Nonlinear optics through the encapsulation of DMASBT dye into a magnesium doped aluminophosphate

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In this work, a styryl dye (trans-2-[4-[(dimethylamino)styryl] benzothiazole, DMASBT) is encapsulated into a magnesium doped aluminophosphate (MgAPO-11, AEL framework, Figure 1a) with one-directional nanochannels of 4.0 x 6.5 Å dimensions. The hybrid material has been synthesized by the crystallization inclusion method and optimized through systematic variations in order to obtain pure phase and suitable optical properties for our system.[1]

The tight-fit between the molecular size of the guest dye and the pore dimensions of the host, favour a rigid planar conformation of the dye, restricting its inherent flexibility and boosting its fluorescence. Moreover, a preferential orientation of the dye molecules along the channels is obtained. These features are crucial to achieving a system with non-linear optical (NLO) properties, which has successfully been achieved.

The distinctive photophysical properties reached are not only run by the pore size of the framework but also by the pH during the synthesis, leading to the stabilization of different cationic species within the pores with distinctive optical features.[2] Therefore, the perfect alignment of DMASBT dye along the channels of MgAPO-11 has led to a highly emitted material with high anisotropic response to the linear polarized light, proven through microscopy measurements (Figure 1b).

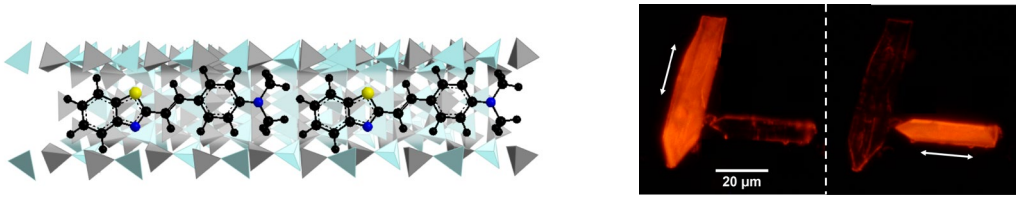

Figure. a) *DMASBT dye molecules inside the MgAPO-11 aluminophosphate.* ***b)*** *Polarized fluorescence images of the particles under green excitation light. Arrows indicate the direction of the polarized light.*

References

[1] R. Sola-Llano, V. Martínez-Martínez, Y. Fujita, L. Gómez- Hortigüela, A. Alfayate, H. Uji-i, E. Fron, J. Pérez-Pariente, I. López-Arbeloa. *Chem. Eur.* **2016**, *22*, 1-13

[2] S. K. Saha, P. Purkayastha, A.B. Das, *Photochem. Photobiol. A Chem.* **2008**, *195*, 368-377