Área: MAT

Sustainable urethanesil based on castor oil doped with europium complex

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Highlights

Development of Hybrid urethanesil based on CO and ICPTS without metal catalyst and solvent;
Incorporation of red-emitting lanthanide complex in the hybrid and the investigation of its optical properties.

Abstract

Polymers based on vegetable oils can be excellent suitable candidates for replacing fossil polymers, for example, polyurethanes (PU) based on castor oil (CO). However, the synthesis of PU materials is normally carried out using organic solvents, metals and high temperatures. To overcome these problems, the sol-gel route is an alternative approach based on mild conditions to produce environmentally friendly organic-inorganic hybrid urethanesil (Ur). Therefore, in this study, we proposed the synthesis of a sustainable organic-inorganic hybrid (OIH) based on Ur derived from CO, as well as the incorporation and interaction of europium β-diketone [Eu(tta)$_3$(H$_2$O)$_2$] in the organic-inorganic hybrid matrix, as shown in the Figure 1. The self-sustaining hybrid of Ur was synthesized from the reaction of 3-(triethoxysilyl)propyl isocyanate (ICPTES) and CO in a 3:1 molar ratio. The films were obtained by the sol-gel process, following the casting method. The CO-based OIH-Ur films showed high transmittance in the visible and infrared spectrum (90%) and the urethanesil showed photoluminescence (PL) with emission at 416.0 nm when excited at 319.0 nm, as shown in Figure 1. The results also revealed an increase in the intrinsic quantum yield of PL (Q_L^{Eu}) for [Eu(tta)$_3$(H$_2$O)$_2$]. It has been verified a Q_L^{Eu} value of 27% for the isolated complex, while a value of 49% was observed when it is incorporated into OIH PU.

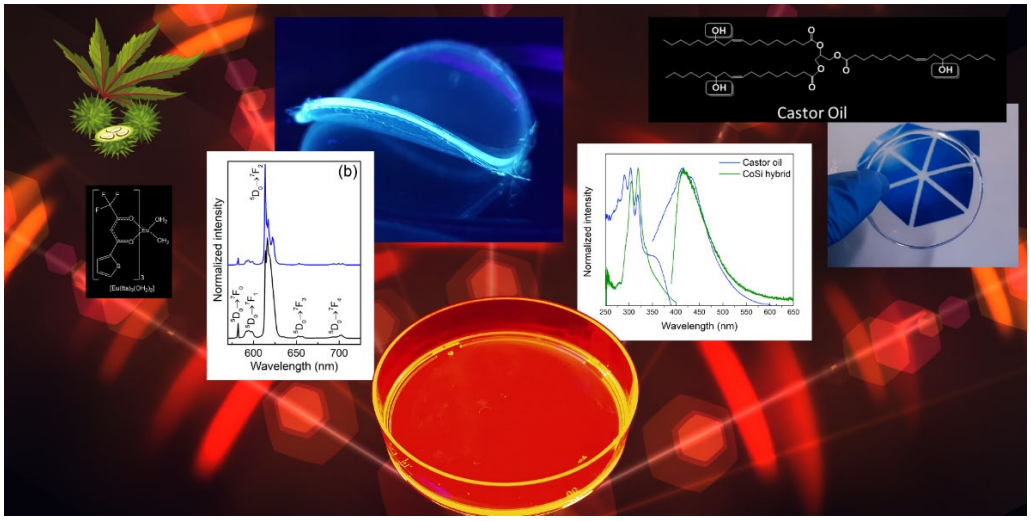

Figure 1 - Main characteristics, namely, the luminescence of the hybrid and the same doped, as well as its precursors.

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