

Contribution to the structural, electrochemical and biological study of iminic derivatives and their complex

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Abstract

The present work focuses on the synthesis and characterization of a symmetrical Schiff base with their complex and new non-symmetrical tetradentate Schiff bases and their copper complexes, are characterized by different spectral methods such as, UV-Vis, Infrared. The electrochemical properties of these metal complexes were conducted by cyclic voltammetry in the DMF using a platinum electrode (Pt) under nitrogen atmosphere. Finally the synthesized products were subjected to biological tests to evaluate their possible antioxidant powers.

Index Terms- Schiff bases, metal complexes, ligands, tetradentates, antibacterial, antioxidant

Introduction

Today, Schiff bases are used as ligands for the preparation of metal complexes with various structures. These types of compounds combined with inorganic elements play a crucial role in biological and biological medical processes, and it is clear that many organic compounds used in medicine do not have a purely organic mode of action, some are activated or bio-transformed by the metabolism of metal ions. Many drugs have modified toxicological and pharmacological properties. These properties in the form of a metallic complex and Schiff bases containing the azomethine group C = N correspond to a broad spectrum of biological activity whose incorporation of metals showed a certain degree of antibacterial activity, antifungal, antitumor and anti-inflammatory [1].

Methods

1. Preparation of ligands and complexes

The synthesis and characterization of new Schiff base ligands by reacting ethylenediamine with the following carbonylated compounds: benzoine, 2-hydroxy naphthalehyde and dehydecate acid (DHA).

The synthesis and characterization of copper complexes Cu(II) based on non-symmetrical ligands that we synthesized.

The condensation of an ethylenediamine molecule with two different carbonylated compounds which are benzoin and dehydroacetic acid in an equimolar ratio in the presence of acetic acid obtained from compound .

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The preparation of ligands and complexes is done by dissolving the reagents in a suitable organic solvent, usually 98% absolute ethanol and DMF.

2. electrochemical study

The electrochemical study of the Schiff base ligand and its complexes was carried out at room temperature using cyclic voltammetry on a VoltaLab potentiostat/galvanostat PGZ-301 with an electrochemical cell of 5mL capacity. The study solutions were prepared by dissolving the complexes in a 5 ml volume of dimethyleformamide (DMF), the electroactive concentration was always 10-3 M. for the concentration of tetra-butyl-ammonium-perchlorate (TBAP), it was in all our experiments 100 times the concentration of the complex, equal to 0.1M.

3. antioxidant activity

A DPPH solution is prepared at a concentration of 4 mg in 100ml of methanol. We prepare solutions of our compounds (ligand, complex) with a mass of 5mg dissolved in a volume of 5ml DMF. 500μL of DPPH is mixed with the test compound solution at different concentrations and Dilute each mixture to 1.5 ml with DMSO. A control mixture is prepared by diluting 500μL of DPPH in 1 ml of DMSO. We leave it in the dark for 30 minutes, then we measure the absorbance at 517 nm and all tests were performed three times to verify reproducibility.

Results

1. infrared characterization

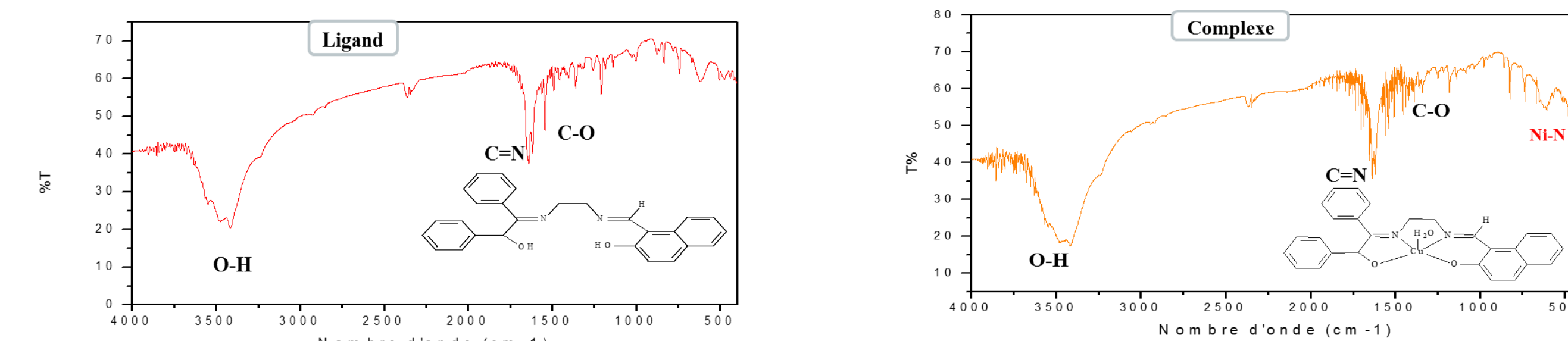


Fig. 2. Infrared spectrum of the H2L2 ligand and their complex in KBr.

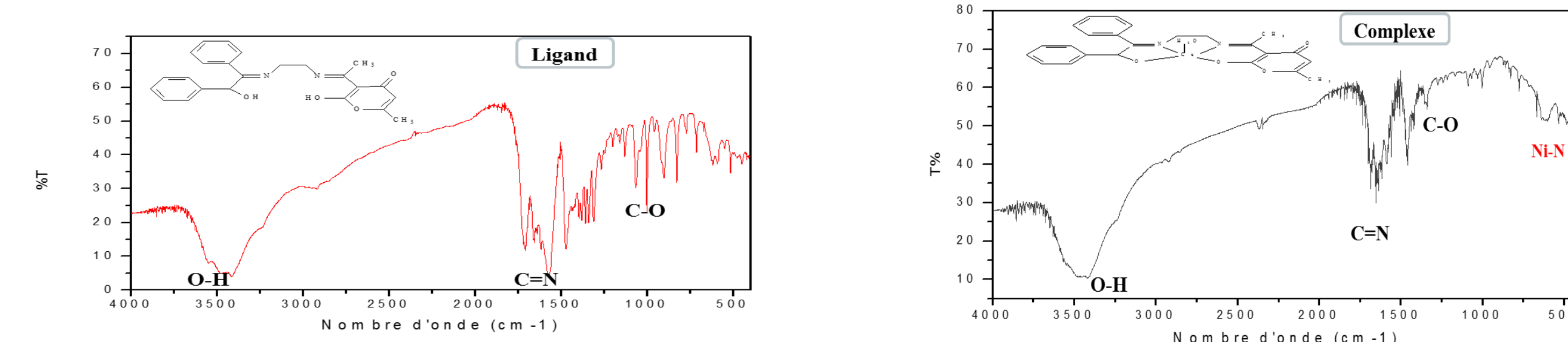


Fig. 3. Infrared spectrum of the H2L4 ligand and their complex in KBr.

2. UV-Visible characterization

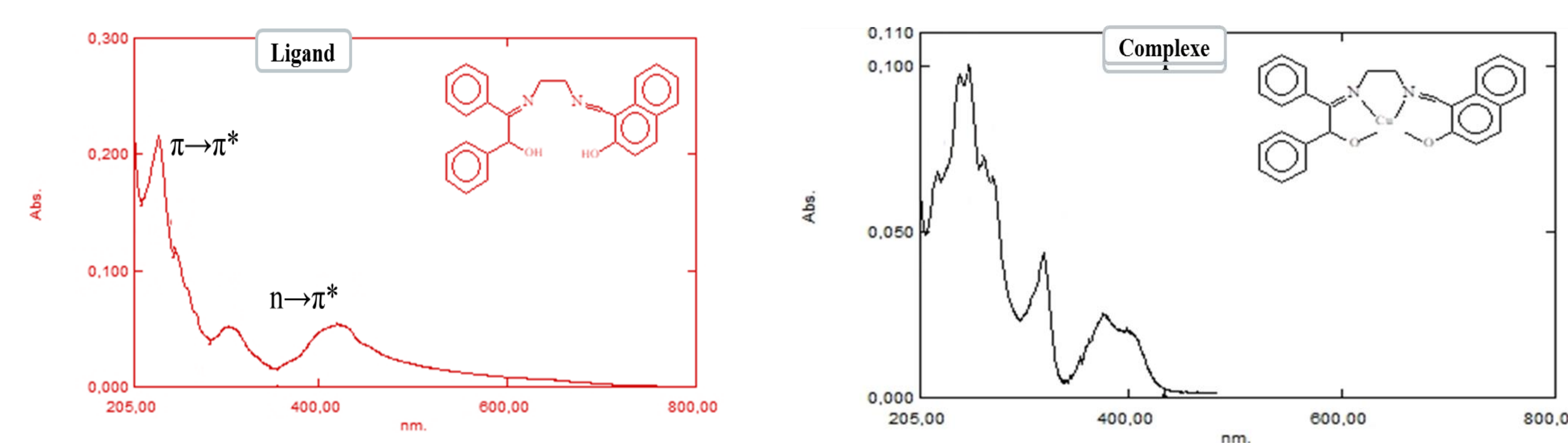


Fig. 4. UV-Visible spectrum of the H2L2 ligand and their complex in KBr.

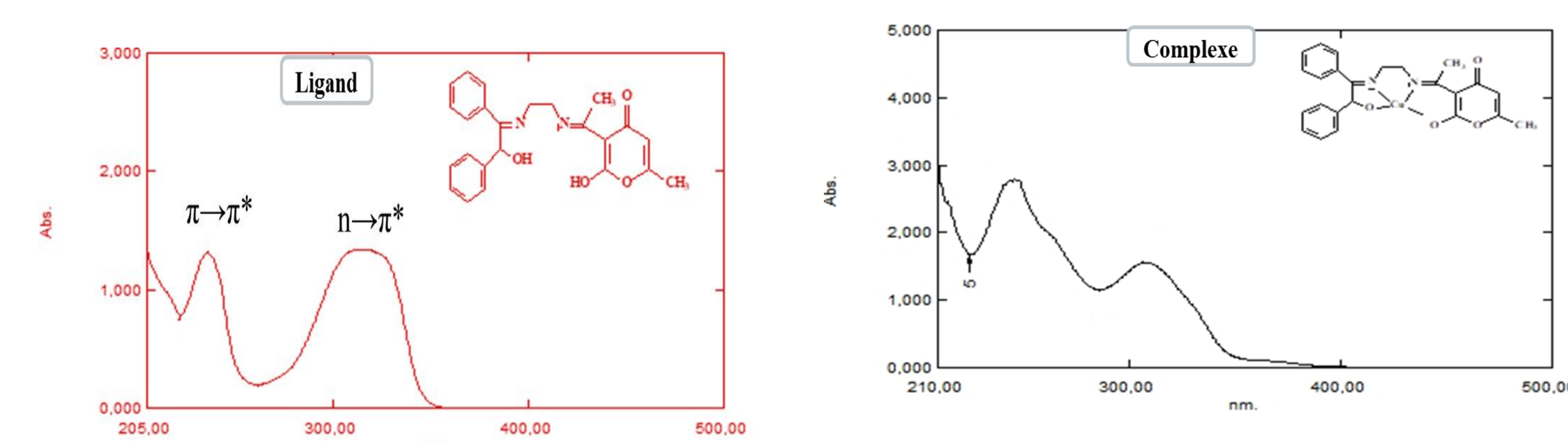


Fig. 1. UV-Visible spectrum of the H2L4 ligand and their complex in KBr.

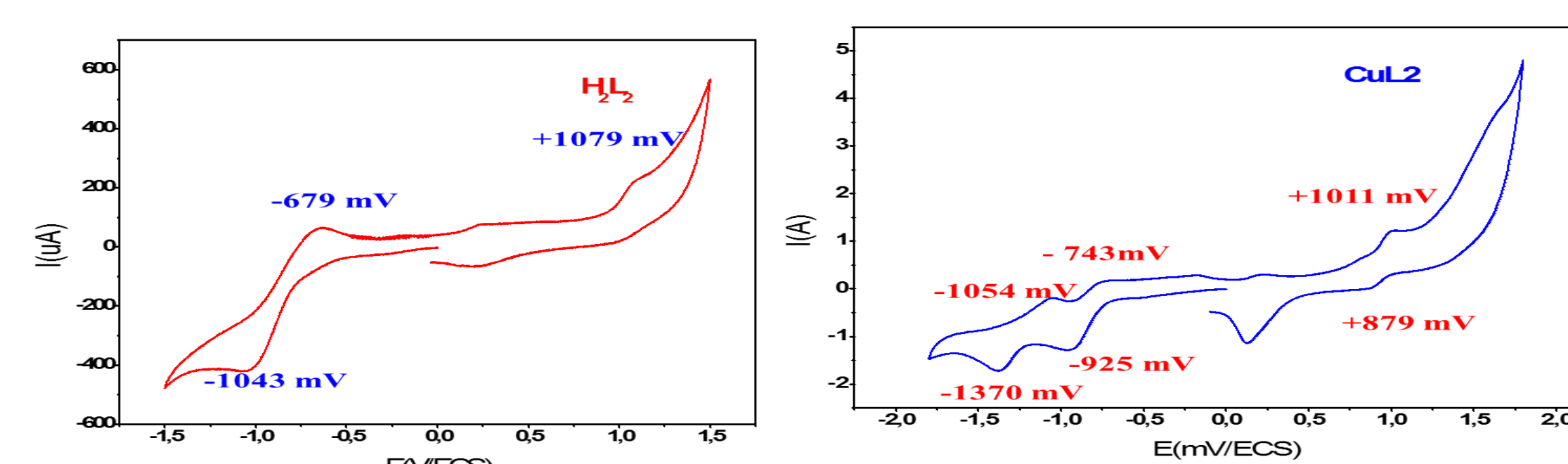
Table . 1. Physico-chemical characterization of ligands and complexes .

composed	λ max
H ₂ L ₂	231 , 420
CuL ₂	250 , 402
H ₂ L ₄	235 , 315
CuL ₄	246 , 372

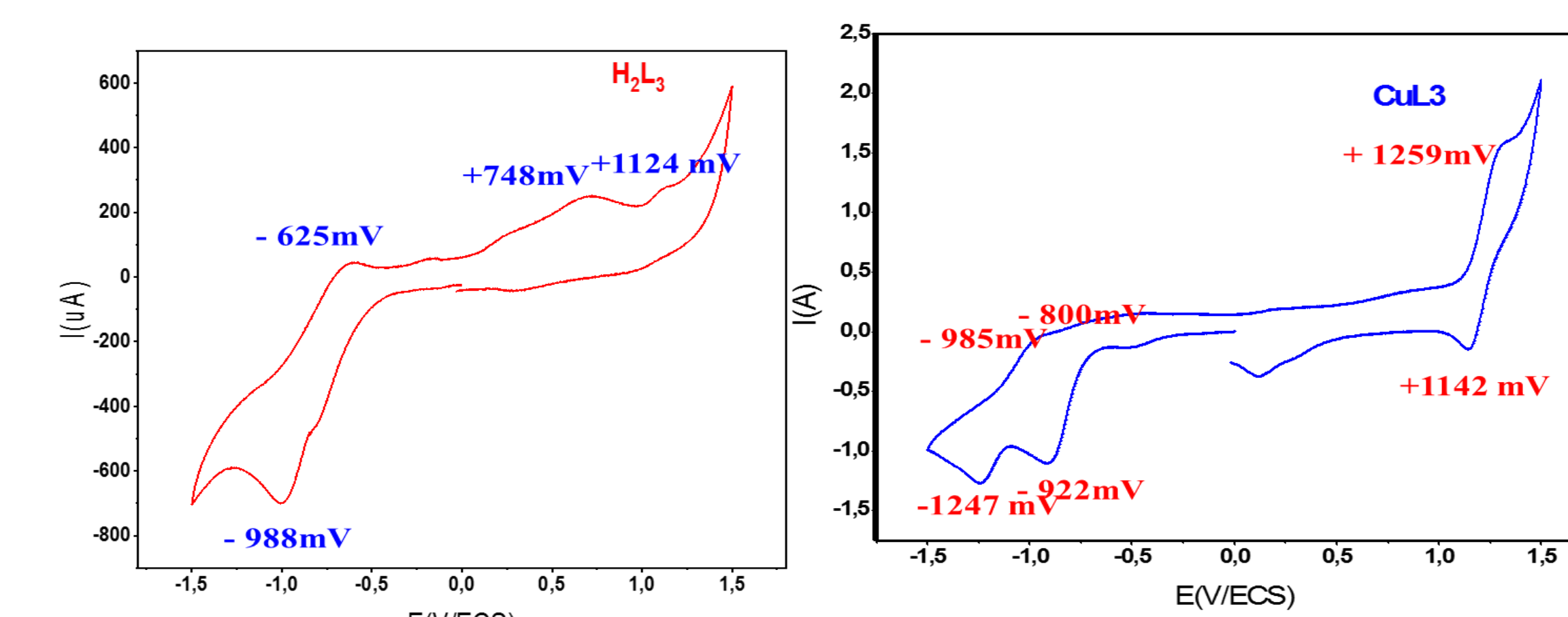
Table . 2. Physico-chemical characterization of ligands and complexes .

composed	O—H	C=N	C—O	M—O	M—N
H ₂ L ₂	3453	1650	1130	-	-
CuL ₂	3460	1624	1180	487	604
H ₂ L ₄	3469	1579	1077	-	-
CuL ₄	3452	1653	1115	473	604

3. Electrochemical study



H2L2 and CuL2 voltammograms recorded in DMF/TBAP/N2



H2L4 and CuL4 voltammograms recorded in DMF/TBAP/N2

4. antioxidant activity

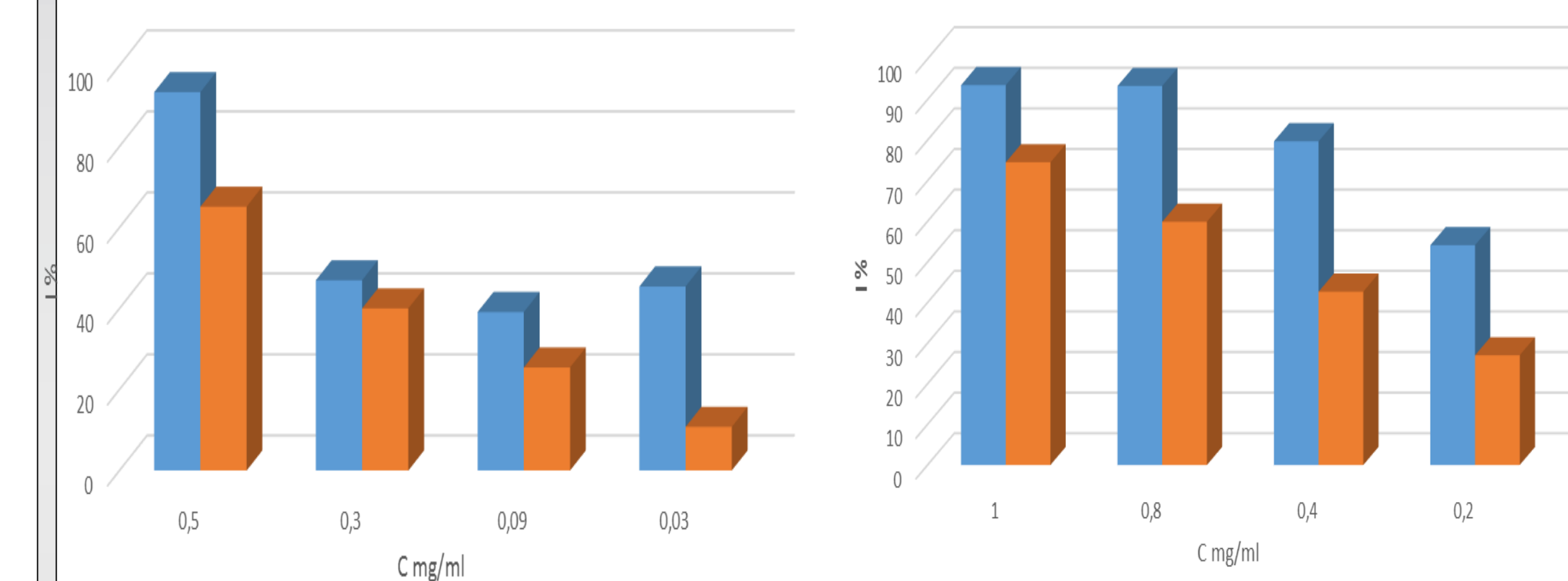


Table . 1. The IC50 value was determined graphically

composed	H ₂ L ₂	H ₂ L ₄
IC50 (mg/ml)	0,369	0,581

Conclusion

The work that we have been able to do in this part is essentially focused in a first stage on the synthesis of two nonsymmetrical tetradentate Schiff ligands which have been synthesized with excellent performance. In a second part we tried to highlight the coordination reaction potentiality of the different ligand compounds synthesized vis-à-vis some transition metals.

We got single crystals. The purity of the synthesis products and the ligands coordination has been demonstrated by the different spectroscopic techniques IR spectral analyses, UV/Vis by comparison of the spectra of the complexes with those of the corresponding ligands if the electrochemical analysis by the cyclic voltammetry shows that the coordination of the metal ions is carried out with the nitrogen donor sites of the imine group and the oxygen of the alcohol group present in each of the ligands, . It has been shown that the Schiff base has tetradentate bound to metallic ions by nitrogen and oxygen atoms.

Ligands and synthesized complexes were subjected to in vitro biological tests to assess their potential antioxidant and . The antioxidant activity was evaluated using the DPPH test, the bases of Schiff H2L2 and H2L4 showed good anti-free radical activity vis-à-vis the free radical DPPH.

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