Polydimethylsiloxane composites containing core-only high emission lifetimes of lanthanides-doped oleylamine-stabilized LaF₃ nanoparticles

Emille M. Rodrigues, Rafael D. L. Gaspar, Italo O. Mazali, Fernando A. Sigoli*

Laboratory of Functional Materials – Institute of Chemistry – University of Campinas – UNICAMP

P. O. Box 6154, Campinas, Sao Paulo, Brazil, 13083-970

*fsigoli@iqm.unicamp.br

Supplementary Information



Figure S1: FT-IR spectra of pure oleylamine and NPLaFEu sample.



Figure S2: Thermogravimetric curves obtained under synthetic air atmosphere of the NPLaFEu sample.



Figure S3: X-Ray diffractograms of the NPLaFEu sample after the thermal treatment similar to TGA analysis conditions.



Figure S4: X-Ray diffractograms of the NPLaFErYb11 and bulkLaFErYb11, NPLaFErYb12 and bulkLaFErYb12, NPLaFErYb13 and bulkLaFErYb13 samples.



Figure S5: Raman spectra of the NPLaFErYb11 and bulkLaFErYb11, NPLaFErYb12 and bulkLaFErYb12, NPLaFErYb13 and bulkLaFErYb13 samples obtained at laser excitation of 514 nm and 2 mW power.





Figure S7: Variation of the asymmetric ratio (R_{12}) with time on the time resolved emission spectra of the NPLaFEu sample.



Figure S8: Emission decay curve of ⁵D₀ metastable state of the bulkLaFEu sample.



Figure S9: Upconversion mechanism for the red (a) and green (b) emission with n=2, for the samples NPLaFErYb12 and NPLaFErYb13.



Wavenumber / cm⁻¹

Figure S10: FT-IR spectra of the pdms membranes with different cross linkers and containing NPLaFEu. The spectra of the pure pdms and of the membranes without the NP (named without NP letters at the end of the sample name) are also shown for comparison. One can note that the Si-H stretching (2100 cm⁻¹) from pdms is not present at the membrane spectra, showing that the hydrossylilation reaction was complete.



Figure S11: Photograph of the MtvsNP (a) at room light and (b)



Wavelength / nm Figure S12: Transmittance spectra in the Uv-VIS-NIR region of the pdms membranes with different cross linkers and containing NPLaFEu. The spectra of the NPLaFEu and of the membranes without the NP (named without NP letters at the end of the sample name) are also shown for comparison. One can observe that the membranes are transparent at the Visible range of the spectra, but have a small absorption at the NIR region due to the presence of the 4-terc-butyl-catecol, a stabilizer agent used in the dvb reagent. The * sign indicates the region where the spectra was corrected due to detector change during the measurement.



Figure S13: Thermogravimetric curves obtained under synthetic air atmosphere of the Mtvs, MtvsNP, Mtvsdvb11NP and Mtvsdvb12NP showing the thermal stability of the membrane samples up to 400 °C.

illuminated by UV lamp, showing the uniform luminescence of the composite material, an evidence of the uniform distribution of the dispersed NPLaFEu.



Figure S14: Absorbance spectra of the dvb cross link showing the absorption band at 240 nm.