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# Mailable films with up converting and persistent properties

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## Highlights

This composite aims to study radiative energy transfer between the up-conversion and persistent luminescence. The use of hydroxy propyl methylcellulose (HPMC) film endeavors to achieve proximity between UCNps and in order to facilitate the radiative transfer of energy. This kind of smart material can help increase the applicability of IR emitting phosphorus, once the composite can be excited at 980 nm and emit at 700nm, both being in the biological window.[1]

## Resumo/Abstract

In this study, two luminescent materials were combined in a cellulose ether polymer, HPMC, to create a mailable film that preserved the luminescent materials optical properties. The first is a core-shell structure, $YF_3$@$YF_3$:$Yb^{3+}$, $Er^{3+}$ (UCNps) that presents up-conversion when excited with an IR (980 nm) laser, emitting both in 550 nm and 660 nm. The second is a persistent luminescent material $Zn_{1,3}Ga_{1,4}Sn_{0,3}O_4$: $Cr^{3+}$(PLM), that presents two interesting excitation bands, one in the blue-violet region (400 – 450 nm) and other in the green region of the visible spectra (500-600 nm) and emits light in 700 to 800 nm. That means that the HPMC composite can emit light when excited throughout the uv-vis and near-IR spectra. The composites were synthesized by a drop casting process, where the HPMC was first dissolved in water; then the luminescent materials were then added the solution and homogenized This suspension was poured into silicon molds and put to dry overnight at 80 °C.

Figure 1 shows that the characteristic excitation and emission profiles of both luminescent compounds can be seen even after the casting process, the emission band of $Cr^{3+}$ in this matrix can be seen with excitation in 415 nm and 560 nm. The excitation in 560 nm presents a partial spectral alignment with the emission of the UCNps in 550 nm. This shows the potential of the combination of these luminescent materials in a smart IR (980 nm) to IR (800 nm) up conversion composite.

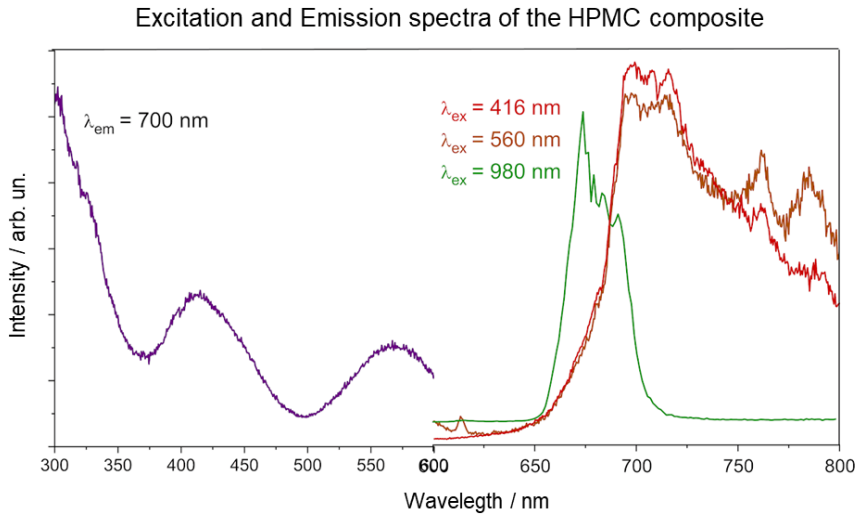


Figure 1: Excitation and emission spectra for the HPMC/UC+PL film

In the case of a radiative energy transfer from the green emission of $YF_3$@$YF_3$:$Yb^{3+}$,$Er^{3+}$ in 550 nm to the excitation band of the $ZnSnGaO_3$: $Cr^{3+}$ in 575 nm, no emission in the 700 nm was seen when the material was excited with 980 nm laser, therefore the radiative energy transfer can not be observed in the film.

## Agradecimentos/Acknowledgments

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## Referências

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