Supporting Information

Efficient Light Harvesting within C153@Zr-Based MOF Embedded in a Polymeric Film: Spectral and Dynamical Characterization

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Thermal Gravimetric Analysis

Thermogravimetric and differential thermal analyses (TGA-DTA) were performed using a TA Q-500 device at a heating rate of 10 ºC min^{-1} under nitrogen atmosphere. Figure S3 shows the TGA of 2,6-NDC, C153, Zr-NDC and C153@Zr-NDC, while Figure S4 displayed those for PC, Zr-NDC/PC and C153@Zr-NDC/PC films. The organic linker 2,6-NDC is stable up to 377ºC, while the laser dye C153 presents a lower decomposition temperature of 230ºC. When the organic linker 2,6-NDC is taking part of the Zr-NDC three-dimensional network, their degradation temperature is higher, being stable up to 575ºC. Moreover, Zr-NDC presents two more steps at ~130 and ~250 ºC, which can be assigned to the loss of solvent (THF, DMF or/and acetic acid, respectively) during heating. The TGA of C153@Zr-NDC is similar to that obtained for Zr-NDC, as the molar mass of C153 is not high enough to precisely detect its degradation temperature. Otherwise, the polymeric membrane PC lost the 85 % of its mass at 520ºC while the remaining 15 % is stable up to 720ºC. By incorporating Zr-NDC into the PC membrane, Zr-NDC/PC, we observed two steps, one at 460ºC due to the PC decomposition and the other at 600ºC due to the Zr-NDC thermal degradation. So, the incorporation of Zr-NDC into PC polymer makes the former more thermally stable (from 575 to 600ºC). Finally, as well as we described for C153@Zr-NDC, when we incorporated the related composite material into the PC film, we do not observe any significant change when compared to that of Zr-NDC/PC system, as the quantity of C153 is so low that the system cannot detect its thermal degradation.

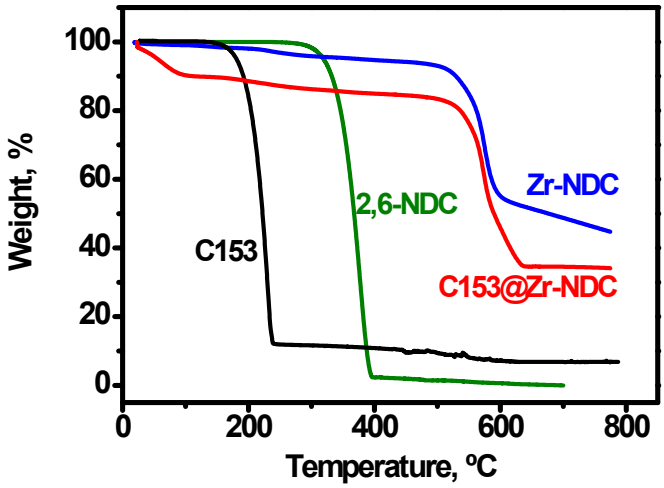

Figure S1. TGA curves for the organic linker 2,6-NDC (green), the laser dye C153 (black), Zr-NDC MOF (blue) and C153@Zr-NDC (red) composite material.

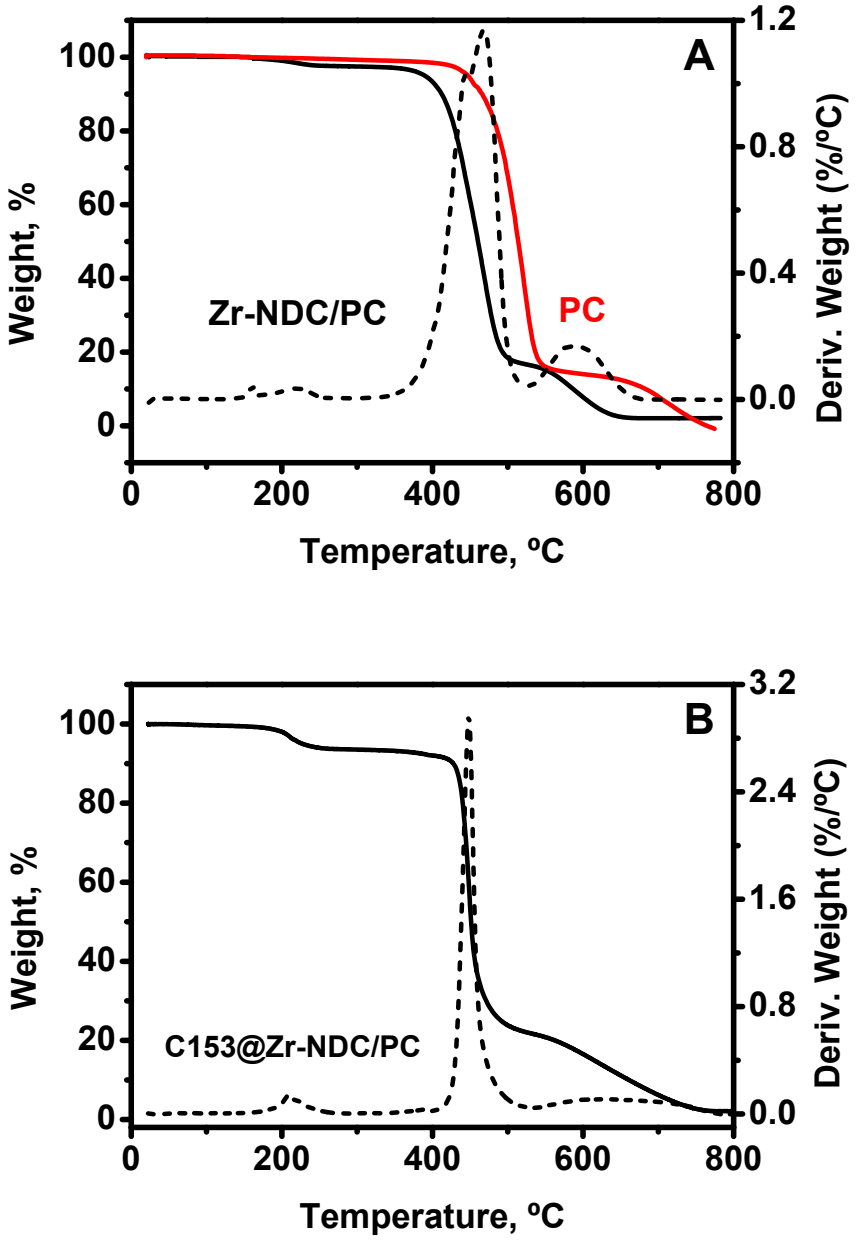

Figure S2. TGA curves for A) PC (red) and Zr-NDC/PC (black) films; and for B) C153@Zr-NDC/PC mixed matrix membrane.

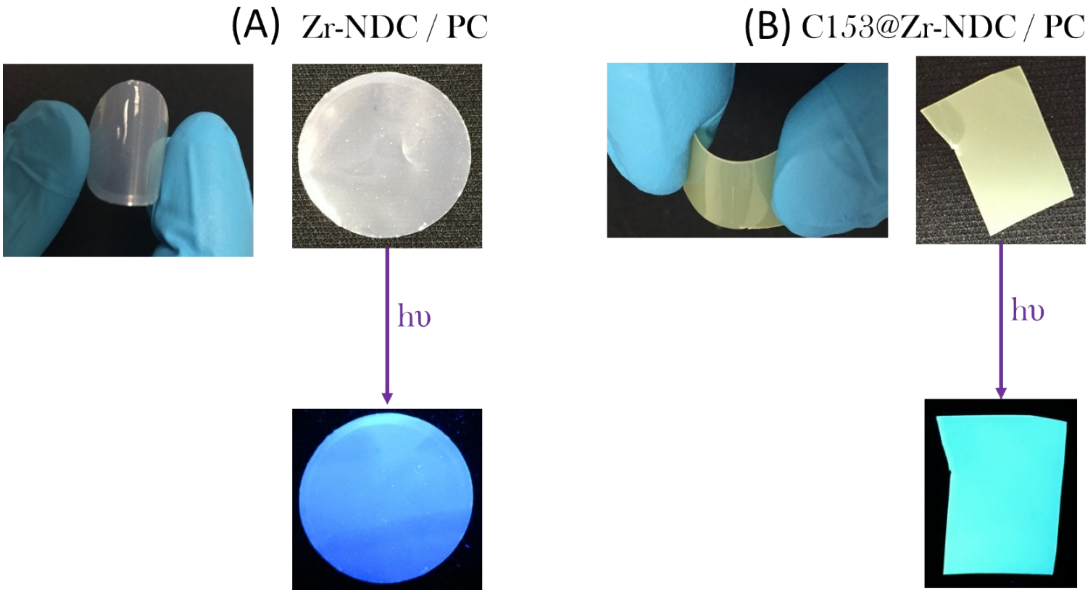

Figure S3. Photograph of the physical appearance before and after UV-irradiation of (A) Zr-NDC/PC and (B) C153@Zr-NDC/PC mixed matrix membranes.

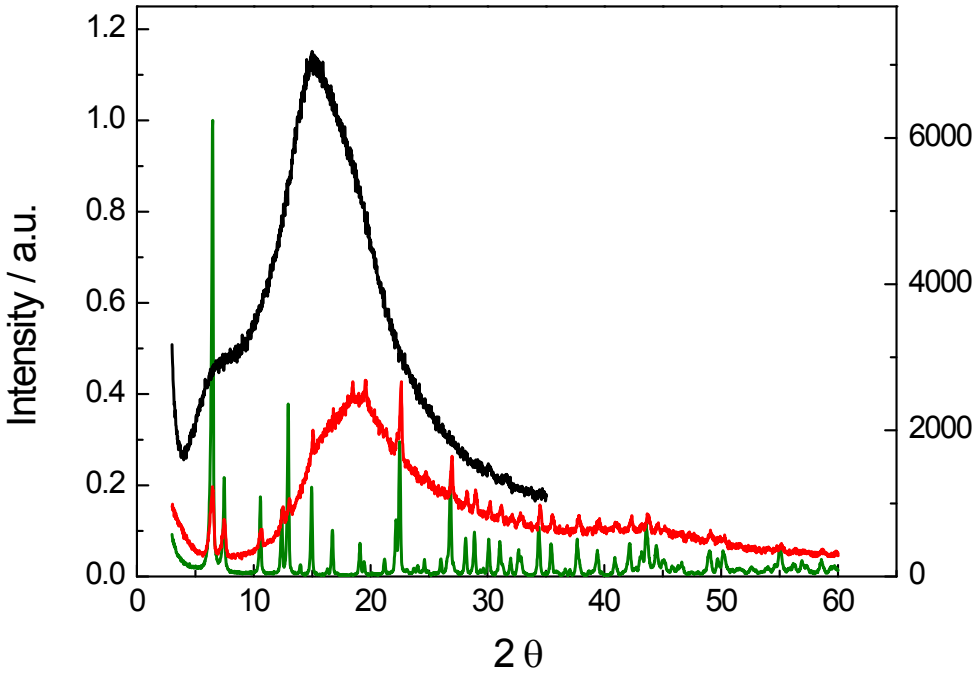

Figure S4. X-ray diffraction patterns of polycarbonate PC (black line), C153@Zr-NDC (green line), and C153@Zr-NDC/PC (red line).

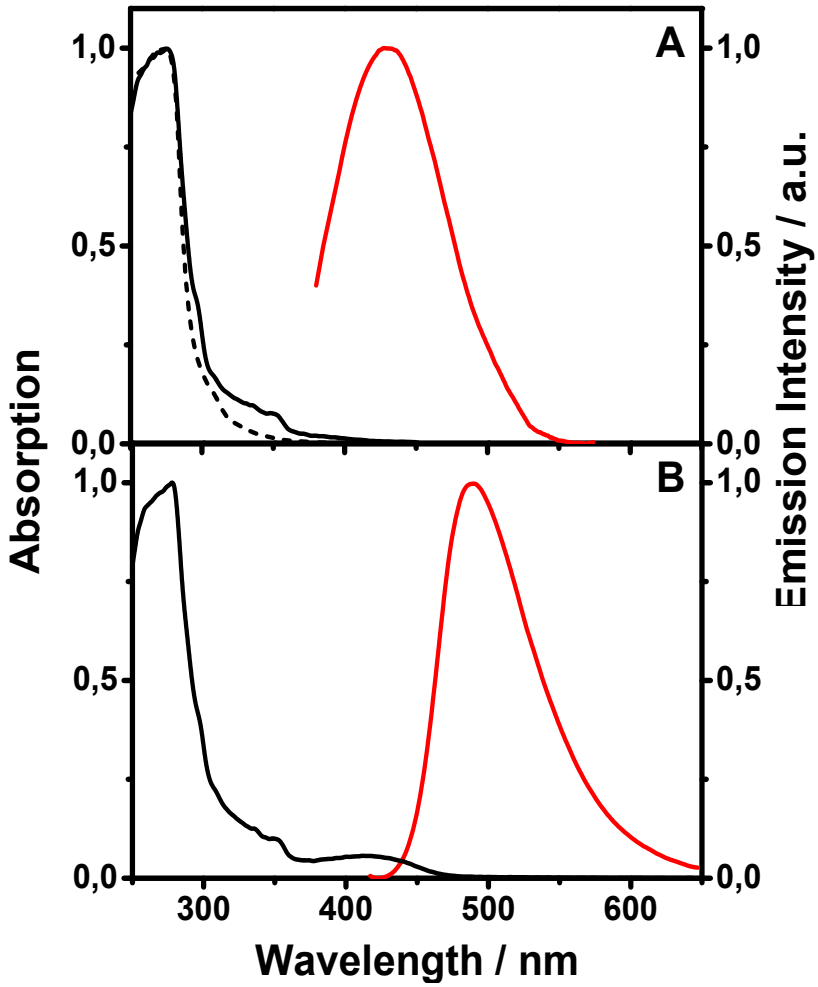

Figure S5. Normalized UV-visible absorption (black lines) and emission (red lines) spectra of (A) PC (dashed line) and 2,6-NDC/PC (solid lines), and (B) a mixture of C153/2,6-NDC/PC films. For emission the excitation wavelength was 370 nm.

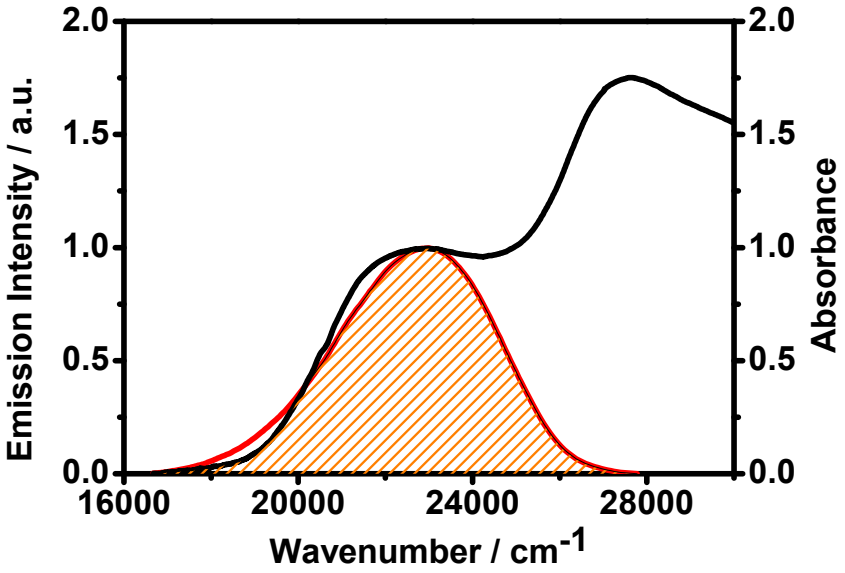

Figure S6. Representation of the spectral overlap between Zr-NDC/PC emission (red line) and C153@Zr-NDC/PC absorption (black line). Both spectra are normalized in a way to obtain a similar value at the maxima. For emission, the excitation wavelength was 370 nm.

Acknowledgements

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