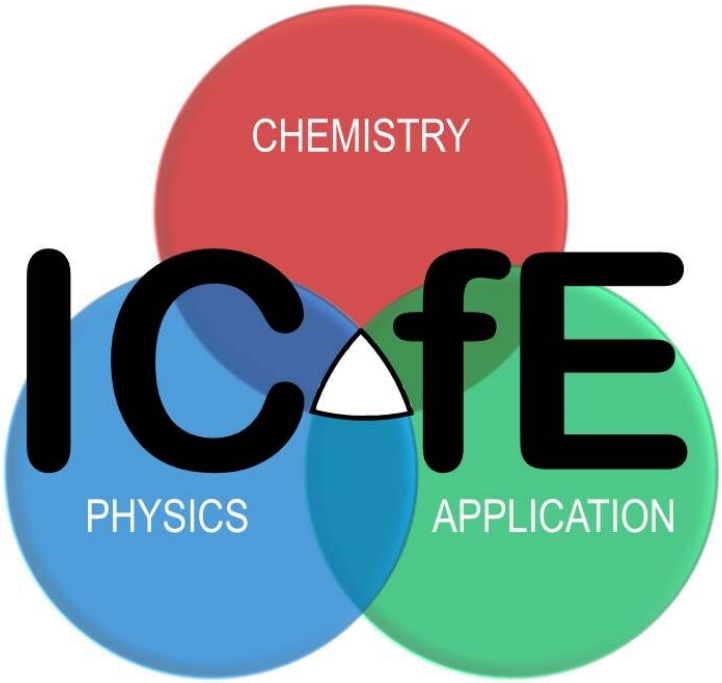

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Programme and Book of Abstracts

SYNTHESIS AND PHOTOLUMINESCENCE PROPERTIES OF [Eu(dbm)$_3$PX] AND [Eu(acac)$_3$PX] THERMOSENSOR COMPLEXES

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Luminescent europium tris(β-diketonate) complexes: tris-dibenzoylmethane piroxicam europium (III) [Eu(dbm)$_3$PX] and tris- acetyl acetonate piroxicam europium (III) [Eu(acac)$_3$PX] were successfully synthesized[1]. The coordination compounds were characterized by X-ray diffraction (XRD), infrared spectroscopy (FTIR), scanning electron microscopy (SEM). The thermal behavior of the complexes was investigated by thermogravimetric analysis (TG). The photoluminescence properties were determined by the emission spectra of the Eu^{3+} complexes. These spectra show characteristic narrow emissions bands, which are assigned to the $^5D_0 \rightarrow {}^7F_J$ (J = 0-4) hypersensitive transitions with the $^5D_0 \rightarrow {}^7F_2$ transition at ~614 nm being the dominant emission (Fig 1), suggesting that the chemical environment around Eu^{3+} ion are non-centrosymmetric. The absence of the broad emission band from the triplet states (T_1) of the organic ligands in the spectral range from 400 to 550 nm is also consistent with an efficient ligand-to-europium intramolecular energy transfer in the complexes. The emission quantum efficiency values of the compounds increases when the spectra are recorded at low temperature such as [Eu(acac)$_3$PX]: η(%) = 6.5 (300K) and 26.0 (77K) and Eu(dbm)$_3$PX: η(%) = 13.5 (300K) and 37.0 (77K). These materials are strong candidates to act as temperature sensors.

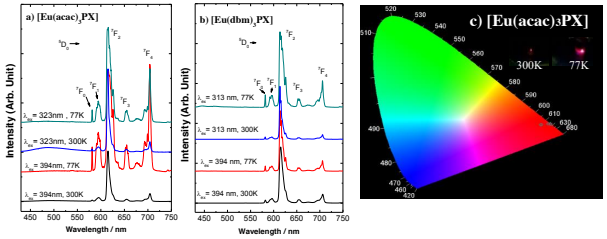

Figure 1. Emission spectra of [Eu(acac)$_3$PX] (a) and [Eu(dbm)$_3$PX] (b) complexes recorded at room and low temperatures. CIE chromaticity diagram of the [Eu(acac)$_3$PX] compound (c) showing the (x,y) emission color coordinates.

References

1) H.F. Brito; O.L. Malta; M.C.F.C. Felinto; E.E.S. Teotonio; The Chemistry of Metal Enolates, Luminescence Phenomena Involving Metal Enolates 2009, John Wiley & Sons, England.

DTA/TG Studies of Lanthanide Hydrides & Nitrides

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Lanthanide hydrides and nitrides have long been studied due to a number of interesting properties and their application as functional materials or precursors in solid state and organic syntheses. In the beginning focus was laid on phase diagrams, crystal structures and physical and chemical properties. [1] Most lanthanides form cubic solid solutions with an hydride content varying from about 1:1.9 to 1:3 (M:H) depending on the size of the lanthanide ion. [2] The corresponding nitrides crystallise in similar cubic space groups. More recently, computational calculations have become the dominant studies on these systems, exploring the electronic and optical features. [3] But despite a lot of activity in that field it is hard to find exact data on the synthesis of both lanthanide hydrides and nitrides, i.e. reaction temperatures and thermodynamic data. This is why in this study we conducted detailed TGA/TG measurements on several lanthanide metals and respective hydrides. We were thereby able to derive optimal temperature programs for the synthesis of several lanthanide hydrides and nitrides starting from the plain metals. We characterised the resulting powders by X-ray powder diffraction measurements and determined the oxygen/nitrogen content.

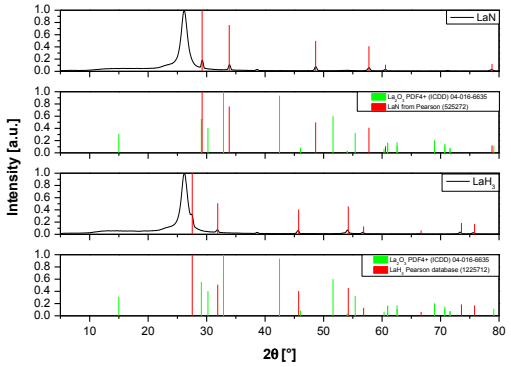

Figure 1. Powder diffraction patterns of LaH_3 and LaN. The broad peak at about 26° 2θ is due to aluminium foil used to protect the powder from air.

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[2] A. Pebler and W.E. Wallace, J. Phys. Chem., 66 (1962), 148
[3] B. Kong, L. Zhang, X.-R. Chen, M.-S. Deng, L.-C. Cai, R-F. Ling-Hu, J. Phys. Chem. Solids, 74 (2013), 1322