Photophysic properties and applications of lanthanide complexes using time-resolved fluorescence and transient absorption spectroscopy

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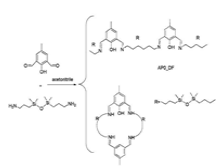
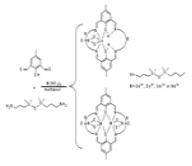
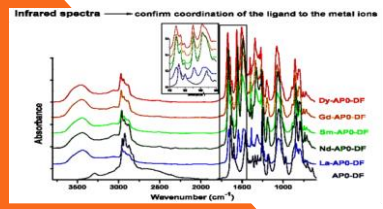
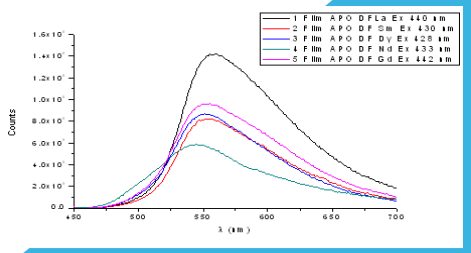
In this presentation transient absorption, steady-state and time-resolved fluorescence spectroscopy were used to investigate and characterize the photophysical properties of lanthanide complexes, as well as for applications by studying fluorescence quenching process.





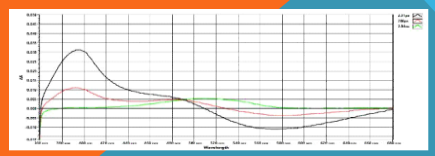
Macrocyclic ligand - obtained by the condensation reaction between siloxane diamine 1,3bis(aminopropyl)tetramethyldisiloxane (AP0) and 2,6-diformyl-4-methyl-phenol (DF) dialdehyde. The lanthanide complexes were obtained by condensation between the siloxane diamine and dialdehyde followed by the addition of La, Gd, Dy, Nd, Sm in methanol at 1: 2 molar ratio as shown in scheme.



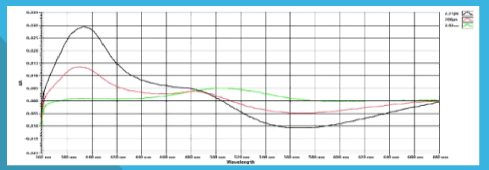


Fluorescence spectra of complexes in film

In order to better characterize the intermediate that appears at longer times, the metal complexes were studied by flash photolysis, with excitation at 355 nm.



Transient absorption for AP0-DF-Dy



Transient absorption for AP0-DF-Gd

Acknowledgements
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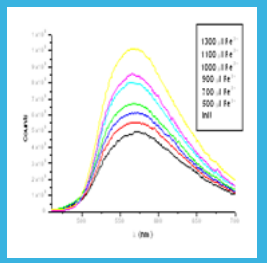
The measurements for quantum yield and lifetime were in solution and film. The lifetime and quantum yield are dependent on the substitution on metal ions.

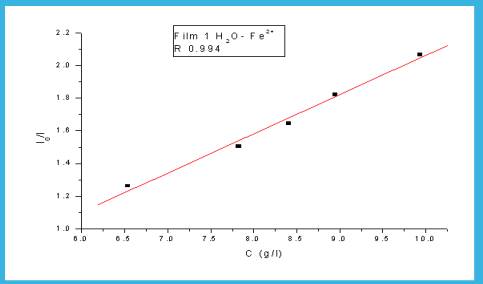
Determination of quantum yield, and lifetime in solution and film

Samples	Q.Y(%)	t1 (ns)	A1 (%)	t2 (ns)	A2 (%)
Solution DMF					
AP0-DF-La3+	3.70	1.562	15.09	3.778	84.91
AP0-DF-Nd3+	1.87	0.385	29.53	3.646	70.47
AP0-DF-Sm3+	2.20	0.333	26.27	3.554	73.73
AP0-DF-Gd3+	2.90	0.307	41.11	3.633	58.89
AP0-DF-Dy3+	2.70	0.297	51.58	3.365	48.42
AP0-DF	1,60	0.2814	86.22	2.8133	13.78
Film					
AP0-DF-La3+	3.43	0.687	90.4	2.428	9.6
AP0-DF-Nd3+	1.36	0.773	85.14	3.835	14.86
AP0-DF-Sm3+	2.99	0.929	46.7	3.163	53.3
AP0-DF-Gd3+	2.88	0.914	51	3.482	49
AP0-DF-Dy3+	3.02	1.203	35.33	3.558	64.67
AP0-DF	19.94	0.6288			

We chose to approach the characterization and investigation of lanthanide complexes for the theoretical information, and also sensors for applications resulting from this study.



The fluorescence quenching of Film APO DF/H2O



Film APO DF/H2O

A new application of the compounds investigated for the detection of heavy metals from water was obtain.