LUMINESCENT INVESTIGATION OF THE POLYMETHYL METACRYLATE(PMMA) NANOPARTICLES DOPED WITH Eu(III)–TTA COMPLEX CONTAINING PHOSPHINE OXIDE LIGAND AND FUNCTIONALIZED WITH 1,6 DIAMINEHEXANE

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Highlights

New luminescent material, Lanthanide nanoparticle, Photoluminescence properties, biological application.

Abstract

Trivalent lanthanide (Ln^{3+})-doped luminescent polimeric nanoparticles (NPs), characterized by long-lived luminescence, large Stokes and/or anti-Stokes shifts, narrow emission bands and high photochemical stability, are considered to be promising candidates as luminescent bioprobes in biomedicine and biotechnology[1,2]. Polymeric nanoparticles also have long been investigated as drug carriers and imaging agents. In this work we report the preparation of tris(2-thenoyltrifluoroacetonato) europium(III) complex containing the trioctylphosphine oxide, with stoichiometric formula of $[Eu(TTA)_3(TOPO)_2]$. This compound has been characterized by spectroscopic and analytical methods and was used as a doping material in the synthesis of polymeric nanoparticles. The polymeric nanoparticle was prepared using cryogenic technique, where in a first step a solution of PMMA with *c.a* 0,300g and 60mL of chloroform were doped with *c.a* 0.0015, 0.015 and 0.0225g of the complex was dried in a lyophilize until obtain dried nanoparticles. In a second step these nanoparticles react with a 1,6-diaminehexane to promote the linker with biological part. In Fig1A it is showed the SEM image of $Eu(TTA)_3(TOPO)_2$ 5.0%-PMMA-Amine.

Figure 1B shows the emission spectrum recorded in the range of420 –720 nm, under excitation at 380 nm, at 298 K. It presents narrow emission bands from the $^5D_0 \rightarrow {}^7F_J$ transitions (where J = 0–4) dominated by the hypersensitive $^5D_0 \rightarrow {}^7F_2$ transition around 613 nm. The presence of the $^5D_0 \rightarrow {}^7F_0$ transition indicates that the Eu(III) ion is located in a symmetry site of the type C_s, C_n or C_{nv}. The $^5D_0 \rightarrow {}^7F_1$ emission is almost insensitive to changes in the chemical environment, and primarily magnetic dipole by character, while the $^5D_0 \rightarrow {}^7F_2$ emission is essentially forced electric dipole in character, and its intensity is very sensitive to the ligand field interaction [1]. The profile of the emission spectra of the doped polymer and the doped polymer functionalized change in all samples. Inserted in Fig 1B $Eu(TTA)_3(TOPO)_2$x%-PMMA-Amine The experimental intensity parameters values of Ω_2 and Ω_4 were calculated for the doped polymer and functionalized doped polymer. According to the theory the value of the intensity parameter Ω_2 is the most influenced by small angular changes in the local geometry. These nanoparticles were also used in the detection of 17-β-estradiol and demonstrated that are a promising biomarker *in vitro* experiments.

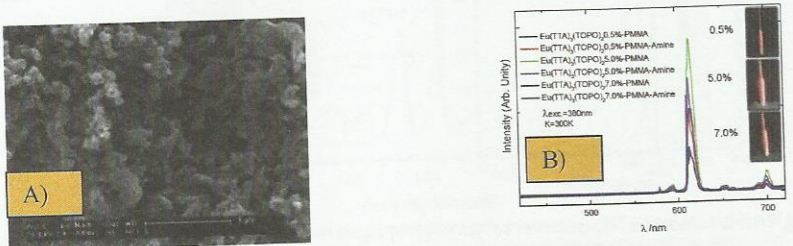

Figure 1. (A) SEM of $Eu(TTA)_3(TOPO)_2$ 5.0%-PMMA-Amine Emission spectra of the polymer doped with $Eu(TTA)_3(TOPO)_2$x%-PMMA and $Eu(TTA)_3(TOPO)_2$x%-PMMA-Amine at 298 K recorded under excitation at 380 nm. Inserted pictures of the polymer doped with the complex and aminofunctionalized under excitation at 366nm

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References

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