XXI Brazilian Meeting on Inorganic Chemistry
X Brazilian Meeting on Rare Earths
III Workshop on Theoretical Bioinorganic Chemistry
Belo Horizonte, September 12 - 15th 2024

Cobalt(III) Complex with Ether Alkyl Xanthate Ligand: Synthesis, Spectroscopic, and Structural Characterization

Thalita R. André[1], Daniella B. Miranda[1], Guilherme P. Guedes[1] and Glaucio B. Ferreira[1]

[1]*Department of Inorganic Chemistry, Universidade Federal Fluminense, Niterói, Brasil*
E-mail: ribeirothalita@id.uff.br

Thematic Area: Photochemistry

Keywords: Xanthate, Cobalt(III), Crystal Structure

Cobalt salts are important products in the industrial sector due to their stable physicochemical properties[1]. In technology, cobalt complexes find applications in magnetochemistry with various spatial arrangements, notably tetrahedral and octahedral geometries[2-4]. Thus, in this work, we report the synthesis of cobalt(III) complex $[Co(S_2CO(CH_2)_2OCH_3)_3]$, which contain the 2-methoxyethyl xanthate ligand. The synthesis of Co^{3+} complex with ether alkyl xanthate ligand (2-methoxyethyl) was carried out following the methodology described by F. GalsbØl *et al.*[5]. An aqueous solution of cobalt(II) chloride was oxidized using 30% hydrogen peroxide (w/w). The solid obtained was dissolved in a mixture of chloroform and ethanol (1:2), and filtered. The filtrate was then slowly evaporated to yield a crystalline solid (m.p. 63-65°C). The complexes were characterized using infrared spectroscopy, Raman scattering, UV-visible spectroscopy, and proton nuclear magnetic resonance (^{1}H-NMR). The IR absorption spectra in MID region (Figure 1a) reveal bands in the complex at 1260, 1102, 840, and 669 cm^{-1}, corresponding to ν_{as}C-O-C, νC=S, νC-C, and νC-S, respectively. A comparison between the spectra of the ligand (Figures 1a-b) and the complex confirms complex formation, evidenced by shifts in the characteristic bands of the xanthate ligands. The FAR region was also examined to confirm the presence of the νCo-S band, observed at 352 cm^{-1} for complex (Figure 1b). The crystal structure revealed neutral compound, in which the xanthate ligand coordinates to the cobalt ion in a bidentate fashion, resulting in distorted octahedral geometry (Figure 1c). These results corroborate the formation of new cobalt(III) complex with ether alkyl xanthate ligand.

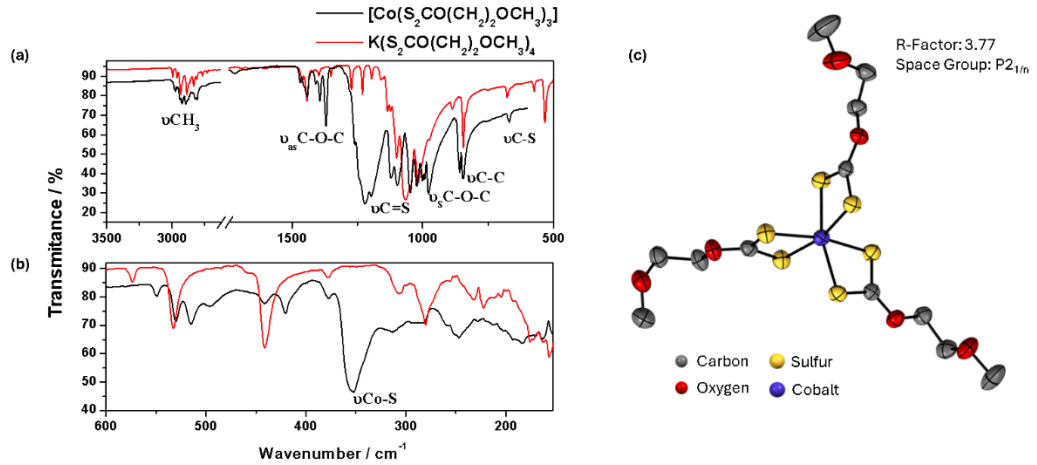

Figure 1. Comparison of the infrared spectra of $[Co(S_2CO(CH_2)_2OCH_3)_3]$ and $K(S_2CO(CH_2)_2OCH_3)$: **(a)** MID region; **(b)** FAR region; and **(c)** Crystal Structure

Acknowledgments: CNPq, CAPES, FAPERJ, LDRX, LMQC, LAME e PROPPi UFF.

References

[1] D. G. Barceloux, J. Toxicol. Clin. Toxicol., 37(2), 201–216 (1999).
[2] J. TITIŠ; R. BOČA, Inorg. Chem., 50, 11838–11845 (2011).
[3] F. A. COTTON, *et al.*, J. Am. Chem. Soc., 83, 4690–4699 (1961).
[4] F. LLORET, *et al.*, Inorg. Chim. acta, 361, 3432–3445 (2008).
[5] F. GalsbØl, *et al.*, Inorg. Synt., 10, 42-28 (1967).