

Novel di- and polynuclear lanthanide ion compounds containing 2-acyl-1,3-indandionate ligands as luminescence sensitizers

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Highlights

Novel classes of Eu³⁺ -indandionate complexes with the ligand 1,2-bis(diphenylphosphine)ethane oxide (dppeO₂) were synthesized and their luminescent properties investigated.

Resumo/Abstract

This present work reports the synthesis, characterization and study of the luminescent properties of Eu³⁺ ion compounds containing ligands derived from 2-acetyl-1,3-indandionate, such as 2-benzoyl-1,3-indandionate (bind), 2-(4-methylphenyl)-1,3-indandionate (mbind) and 2-isovaleryl-1,3-indandionate (isovind), in which the ligand 1,2-bis(diphenylphosphine)ethane oxide (dppeO₂) acts as a bridging ligand. The complexes were synthesized by the direct reaction in ethanolic solution of the precursor compounds [Ln(indadionate)₃(H₂O)₂] and the dppeO₂ ligand. The obtained materials were characterized using absorption spectroscopy in the infrared region and thermogravimetric analysis (TGA) techniques. The absorption spectra of the complexes suggested that the coordination of the indandionate and bis(diphenylphosphinoxides) ligands occurs through the oxygen atoms of the C=O and P=O groups, respectively (Figure 1a). Thermal analysis data (TGA/DTA) indicate that the synthesized compounds present high thermal stabilities up to approximately 350°C, indicating the absence of water molecules coordinated to the metal ion (Figure 1b). The spectroscopic properties of the complexes were investigated from emission spectral data recorded at room temperature. When compared to the precursor complexes, the complexes containing the dppeO₂ ligand exhibit high emission intensities in the red region, corroborating the thermal analysis data for the replacement of water molecules by the neutral ligand. These data suggest that the prepared materials have great potential to act as light-converting molecular systems.

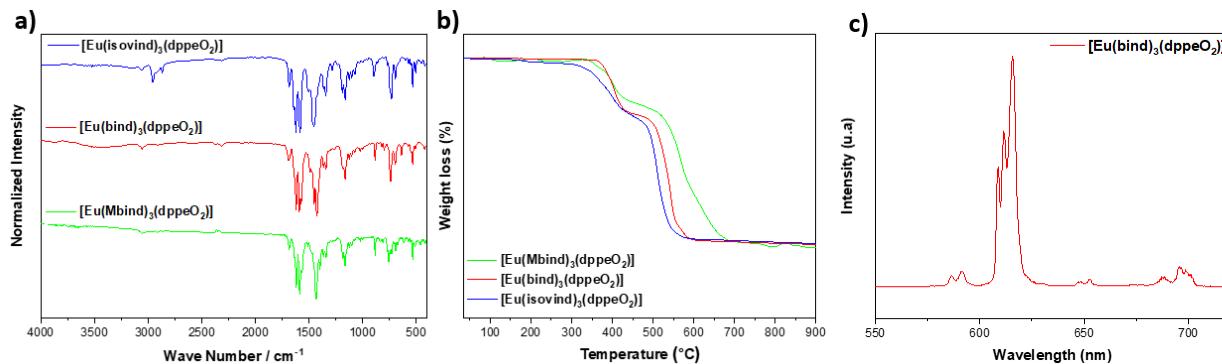


Figure 1 (a) Absorption spectra in the infrared region of the complexes. (b) TG curves of compounds recorded in synthetic air atmosphere (c) Complex emission spectra. The emission spectrum of the [Eu(bind)₃(dppeO₂)] is presented as representative one.

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