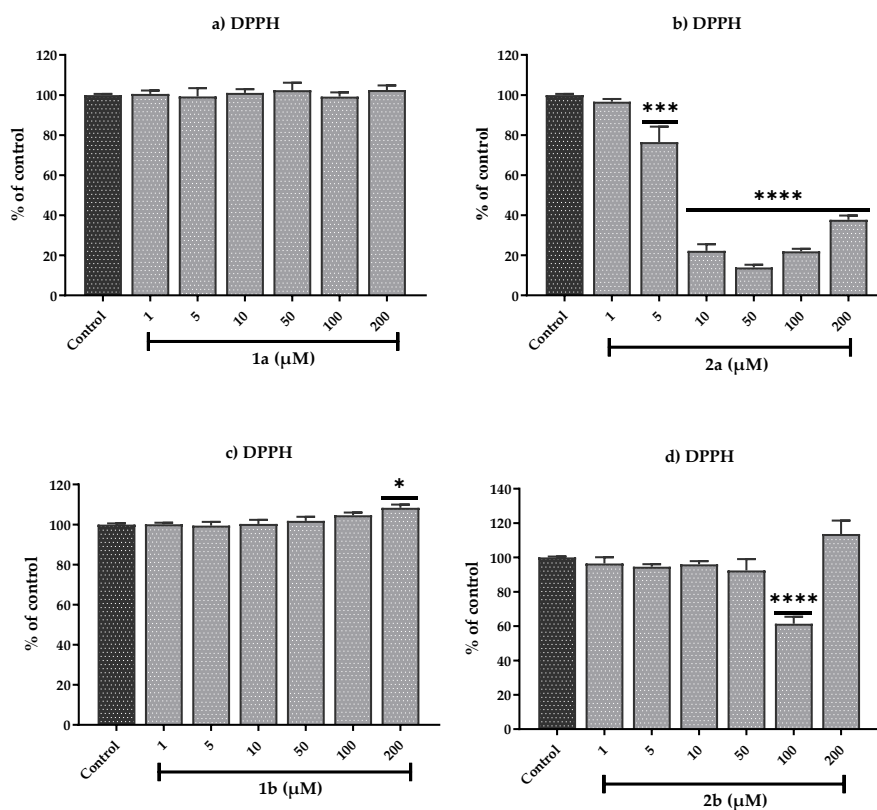


Figure S18. Effect of ligands and Cu(II) complexes represented by the **1a** (a), **2a** (b), **1b** (c), **2b** in different concentrations on DPPH radical-scavenger activity. Data are expressed as the mean \pm SEM for three independent experiments, carried out on different days. The results are calculated as % of control of the absorbance at 517 nm. Asterisk denotes significance levels when compared to control group: (*) $P < 0.05$, (***) $P < 0.001$ and (****) $P < 0.0001$ (One-way ANOVA followed by the Newman-Keul's test).

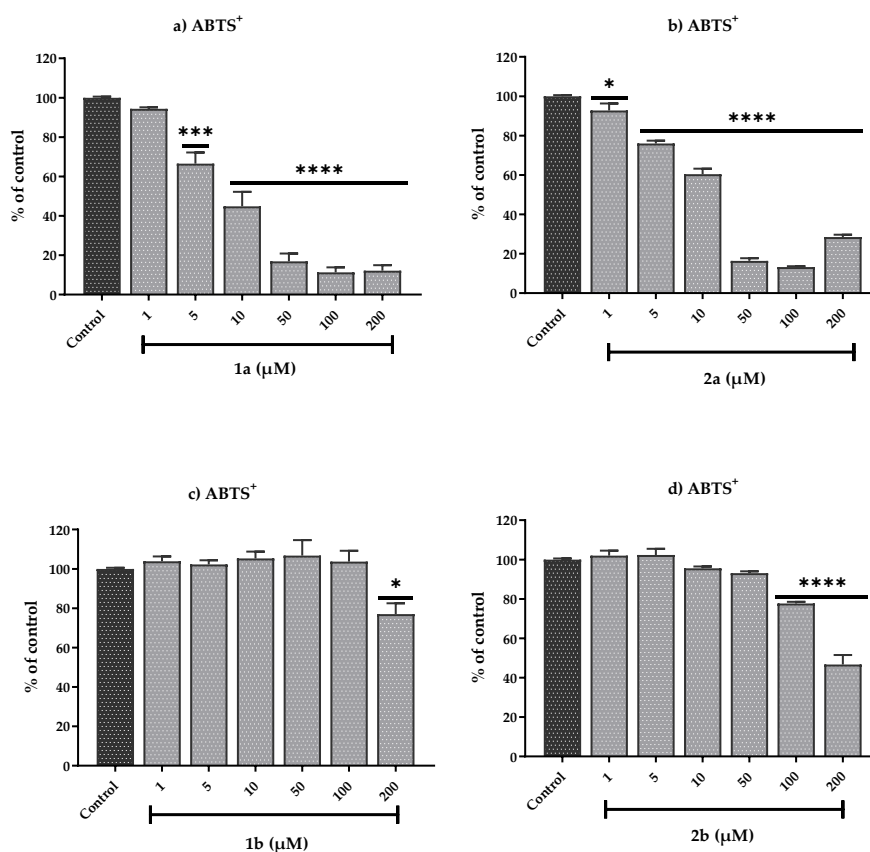


Figure S19. Effect of ligands and Cu(II) complexes represented by the **1a** (a), **2a** (b), **1b** (c), **2b** in different concentrations on ABTS⁺ radical-scavenger activity. Data are expressed as the mean \pm SEM for three independent experiments, carried out on different days. The results are calculated as % of control of the absorbance at 730 nm. Asterisk denotes significance levels when compared to control group: (*) $P < 0.05$, (***) $P < 0.001$ and (****) $P < 0.0001$ (One-way ANOVA followed by the Newman-Keul's test).

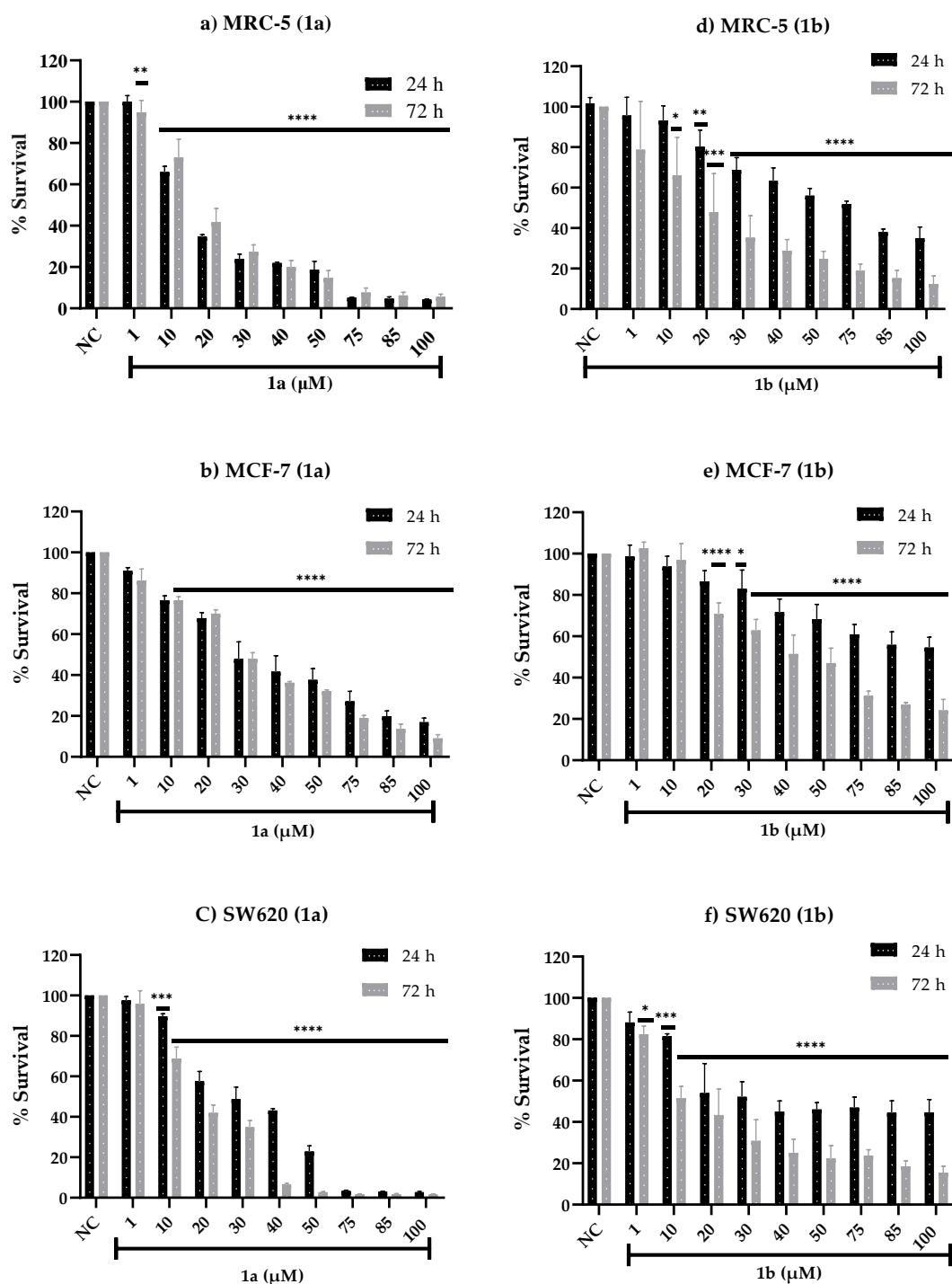


Figure S20. Comparison of the dose-response survival diagrams of MRC-5, MCF-7 and SW620 cell lines exposed to **1a** and **1b** free ligand (0 – 100 μ M) for 24 h or 72 h. The obtained values represent an average of at least three independent experiments. NC represents the negative control. Graphs represent the average \pm SD. Statistical analysis were performed using One-way ANOVA followed by

Dunnett's multiple comparison test and $p < 0.05$ was considered as significant. * $p = 0.0189$ (d), 0.0145 (e), 0.0224 (f); ** $p = 0.0027$ (a), 0.0015 (d); *** $p = 0.0010$ (c) and (f), 0.0003 (d); **** $p = < 0.0001$.

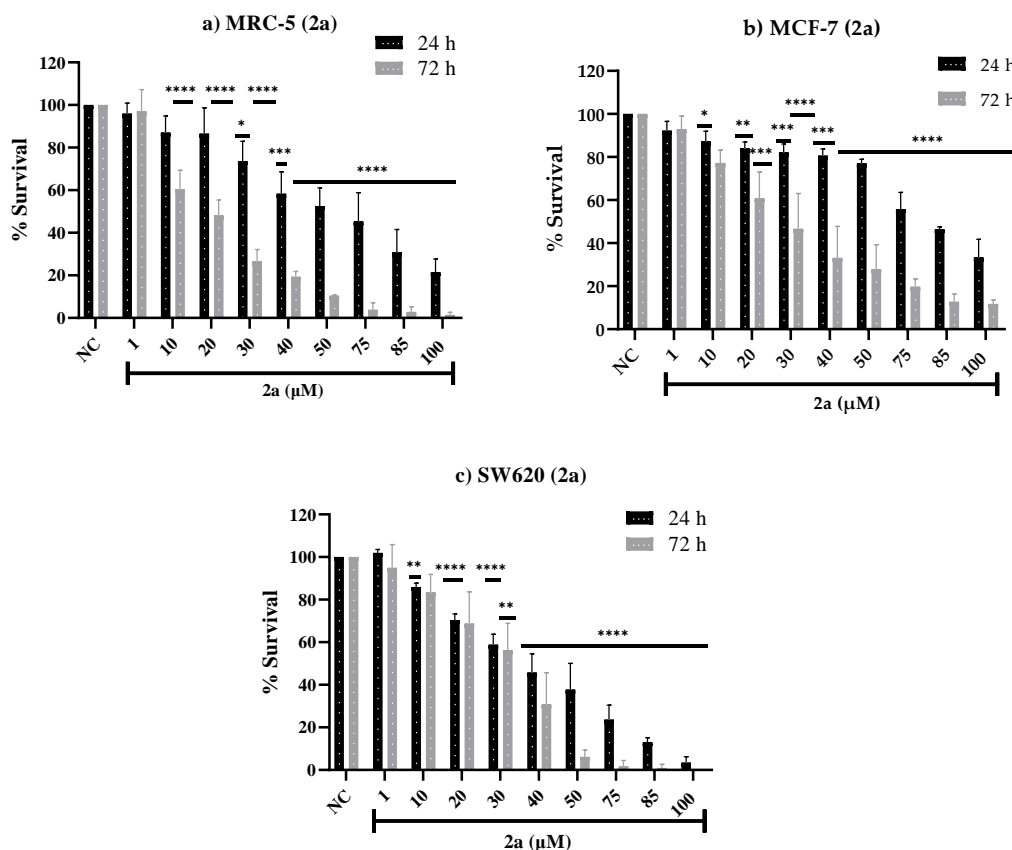


Figure S21. Comparison of the dose-response survival diagrams of MRC-5, MCF-7 and SW620 cell lines exposed to complex **2a** (0 – 100 μM) for 24 h and 72 h. The obtained values represent an average of at least three independent experiments. NC represents the negative control. Graphs represent the average \pm SD. Statistical analysis were performed using One-way ANOVA followed by Dunnett's multiple comparison test and $p < 0.05$ was considered as significant. * $p = 0.0141$ (a); 0.0185 (24 h - b), 0.0445 (72 h -b), ** $p = 0.0026$ (b), 0.0036 (24 h - c), 0.0017 (72 h - c) *** $p = 0.0002$ (a); 0.0009 (24 h-b), 0.0004 (72 h -b), **** $p = < 0.0001$.

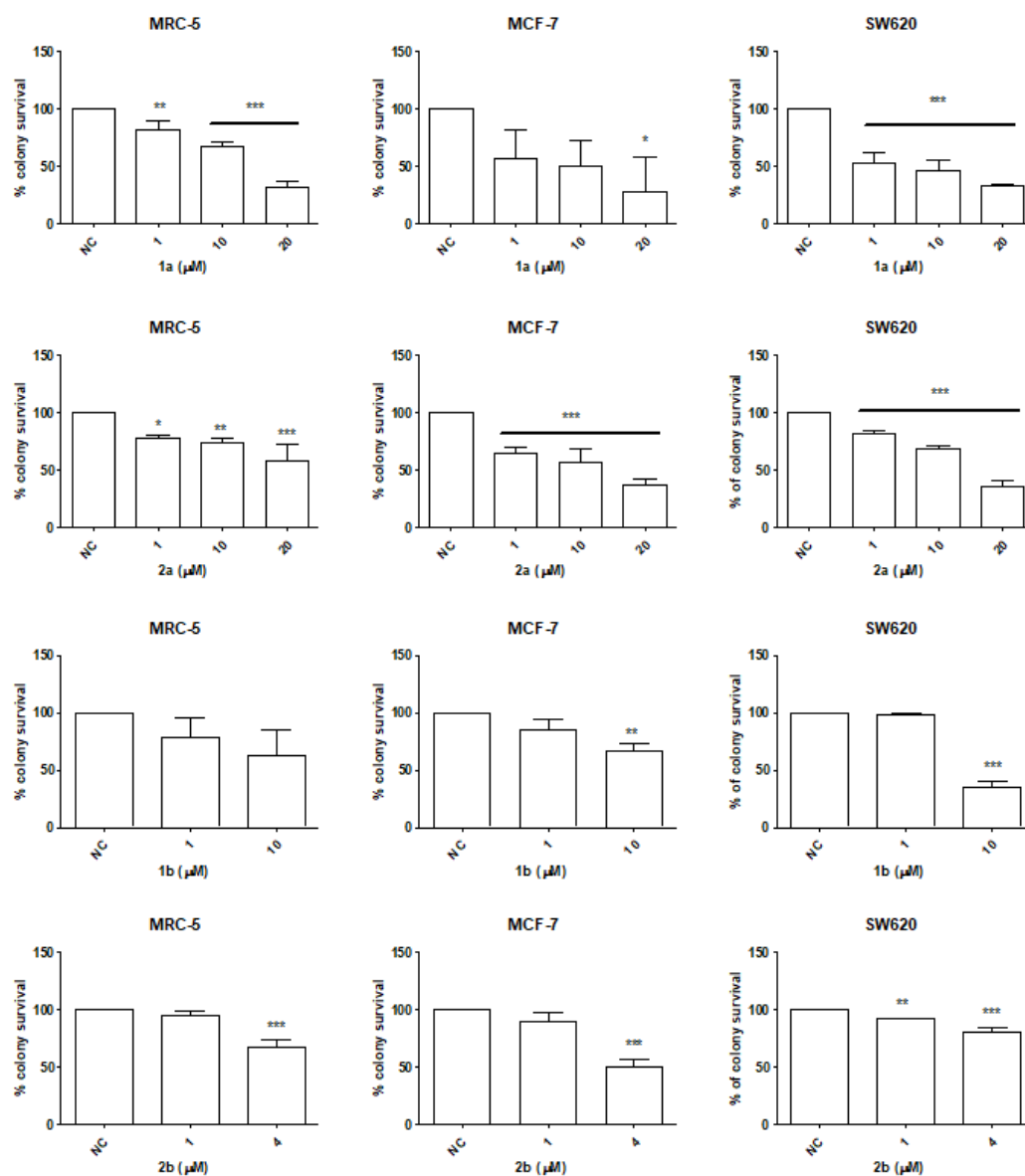


Figure S22. Colony Survival for **1a**, **1b**, **2a** and **2b** on MRC-5, MCF-7 and SW620. Data represent mean and SD of 3 independent experiments. One-way ANOVA and Dunnett1s posttest. (*) $p < 0.05$; (**) $p < 0.01$; (***) $p < 0.001$.

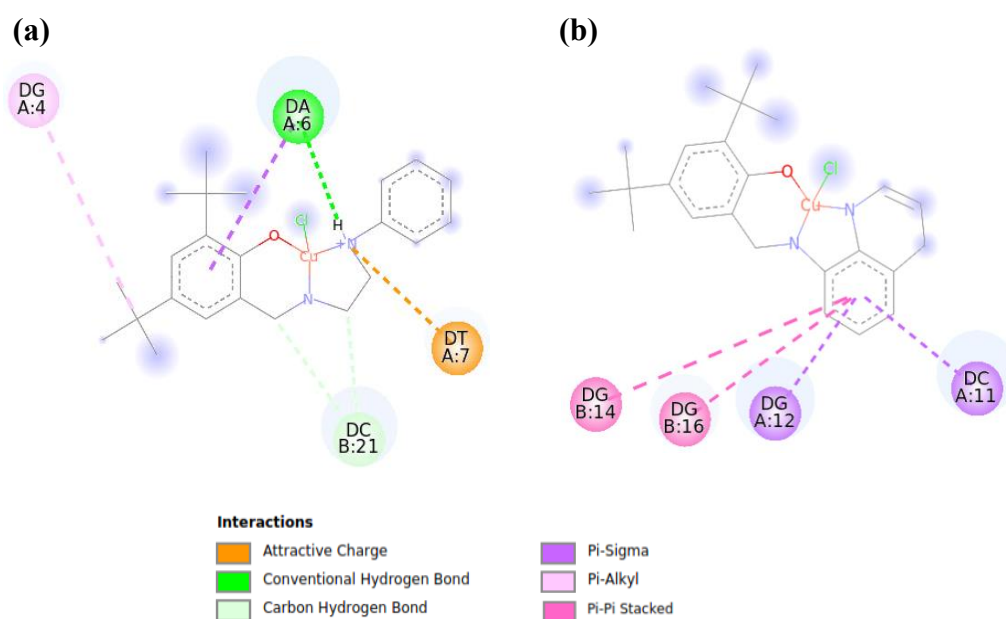


Figure S23. Two-dimensional interaction diagram of complexes **(a) 2a** and **(b) 2b** with DNA (PDB: 1BDNA).

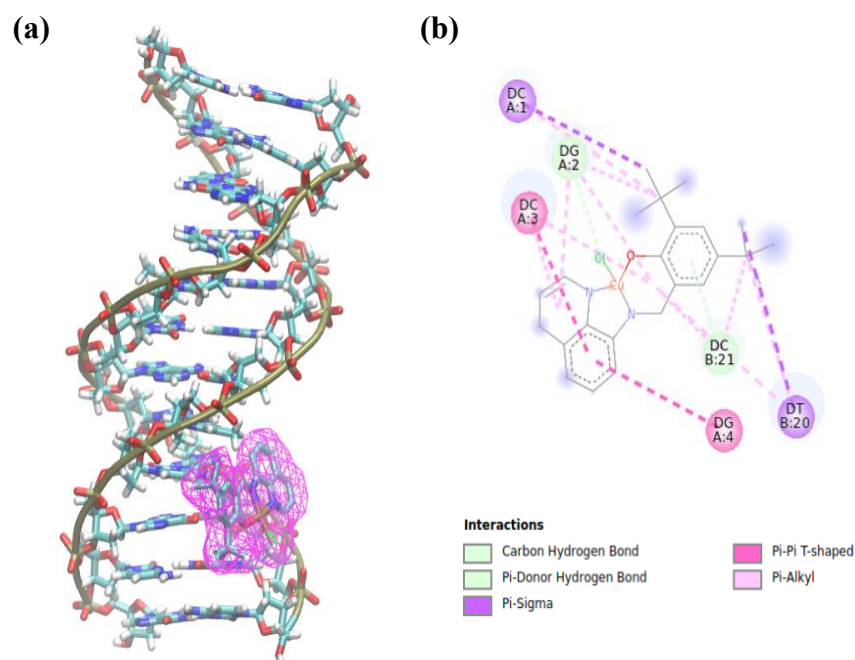


Figure S24. (a) An alternative docking pose for **2b** with an affinity value of -7.4 kcal mol $^{-1}$. **(b)** Two-dimensional interaction diagram of this mode with DNA.

Table S1. Crystallographic data and structure refinement parameters for **2a'**.

Complex	2a'
Empirical formula	C ₉₂ H ₁₂₄ Cl ₄ Cu ₄ N ₈ O ₄
Formula weight (g mol $^{-1}$)	1801.94
T (K)	111(2)
Crystal system	Triclinic
Space group	<i>P</i> -1
<i>a</i> (Å)	11.4946(5)
<i>b</i> (Å)	12.1360(5)
<i>c</i> (Å)	16.7973(7)
	77.584(2)
	87.932(2)
	87.077(2)
<i>V</i> (Å ³)	2284.66(17)
<i>Z</i>	1
Radiation type	Mo <i>K</i> α
<i>Q</i> _{calcd} (g cm $^{-3}$)	1.310
<i>μ</i> (mm $^{-1}$)	1.088
<i>F</i> (000)	948
Crystal size (mm)	0.14 × 0.09 × 0.06
<i>θ</i> range (°)	2.327 to 30.686
Limiting indices (<i>h</i> , <i>k</i> , <i>l</i>)	$-16 \leq h \leq 16$ $-17 \leq k \leq 17$ $-24 \leq l \leq 24$
Reflections collected	77504
Reflections unique (<i>R</i> _{int})	14148 (0.0787)
Completeness to <i>θ</i> _{max} (%)	99.9
Data / restraints / param.	14148 / 0 / 517

Absorption correction	Multiscan
Min. and max. Transmission	0.7080 and 0.7461
R ₁ [I > 2σ(I)]	0.0440
wR ₂ [I > 2σ(I)]	0.0804
R ₁ (all data)	0.0843
wR ₂ (all data)	0.0902
S on F ²	1.011
Largest diff. peak and hole (e Å ⁻³)	0.614 and -0.558

Table S2. Selected geometrical properties of compounds **2a**, **2a'** and **2b** at the B3LYP/def2-TZVPP/def2-SVP level of theory. Distances are in angstroms and angles in degrees.

Calculate value			
Parameter	2a	2a'	2b
Cu-O	1.904	1.954	1.923
Cu-Cl	2.219	2.261	2.235
Cu-N1	1.937	1.962	2.000
Cu-X	2.109	2.162	2.062
Cu-Cu	-	3.417	-
Cu-Cl2	-	2.959	-
N1-Cu-Cl	163.4	174.4	171.2
X-Cu-O	169.6	175.2	169.4
O-Cu-Cl	98.8	92.9	94.2
X-Cu-Cl	88.1	91.9	94.6
N1-Cu-X	82.8	83.8	81.1
O-Cu-N1	92.2	91.4	90.9

Coordinates xyz : Coordinates from ORCA-job 2a

Cu	6.42927785072474	3.34919281219363	6.26155145588961
O	5.37803864012287	3.51217530414253	4.68240461520883
Cl	5.31985489493879	1.67369650160085	7.23939139736439
N	7.88888188813128	3.16793670642029	7.76649587423149
H	7.32664449521611	2.73934977925756	8.49607159581196
N	7.35152785036804	5.05935965447030	5.91696650202245
C	8.98139221043392	2.29197166969540	7.42812393099237
C	9.54058361259485	2.32135389754930	6.14460348989118
H	9.12776236535299	2.98743287630445	5.38517521094167
C	10.59766742193177	1.46567337941395	5.82753812579071
H	11.02550577660827	1.48844866669680	4.82258633710933
C	11.08962013726641	0.56840588879838	6.77981645377514
H	11.90951721948451	-0.10688642596945	6.52496782307364
C	10.51709010980218	0.52761278439325	8.05418215190476
H	10.88522165933636	-0.18092703297971	8.79989290873629
C	9.46845022240524	1.39019245480596	8.38015187793015
H	9.01536244460654	1.35955043540256	9.37435290893259
C	8.24584011723752	4.56476269618001	8.10947584906661
H	9.14332902228960	4.60652344349418	8.74841353062511
H	7.39526341827295	4.97848877567808	8.67157994532786
C	8.44949602069490	5.36608663237956	6.82792091957558
H	8.49745993546515	6.44375967532965	7.05980556067396
H	9.41179587229549	5.08790032233023	6.36497545266368
C	7.04384404226819	5.88469667159453	4.96534487391082
H	7.61182167685465	6.82797188856120	4.90353004210258
C	6.03210957020111	5.71521419994138	3.97569871287226
C	5.22705303838530	4.52566993589814	3.89099940974653

C	4.21050101489871	4.47406788331343	2.86482932854206
C	4.08860032813358	5.55978007009354	2.01369013679644
H	3.32349935204435	5.51500134994000	1.24049112139063
C	4.88582315587218	6.73753347782381	2.07003654211784
C	5.84283313438268	6.78777655292767	3.05845067163693
H	6.48791303104384	7.66096154041005	3.16925923610111
C	3.29982951727676	3.23957105428753	2.74300083546199
C	2.27433284818610	3.40144030994290	1.60723618211704
H	2.75733902441419	3.51562730648100	0.62346042616934
H	1.61133405700612	4.26622421679429	1.76930897598564
H	1.63983795620931	2.50306620090403	1.56063849932099
C	4.15090486245100	1.98766996175989	2.43236412870618
H	3.49625841877244	1.10822949716343	2.31730114153964
H	4.86655533325910	1.77980917853508	3.23769751550547
H	4.70741636565743	2.12228151204643	1.49016043659348
C	2.51504715032636	3.03148532765298	4.05859546891291
H	1.89913283050086	3.91746832328389	4.28479218274939
H	3.18617411499136	2.84265298506869	4.90560141670408
H	1.83851850787583	2.16701564881317	3.95692553750223
C	4.64347491251293	7.86416593313821	1.05622224105726
C	4.85409024441176	7.32120361719270	-0.37378964338876
H	4.68024329140262	8.11526588259184	-1.11882777217099
H	4.16422330880006	6.49447037962817	-0.60144519501813
H	5.88178873986967	6.94618746889469	-0.50301118456007
C	3.19656661955099	8.38370724239666	1.19802498774587
H	3.00244987303752	9.18990323477469	0.47125738327080
H	3.02106258687796	8.78233314126339	2.20976389163321

H	2.45738127284263	7.58825974921757	1.01814649036440
C	5.60299321481215	9.04476401594033	1.27061869571163
H	6.65551984096369	8.73988304782376	1.15916895720259
H	5.47924411919238	9.49561002178494	2.26793470467289
H	5.40399945913284	9.83037027452752	0.52477970345374

Coordinates from ORCA-job 2a'

Cu	10.43465165283363	7.72443878369060	7.87480873110712
O	10.46934505414110	7.64204537952991	5.92286193237510
N	10.30331607811301	7.96948435581608	10.01866883196358
H	11.30547997665298	8.05390016234102	10.17127335230819
Cl	11.74222640787630	5.89207070474505	8.09005927162183
C	9.79242933746797	6.85595643679011	10.74341724108252
N	9.20042094694973	9.24949505712336	7.83794981931180
C	8.41779399081223	6.68743258602720	10.96448401392852
H	7.70000304447882	7.41321693576422	10.58400872881750
C	7.95524258253351	5.57640967581781	11.67363316729596
H	6.88171332297797	5.45758592647420	11.83990904162293
C	8.85165986360905	4.62381651529686	12.16502988561267
H	8.48533191469536	3.75633653854877	12.71880007317175
C	10.22163803840571	4.79233753182995	11.93984954367101
H	10.93989849158612	4.06208270342929	12.31723727032841
C	10.69178918474088	5.89677642231889	11.23375672230019
H	11.75782452254933	6.01804910820786	11.05779529355457
C	9.66076920910438	9.29073340347329	10.21408282321649
H	10.46099469873845	10.03585621473906	10.14149301037518
H	9.20866702247339	9.34928403539009	11.21584349514592

C	8.62621342452340	9.57892624714562	9.12950849906117
H	7.72218870527822	8.96567896861147	9.27541297761618
H	8.31954268159097	10.63892526109815	9.17885420653413
C	9.15734288713332	10.07840327094894	6.85654177345167
H	8.66852838617756	11.05249727639400	7.02961201241230
C	9.65603132370584	9.87010521195645	5.52716369172593
C	10.33329922143805	9.55573489545241	2.86648583900816
H	10.57224303784928	9.43565078915100	1.81121712554317
C	10.47515409307211	8.45008265146111	3.69244554903803
C	10.20628841195109	8.61536364330337	5.10216742226675
C	9.89062424767634	10.83467395329260	3.29034320965460
C	9.52953688861286	10.95117937089058	4.61774960576319
H	9.13087356621972	11.88840125699040	5.00884497900562
C	10.85881362843363	7.06881883413091	3.13047692445287
C	12.15975549240363	6.54411427488402	3.77121039406956
H	12.45399312111749	5.59258457620546	3.29882594248416
H	12.01220377886979	6.35940374770301	4.84138366677536
H	12.98260616280003	7.26258211271377	3.63204839839710
C	9.70973356113215	6.07732466815860	3.42242189458599
H	8.77699534815833	6.41165583570555	2.94045075523132
H	9.53333098052036	5.98470152542046	4.50245872108915
H	9.96006478998405	5.07907708613653	3.02652760958949
C	11.07468148440051	7.11158673892870	1.60799601278315
H	10.17121213171690	7.43938024736764	1.07058646541654
H	11.32553339204883	6.10205389068588	1.24722753754760
H	11.90493579773042	7.77959948654336	1.32831133973206
C	9.79728723557653	11.98184778019748	2.27480731971581

C	8.83436438899564	11.58441606579163	1.13520969198527
H	8.74975316012200	12.39912404729559	0.39708245194823
H	7.82858407539300	11.37172474420615	1.53079308774696
H	9.18197844946543	10.68630965106551	0.60233711542097
C	11.19619851230450	12.26384788961314	1.68655891198396
H	11.62424040909364	11.37218317176925	1.20367052568696
H	11.89459350630463	12.58397306272383	2.47563283521790
H	11.14543330432712	13.06474507967311	0.93046437289592
C	9.27581302933289	13.27491447869224	2.91973605792016
H	9.23370905881590	14.07910065937242	2.16848731262676
H	9.93189400299473	13.61544727341165	3.73627919325433
H	8.26027720454690	13.14644928459320	3.32606469560370
Cu	13.77976776397461	7.98120986452543	8.52427744292796
O	13.74499091548372	8.06355675152856	10.47624690534671
N	13.91117621240375	7.73618140373525	6.38038136967057
H	12.90901854912799	7.65171665048832	6.22777907784875
Cl	12.47226949992673	9.81360478975128	8.30897643243940
C	14.42202067725026	8.84972155391136	5.65562823263368
N	15.01405873916921	6.45620843639089	8.56114448347256
C	15.79664909465609	9.01829646283023	5.43455511142808
H	16.51446868702221	8.29254265799702	5.81503525505140
C	16.25915572026303	10.12932969062000	4.72539276645857
H	17.33268016009839	10.24819137622248	4.55911223276898
C	15.36270135518074	11.08188136414985	4.23398333178205
H	15.72899415670359	11.94936735804204	3.68019925166406
C	13.99272974700452	10.91330777300864	4.45916516278507
H	13.27443807950637	11.64352555465819	4.08176333618692

C	13.52262407900030	9.80886076011430	5.16527483720171
H	12.45659340145221	9.68754858799568	5.34122952799783
C	14.55378761219148	6.41496220638805	6.18499742363074
H	13.75359533026540	5.66980239691471	6.25756530185474
H	15.00592217139553	6.35642204633768	5.18325058946525
C	15.58832849308134	6.12682747494576	7.26960008454309
H	16.49231551893693	6.74013796132542	7.12372895030625
H	15.89507057847287	5.06684899085571	7.22025523909458
C	15.05712143035757	5.62726961977935	9.54252798641226
H	15.54596443310263	4.65319212195922	9.36944524915846
C	14.55836005194985	5.83550586318653	10.87188720605234
C	13.88070185301932	6.14966787408342	13.53249206236074
H	13.64160278007102	6.26966943755615	14.58773514831830
C	13.73910484275968	7.25541986738192	12.70662104613791
C	14.00811148909471	7.09023776122826	11.29691908936957
C	14.32340571845401	4.87075254524154	13.10859265318957
C	14.68471081862833	4.75435748810573	11.78123409754416
H	15.08338605271634	3.81715155453353	11.39011289293862
C	13.35540729092908	8.63665249420471	13.26863523089579
C	12.05501515234178	9.16175855172504	12.62712241525665
H	11.76064189326627	10.11324464204137	13.09950775034625
H	12.20336697262172	9.34668120458224	11.55709456378720
H	11.23191529505544	8.44342636834124	12.76553271056880
C	14.50488885651513	9.62797479731585	12.97766837131574
H	15.43723753370595	9.29334639296367	13.46018766910503
H	14.68202787178454	9.72080251037297	11.89777493945452
H	14.25450109947601	10.62618645465298	13.37361940138731

C	13.13853530223132	8.59361523197141	14.79096547989562
H	14.04156755511071	8.26546111152236	15.32889092475046
H	12.88771798253762	9.60313777485758	15.15178692960825
H	12.30791926103346	7.92576820799152	15.06996818177773
C	14.41653019594876	3.72348050274844	14.12403684630939
C	15.37920606926862	4.12079937927183	15.26388166676807
H	15.46366430304058	3.30601476765755	16.00194148257876
H	16.38506955753893	4.33353870245292	14.86853565973144
H	15.03147258250653	5.01884731298736	15.79677463329066
C	13.01749121748567	3.44142160437223	14.71195521254297
H	12.58933371504668	4.33304729924867	15.19481349478688
H	12.31927764794868	3.12134774113858	13.92270045287139
H	13.06809502292465	2.64046697919532	15.46800003355532
C	14.93814564671746	2.43047758102100	13.47909378044248
H	14.98010308844023	1.62622103028823	14.23027530547268
H	14.28223259766531	2.09001580479760	12.66238637635128
H	15.95376205357689	2.55899181944360	13.07298233505245

Coordinates from ORCA-job 2b

C	3.98553773990649	6.66302105229965	1.23463602050195
C	5.38327466526945	6.80396263000328	1.22218671122103
C	3.19815729011710	7.78119750510912	1.23952938981237
H	3.55367588559393	5.67096324738992	1.24580298524992
N	5.96210211048391	7.98125637956060	1.20388141875383
H	6.06074494623846	5.95544934958883	1.22957676715870
C	3.79294542109280	9.05807288205004	1.22169472078716
H	2.11637710503687	7.70127529689300	1.25846559767834

C	5.20392293243370	9.10496026982697	1.19436918443910
C	3.06709429820248	10.26732029573773	1.23260099024928
C	5.89045564415590	10.34516238081256	1.15542949886932
C	3.74195752141210	11.45856498816616	1.22211004195239
H	1.98416122655670	10.23942752215003	1.26063213152278
C	5.14490289253038	11.50528754441293	1.18770647369919
H	3.18970355200002	12.39056565843129	1.24746750336903
H	5.63089640636212	12.47191723646744	1.20003307158971
N	7.27562300809065	10.23577207150709	1.10320426574922
C	8.02181525406793	11.27461916806792	0.84741291874034
Cu	7.96915488908284	8.38570556746848	1.23757267780680
O	9.76833168484542	9.03651884935333	1.38467638214298
Cl	8.58276831088914	6.25269634747506	1.21748178005582
C	9.42109379422556	11.32243549585911	0.80210392763049
H	7.52326343494743	12.21854589112523	0.62105214645677
C	10.24359577259055	10.19426220876209	1.12338640794372
C	11.66597691145564	10.41133416844828	1.14653065351856
C	12.14211888205153	11.63114617563511	0.73673448530945
C	9.99574541071862	12.55578674089626	0.40514297082043
C	11.34404467688048	12.72699565763078	0.32367288577803
H	13.21526050872356	11.76634342156093	0.72423185388723
H	9.31537852526167	13.35589605061243	0.13614352156063
C	11.99094461927697	13.97004166368386	-0.27201445190710
C	11.00533641950721	15.13273002031553	-0.36274594957050
C	12.46562483281251	13.61745727898008	-1.68823979765462
C	13.19221519747244	14.43074891385153	0.55493351561377
C	12.60757932120909	9.28677399820755	1.55969961675383

C	12.51193190179040	8.15136682847341	0.53237139127803
C	12.25860012325396	8.78100710926371	2.96570583272261
C	14.06161142624361	9.74924541947291	1.60693690457731
H	11.23926704118700	8.40509302945405	3.02238560737708
H	12.38666409444008	9.58284139581382	3.69849017009370
H	12.93616522041993	7.96759394784553	3.23765963248603
H	11.50770856333329	7.73265511630527	0.48717910300203
H	13.20745896506827	7.35050123075180	0.79711402202433
H	12.78565073592830	8.52335706045805	-0.45913783081651
H	10.16784134897535	14.90784818612187	-1.02720373455626
H	11.50977242781732	16.01280976755395	-0.76854119582348
H	10.60274105191760	15.39448383565105	0.61943898476211
H	11.62719385233265	13.28230862169517	-2.30339815755956
H	13.20479016389788	12.81305581713133	-1.66807522367061
H	12.92614251723201	14.48717110230930	-2.16620532638066
H	12.89292399728100	14.69188061976857	1.57316213016543
H	13.64095929456844	15.31533661998144	0.09524705119500
H	13.96923976709117	13.66704482586151	0.61201209567690
H	14.43513547019600	10.04828546879464	0.62388976115731
H	14.68253379553478	8.92157031431120	1.95661177943085
H	14.20421114998920	10.58141875464114	2.30159468536842

Coordinates from ORCA-job 1a

C	-5.76873542475317	-3.01600485810156	-0.55615197992032
C	-5.07865064961583	-2.03396438797473	-1.27826845096544
C	-5.13166498658434	-4.19068782856504	-0.16760537183593
C	-3.77794610208207	-4.41939511750174	-0.49302011733659

C	-3.74069935664138	-2.25711932957272	-1.60731011753029
C	-3.09060377809309	-3.43558684976981	-1.22915722756585
N	-3.15884557788085	-5.58365363660585	-0.05406140685152
H	-5.67680607980246	-4.94738471158812	0.40474327250354
H	-3.18570375542786	-1.50555692527880	-2.17537697262406
H	-2.04712830644209	-3.58394760538480	-1.50840553429700
H	-6.81813963211316	-2.86355985388598	-0.28970861936217
H	-5.57981214855101	-1.11193804867564	-1.58068225665684
C	-1.86967972361405	-6.00457053044944	-0.55670630783278
C	-1.43361939373650	-7.30113704045261	0.12470717799750
H	-1.11816728807566	-5.22926480749641	-0.33706535651882
H	-1.86970447074520	-6.14671841527182	-1.65697082612437
N	-0.11050278617286	-7.67952078452965	-0.31428356469591
H	-2.17284112157728	-8.10487402170485	-0.07506738361360
H	-1.41354795758161	-7.13181871305537	1.21544919445920
H	-3.79585666651217	-6.33274105339922	0.16851962974165
C	0.09381827241168	-8.83296289019925	-0.83000248889891
C	1.39528927042546	-9.27394348048732	-1.30552706772342
H	-0.73751497066890	-9.55597777637455	-0.93709988693530
C	1.52156674052089	-10.57148262000562	-1.84137901898776
C	2.52441027438987	-8.41592880224982	-1.24156332326088
C	3.78119540925302	-8.86191797726668	-1.73040968130110
C	3.83583404904978	-10.15791703695106	-2.24615059682170
C	2.73761406504418	-11.04235383484329	-2.31640960324860
C	5.02249707061735	-7.95138204546916	-1.69158635241013
C	4.75937188652548	-6.67429363421922	-2.52137945227804
H	5.65328429644768	-6.02896755086223	-2.51337152860594

H	3.91555273538117	-6.09851942272574	-2.12141669124465
H	4.53755355670429	-6.93335349012346	-3.56931745656186
C	6.25948792840200	-8.64650514175486	-2.28599843813859
H	6.11300383747849	-8.92028244784690	-3.34272221966337
H	6.53285953542827	-9.55581572455806	-1.72776952178121
H	7.11905767623236	-7.96027419971329	-2.23841440995186
C	5.35262121858284	-7.57777594769979	-0.22909131598848
H	4.52803158105994	-7.03148804267364	0.24568677868524
H	6.25287474802874	-6.94213533023870	-0.19661208962132
H	5.55578190875217	-8.48388449427531	0.36428800295902
C	2.93123813791773	-12.45034654889365	-2.89886246041705
C	1.62375754498788	-13.25760461323949	-2.89491680013267
H	1.23109320942800	-13.39235784211609	-1.87480591996247
H	1.80122159009025	-14.25897221505633	-3.31734516038920
H	0.84334525130850	-12.77392181628267	-3.50317803374388
C	3.42944702757836	-12.34043661518122	-4.35583715559968
H	2.69713738071484	-11.80482379758532	-4.98051816461021
H	3.58388743882321	-13.34272325220607	-4.78824405358163
H	4.38502382333903	-11.79817326086303	-4.42000970796389
C	3.97440084009109	-13.21432008375234	-2.05539918246493
H	4.94803994937678	-12.70098190969012	-2.04724666379266
H	4.13347024887755	-14.22692125784523	-2.46143431473032
H	3.63778783105433	-13.31156384556157	-1.01103518749622
O	2.40150828593327	-7.18103049737498	-0.72104813112551
H	1.44515362511627	-7.06800085479972	-0.43748313676966
H	0.62752367168914	-11.19603966842292	-1.86864514313905
H	4.79293825960961	-10.51508551132678	-2.62125220327241

Coordinates from ORCA-job 1b

C	-1.51126892104837	-1.71536217644799	0.06007084592919
C	-0.96607743666408	-0.44746220420035	0.06482917412502
C	0.43159471747571	-0.26435255144964	0.01762858540136
C	-0.66256180768569	-2.85136756034290	0.01119464166954
C	0.76318774577102	-2.68563827469513	-0.00694766703349
C	1.30493770513417	-1.34429132643233	0.00401133267488
C	-1.16977730623653	-4.17840311963205	-0.01399364359395
N	1.59776940028339	-3.76525939502895	-0.05998999118927
C	-0.30131970259754	-5.24377126633774	-0.06312552440155
C	1.08882914601556	-4.97694060254436	-0.09178083438492
N	2.67725744632446	-1.14263427328488	-0.12503970434531
C	3.46183689189777	-1.83401924330526	0.60143329411758
C	4.89983046962942	-1.98937225346698	0.35330911860178
C	5.77059914971497	-0.91180568379629	0.14500368742550
C	7.13366115949083	-1.13318286092396	-0.04346419755304
C	7.57953659321901	-2.46925486735998	-0.02761446492605
C	5.36774398071226	-3.31714152612199	0.31056212546311
C	6.74627179903172	-3.58189729065572	0.13515111299511
C	7.29612126332579	-5.01956950073973	0.10394136447126
C	6.68962305751876	-5.78579751984904	-1.09317764001037
H	5.59604330497646	-5.84309799475630	-1.02413861406462
H	7.08957962569811	-6.81292067188988	-1.12487272267753
H	6.95144655441288	-5.28988803579371	-2.04161660804983
C	8.82617671214484	-5.04483066191218	-0.05522218334018
H	9.15098256840552	-4.58343697088078	-1.00072934850980

H	9.17314440702594	-6.08981666048611	-0.06139365446631
H	9.33687807622345	-4.53026796509250	0.77383500175058
C	6.95097639717442	-5.74003704705775	1.42621221543906
H	5.86669169386601	-5.79689354543463	1.58553489164470
H	7.39954658898759	-5.21133027864559	2.28274153437669
H	7.35283059184869	-6.76665448713425	1.41268986056788
C	8.14729409907312	0.00180225841088	-0.25875077572455
C	7.47479583003611	1.38317834548802	-0.23371323365363
H	6.71623598075229	1.48201918171741	-1.02569465400386
H	8.22914741934066	2.16951818492991	-0.39430017995531
H	6.98766580184048	1.58172350380266	0.73377269925890
C	8.83297494067217	-0.17906460845630	-1.62993818877689
H	8.09096529772950	-0.15461139082173	-2.44357433121568
H	9.36947692572636	-1.13807141150063	-1.69475104482545
H	9.56490531313375	0.62654805546111	-1.80677183072164
C	9.21128782809747	-0.04084911940203	0.85841475246003
H	8.74403433415822	0.08494130625098	1.84801616362205
H	9.95044042689659	0.76595481991225	0.72170851762987
H	9.75702650570513	-0.99663462198422	0.86492111371703
H	5.34627095455856	0.09128912548787	0.15808254289298
H	8.64406440983560	-2.64686739687003	-0.16552880602504
H	3.06468234368940	-2.44194532186172	1.43179968156867
H	-2.25215719933334	-4.33260413825986	0.00296709772511
H	-0.65917525824524	-6.27482591856575	-0.08621827554607
H	1.80440408634190	-5.80504236850070	-0.14384177600049
H	0.85793329791735	0.74037002120719	-0.00473875873035
H	-2.59350407473455	-1.86327035520057	0.08987620861022

H	-1.61811499487258	0.42884797873453	0.09723801940000
O	4.47738581684845	-4.35182433827602	0.41150325658731
H	3.56110804275585	-4.05166397600421	0.21448981359975