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Luminescent properties of mononuclear complexes from Eu(III) and variations of biphenyl carboxylic acid

This project focuses on the study of europium due to its luminescent properties and various technological applications. The general issue with lanthanides is their low energy absorption,attributed to deficiencies in the – transition bands. Europium, dissipates energy through vibrations, which is not conducive to radiative processes. A solution is to add functional group bonds that generate an antenna effect, allowing the europium ion to capture energy and emit it as light.

The objective is to synthesize mononuclear complexes from Eu(III), create a precursor complex, add sensitizers, and evaluate the luminescent properties of three new mononuclear Eu(III) complexes using three variants of biphenyl carboxylic acid. Water is unfavorable for luminescent processes, biphenyl carboxylic acid was added, removing water molecules from the compound and resulting in a solvent-free complex, enabling luminescent processes. The resulting products are the compounds:$EuAB_3$-2N-Carboxylic, $EuAB_3$-3N-Carboxylic, and $EuAB_3$-4N-Carboxylic.

The luminescent properties of each compound were analyzed, with sensitization at wavelengths different from those of Eu^{3+} (393 nm and 464 nm). Emissions were generated from the $^5D_0 \rightarrow {}^7F_1$ electronic transition producing photons at 590 nm and the $^5D_0 \rightarrow {}^7F_2$ transition producing photons at 616 nm. The luminescence lifetimes were studied, identifying each compound as fluorescent due to their short emission times, emiting in the microsecond range. The color purity of each compound was simulated, and structural characterization was performed using XRD, demonstrating the development of unprecedented luminescent materials through new synthesis routes. The addition of the three biphenyl carboxylic acid variations optimized the molecules, providing new excitation and emission properties. Emission intensity varied with the non-centrosymmetry of the Eu^{3+},generating radiative processes by avoiding molecular resonance.

Keywords

Europium, Luminescence, Mononuclear complexes, Antenna effect, Biphenyl carboxylic acid

Reference

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Author approval

I confirm

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