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Hypromellose-based composites with improved upconversion yield

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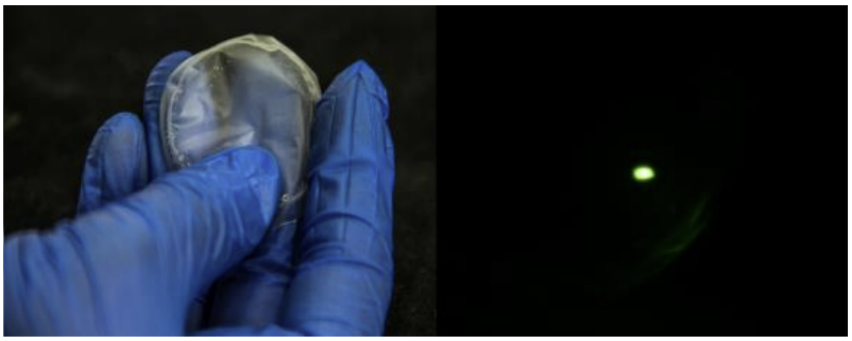
The upconversion phenomenon occurs when two or more lower-energy photons are converted into one higher-energy photon. This phenomenon can be applied in different areas such as bioimaging and solar converters. However, the phenomenon presents a main limitation, its inherent low yield, and the need for coherent excitation light source. In this study, we investigated the enhancing effect of metallic nanoparticles on Hypromellose polymeric composites with upconverting properties. For this purpose, yttrium fluoride nanoparticles doped with ytterbium and erbium were prepared by a solvothermal method and incorporated into hydroxypropyl methylcellulose (HPMC) films using a drop-casting process. Simultaneously, metallic nanoparticles with surface plasmon resonance were added to these composites before the drop-casting process. X-ray fluorescence nanomapping registered at the Carnaúba beamline from Sirius Synchrotron facility was used to understand the interaction between the upconversion nanoparticles and Au or Ag-nanoparticles in the composite and, showed, serendipitously, that the gold nanoparticles interact preferentially with the fluoride nanoparticles over the carbonyl ends of the HPMC as a result of the casting methodology. The photoluminescence study showed an intensification of the upconversion quantum yield in the presence of gold nanoparticles.



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