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

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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 $^1$H and $^{13}$C 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 synthesize, 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 NaHCO$_3$. The organic layer was dried over Na$_2$SO$_4$ and concentrated. The product was purified by column chromatography on silica gel with CH$_2$Cl$_2$.

Mass spectrometry (ES+): molecular formula: C$_9$H$_8$N$_2$O, 160.1 g/mol, [C$_9$H$_9$N$_2$O]$^+$ 161.1 and 162.1 m/z. The complex was synthesized adding 0.1 mmol of (CH$_3$COO)$_2$Co·4H$_2$O (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:

<table>
<thead>
<tr>
<th>Band(cm$^{-1}$)</th>
<th>Free ligand (cm$^{-1}$)</th>
<th>Complex(cm$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ν(O-H)</td>
<td>3216</td>
<td></td>
</tr>
<tr>
<td>ν(Co-O)</td>
<td></td>
<td>584</td>
</tr>
<tr>
<td>ν(C-O)</td>
<td>1038</td>
<td>1027</td>
</tr>
</tbody>
</table>

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.

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