

## Development of sustainable luminescent solar concentrators: from castor oil to photovoltaic cell

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### Highlights

Hybrid material based on Castor Oil and 3-(triethoxysilyl)propyl isocyanate. Incorporation of [Eu(tta)<sub>3</sub>(H<sub>2</sub>O)<sub>2</sub>] complex. Cylindrical luminescent solar concentrator for PV energy production enhancement.

### Abstract

It is consensus that the tremendous growing in global energy consumption since the beginning of the twentieth century, mainly coming from fossil sources, has led to the recent climate changes. Under this scenery, there is no doubt that the energy of the future is going to be based on natural and renewable sources. Over the last years, much attention has been dedicated to obtaining new materials to be used in photovoltaic (PV) energy production. Several strategies have been adopted in order to improve the PV energy conversion. Notwithstanding, some challenges concerning PV need to be overcome, mainly related to the efficiency of the process. In this sense, luminescent solar concentrators (LSCs) has been successfully used during the last decades for such purpose. Efficient UV absorption, efficient emission quantum yield, photostability, and sustainability are characteristics extremely important concerning LSCs. In the present study we present and discuss outstanding results concerning a sustainable organic-inorganic hybrid (OIH) material based on Castor oil (CO) and containing a Eu<sup>3+</sup> complex, namely SiCO-[Eu(tta)<sub>3</sub>]. Such material was obtained by using the sol-gel process, following the casting method. The results have shown that the SiCO-[Eu(tta)<sub>3</sub>] material presents satisfactory thermal stability, broad transparency window (90% of transmittance in the visible and infrared) and efficient UV-to-visible conversion. Furthermore, the photoluminescence results have revealed an expressive increase in the emission quantum efficiency when the [Eu(tta)<sub>3</sub>] complex is incorporated into OIH material. Moreover, experiments in progress have shown that SiCO-[Eu(tta)<sub>3</sub>] can be used to produce cylindrical LSCs. Which, are more efficient than planar ones. All the results indicate that the obtained material have a huge potential to be used as efficient luminescent solar concentrators and consequently improving PV cells energy conversion.

### References

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