Spectroscopic Studies and Photophysical Properties of a New Complex of Ruthenium Containing Naphthalene Derivatives in the Coordination Sphere

Isabele A. S. de Campos[1](PG), Edjane R. dos Santos[1](PQ), Rose M. Carlos*[1](PQ).

rosem@ufscar.br

[1] *Chemistry Department, Universidade Federal de São Carlos, 13565-905 São Carlos, SP, Brazil.*

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Abstract

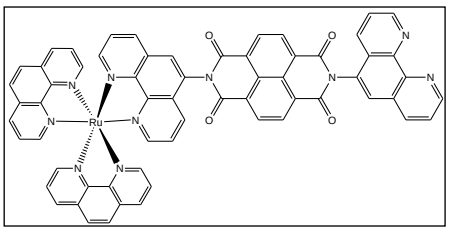
Here, we describe spectroscopic and photophysical properties of the new luminescent ruthenium complex $[(phen)_2Ru(NTCDA)]^{2+}$ has been characterized by elemental analysis and spectroscopic (UV-vis, emission, IR, ^1H NMR) and electrochemical techniques that offers potential applications in photosensitized reactions.

Introduction

1,4,5,8-Naphthalenetetracarboxylic Acid dye and its derivatives are fluorophores with exceptional thermal and photochemical stability, strong absorption in the visible.[1,2] Due to these properties these compounds have been used in diverse applications as light emitting diodes, field-effect transistors, sensing and photovoltaic cells.[2,3] These findings encourage us to study the spectroscopic, photochemical and photophysical properties of the ruthenium(II) polypyridine complex of general formula $[(phen)_2Ru(NTCDA)]^{2+}$, scheme 1.

Results and discussion

The dye was covalently linked to Ru(II)-diimine complex and characterized by spectroscopic and electrochemical techniques. The data of CHN, ^1H NMR, IR suggest the coordination of new compounds the Ru(II).



Scheme 1. Molecular Structure of the Complex $[(phen)_2Ru(NTCDA)]^{2+}$.

The complex is very stable chemically and photochemically in the solid state and organic solvents. The UV vis spectrum of the naphthalene fragment display a broad and intense absorption with a short emission lifetime and a short quantum yield, while the $\{Ru(II)(phen)_2\}^{+2}$ fragment shows a broad MLCT singlet absorption with a maximum at 447 nm and long-lived emission attributed to ^{3}MLCT state. The luminescent studies were carried out in DMSO solution and acetonitrile. The complex was also investigated in solid state and polymeric matrix, and a similar emission spectra is observed.

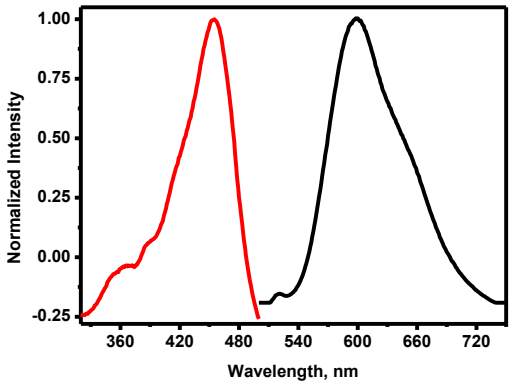


Figure 1. Emission and excitation spectra of Complex in CH_3CN at 25 ºC.

Conclusions

The combination of these two dyes in dyads can bring new properties resulting from the synergies between the two moieties that can be useful for diverse applications such as photovoltaic cells and cancer photodynamic therapy.

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[1] Cox, R. P.; Higginbotham, H. F.; Graystone, B. A.; Sandanayake, S.; Langford, S. J.; Bell, T. D. M. *Chemical Physics Letters.* **2012**, 521, 59.
[2] Bhosale, S. V.; Jani, C. H.; Langford, S. J. *Chem. Soc. Rev*., **2008**, 37, 331.
[3] Bhosale. S. V.; Kalyankar, M. B.; Bhosale, S. V.; Langford, S. J.; Reid, E. F.; Hogan, C. F. *New J. Chem*., **2009**, 33, 2409.