

# Synthesis of the novel chromophore [Ru(bpy)<sub>2</sub>(NI)<sub>2</sub>](PF<sub>6</sub>)<sub>2</sub> and its spectroscopic characterization

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**Introduction.** Ruthenium polypyridine complexes have wide application in chemiluminescent processes, acting both as LAS (light absorption sensitizer) or LES (light emission sensitizer) mediators.<sup>1</sup> Also of interest to this work are the naphthalimide ligands

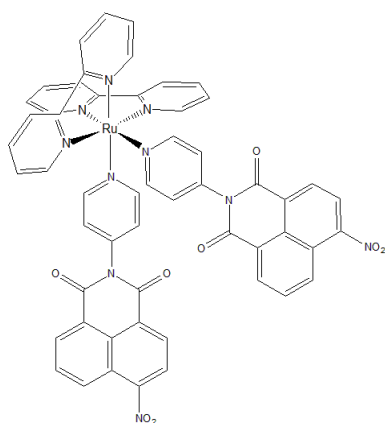


Figure 1. Pictorial view of complex [Ru(bpy)<sub>2</sub>(NI)<sub>2</sub>](PF<sub>6</sub>)<sub>2</sub>

(NI), which are planar, rigid and conjugated organic molecules. In general, the spectroscopic properties of NI ligands are sensitive to the environment in which they are, displaying changes on the energy of ground and lowest excited electronic states as a response to solvent changes.<sup>2</sup> Considering the NI ligands and the [Ru(bpy)<sub>2</sub>] core as appealing chromophores, this work presents a novel complex in which two ligands belongs to the naphthalimide family (Figure 1). **Experimental.** The complex [Ru(bpy)<sub>2</sub>(NI)<sub>2</sub>](PF<sub>6</sub>)<sub>2</sub> was synthesized by adaptations of the method described by Nikolaou and coworkers,<sup>3</sup> purified by adsorption alumina column and characterized using electronic spectroscopy. **Results and discussion.**

The electronic absorption spectrum of compound [Ru(bpy)<sub>2</sub>(NI)<sub>2</sub>](PF<sub>6</sub>)<sub>2</sub> (collected from acetonitrile solution) displayed four bands, compatible with the typical profile observed for this type of chromophore.<sup>1</sup> Two very intense bands at 240nm and 285nm, ascribe to  $\pi$ - $\pi^*$  transitions of both, 2,2'-bipyridine and NI ligands; a broad band at 344nm ( $\epsilon = 4203 \text{ L mol}^{-1}\text{cm}^{-1}$ ) ascribed to a low lying  $\pi$ - $\pi^*$  transition of the NI ligand; and a less intense, broad band at 426nm, assigned to a metal-to-ligand charge transfer (MLCT). Excitation at the MLCT transition (acetonitrile solution) leads to a strong emission band centered at 509nm, which is sensitive to the presence of molecular oxygen. Emission spectrum collect from deaerated acetonitrile solution (degassed with Ar(g)) displayed an increase of 25% on emission intensity. This result shows that the emissive MLCT state has a triplet character and it is partially quenched in the presence of <sup>3</sup>O<sub>2(g)</sub>. At the concentrations investigated so far ( $\sim 10^{-5} \text{ mol L}^{-1}$  solutions) no aggregation were observed. **Final Remarks.** The results obtained at this point are consistent with the proposed structure, demonstrating that the synthesis was successful. In the next steps of this work, solvatochromism and aggregation studies will be performed.

<sup>1</sup>Juris, A., Balzani, V., Barigelletti, F., Campagna, S., Belser, P. L., & Von Zelewsky, A. **Coordination Chemistry Reviews**, v. 84, p. 85-277, 1988. <sup>2</sup>Demets, G. J. F., Triboni, E. R., Alvarez, E. B., Arantes, G. M., Berci Filho, P., & Politi, M. J. **Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy**, v. 63, n. 1, p. 220-226, 2006. <sup>3</sup>NIKOLAOU, S., Desenvolvimento de Estruturas Polinucleares baseados em Clusters Trinucleares e Complexos Poliimínicos de Rutênio: unidades de montagem em Química Supramolecular, 2002, 176, Tese (Doutorado) Instituto de Química – Universidade de São Paulo, São Paulo 2002.

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