Encapsulation of xanthene dyes into nanochannels of MgAPO-11 for optical applications

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The incorporation of photoactive molecules into ordered nanostructured systems is an emerging field for the development of new functional optical materials. In particular, one-dimensional nanochanneled crystalline systems allow a supramolecular organization of the embedded molecules and an improvement of their properties. For this purpose, several xanthene type dyes with absorption and emission bands in the whole visible spectrum range have been encapsulated into magnesium aluminophosphate-11 (MgAPO-11) by inclusion during crystallization. The selected host material, owing to the special size and topology of the nanochannels allows a tight fit to the molecular dimensions of the forementioned dyes. As a result, highly luminescent materials have been obtained, since the encapsulation of monomeric units of the dyes is only allowed.

Not only do we improve the luminescence properties of the dyes in the hybrid material, but we have also obtained a particular anisotropic response of the particles under polarized light, due to the preferential alignment of the dye molecules along the 1D MgAPO-11 channels. Pursuing new enhanced properties, two dyes have been encapsulated in this host, acridine (AC) and pyronine Y (PY), with perpendicular orientation of their transition dipole moments. This property, together with an appropriate dye-loading rate that enables a FRET process, has resulted into a blue-to-green color switching, instantaneous, efficient, reversible, reproducible and with high fatigue resistance.

References

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[2] Martínez-Martínez, V.; García, R.; Gómez-Hortigüela, L.; Sola Llano, R.; Pérez-Pariente, J.; López-Arbeloa, I., ACS Photonics, **1** (2014) 205.

Figures

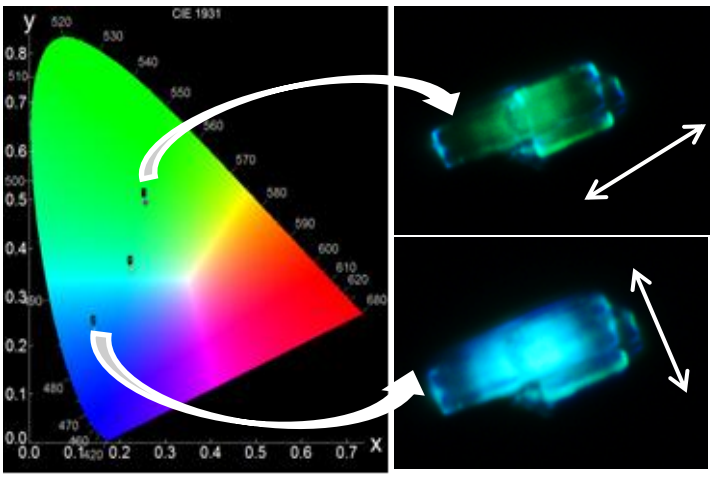

Figure 1. (Right) Fluorescence image of a PY-AC/MgAPO-11 particle upon UV excitation light, with parallel (up) and perpendicular (down) polarizations to the MgAPO-11 channels' c-axis. (Left) Their corresponding emission colors in CIE.