

Coordination Compounds of cobalt(II) and 2-(1H-imidazol-2-yl)-phenol.

Augusto F. Curti*, Marcos A. Ribeiro, André L. B. Formiga

Abstract

Transition metal complexes with redox active ligands as dioxelenes are very known by its bistability property called valence tautomerism, used in electronic devices. In this work a coordination compound of cobalt(II) and 2-(1H-imidazol-2-yl)-phenol was prepared intending to investigate this specific electronic phenomenon. The complex was characterized by IR, elemental analysis, mass and UV-VIS spectroscopy and the ligand by this previous techniques and ¹H and ¹³C NMR

Key words:

Valence Tautomerism, cobalt(II).

Introduction

Some complexes of transition metals d^n ($n=4,5,6,7$), can exhibit a particular electronic behavior, called bistability. This behavior is characterized by the presence of two composition isomers with distinct electronic arrangements. This requires a ligand having orbitals that lies close in energy with metal orbitals and showing a reversible redox capacity, to stabilize both electronic states. This allow electron transfer between the redox active ligand and the metal center. The equilibrium between the two isomers can be modified by external stimulus like temperature and light.⁽¹⁾ Due to a variety of applications in electronic and memory systems⁽¹⁾ the aim of this work is synthesise, characterize and study this behavior in a new cobalt complex.

Results and Discussion

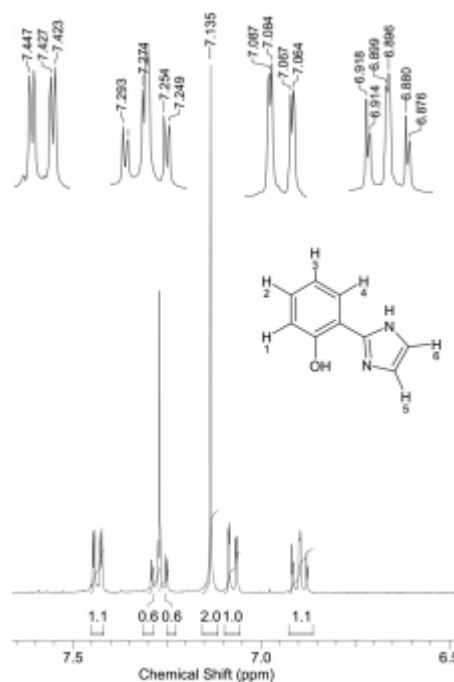
The ligand, 2-(1H-imidazol-2-yl)-phenol, was synthesized following Kudo *et al* procedure,⁽²⁾ 168mmol(12.96 g) of ammonium acetate was added into a methanol/water solution (1:1, v/v, (40 mL) of salicylaldehyde (28 mmol, 3.06 mL) and glyoxal (29 mmol, 2.74 mL), the mixture was stirred at room temperature for 2 hours. The residue was extracted with ethyl acetate and washed with an aqueous solution of NaHCO₃. The organic layer was dried over Na₂SO₄ and concentrated. The product was purified by column chromatography on silica gel with CH₂Cl₂. Mass spectrometry (ES+): molecular formula: C₉H₈N₂O, 160.1 g/mol, [C₉H₉N₂O]⁺ 161.1 and 162.1 m/z. The complex was synthesized adding 0.1 mmol of (CH₃COO)₂Co·4H₂O (28.45 mg) in a methanol solution (11mL) of 2-(1H-imidazol-2-yl)-phenol (0.3 mmol, 43.8 mg). The solution was stirred at 70°C and a black solid precipitated after 14 hours. The crude product was filtered and washed with methanol. IR analysis confirms the formation of the complex:

Chart 1. FT-IR spectroscopy (ATR) of free ligand and complex

Band(cm ⁻¹)	Free ligand (cm ⁻¹)	Complex(cm ⁻¹)
v(O-H)	3216	-
v(Co-O)	-	584
v(C-O)	1038	1027

Chart 2. Assignment of the ¹H NMR spectrum of 2-(1H-imidazol-2-yl)-phenol I CDCl₃

δ(ppm)	Signal type	Integration	Hydrogen
6.897	triplet of doublets	1	H3
7.075	doublet of doublets	1	H4
7.135	singlet	2	H5, H6
7.271	triplet of doublets	1	H2
7.435	doublet of doublets	1	H1



Conclusions

The ligand (2-(1H-imidazol-2-yl)-phenol) and cobalt coordination compound were successfully synthesized and purified. Further analysis are being carried to provide a better understand of electrochemical behavior of ligand and its complexes.

Acknowledgement

This work was supported by CNPq and Fapesp.

1 Shultz, D.A. *Magnetism: Molecules to Materials II: Molecule-Based Materials*, v. 4, n. Mv, p. 281–305, 2002.

2 Kudo, K.; Furutani, M.; *et al.* . *ACS Macro Lett.*, p. 1085–1088, 2015